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**Title**

Australian Antarctic scientists : consciousness and behaviour

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APPENDIX A: Complete Guna Characteristics Guide (CGCG) (Bhaktivedanta 1970, chap. 85; 1987-8, 11:chap.13, 11:chap.25; 1989, chaps.14-18; 1992, chap. 5; Burger 1998, 8, 169-74; Das 1987, 7-9; Flood 1996, 234-5; Mohan and Sandhu 1986, 47-9; Mohan and Sandhu 1988, 24-8; Rao and Harigopal 1979, 64; Totton and Jacobs 2001, 94; Singh 1971, 149-50; Sitamma and Rao 1995, 185-6; Sitamma, Sridevi and Rao 1995, 13-6; Stempel et al. 2006, 262; Wolf 1999, 1381).

- Most entries represent exact wording from above-listed texts. Exceptions to this include grammatical adjustment and/or additional wording to accommodate the meanings of characteristics outside complete sentences provided in texts, as well as occasional entries of characteristics comprised from broader readings from above-listed texts and other texts by Bhaktivedanta discussed throughout this thesis.
- The order in which individual guna topics, as well as individual guna characteristics appear in the table, does not carry any significance.

PARALLEL TOPICS ↓	SATTVA	RAJAS	TAMAS
1. KNOWLEDGE	<p>1. SELF-REALISATION/SELF-KNOWLEDGE</p> <p>2. GREATER AND REAL KNOWLEDGE</p> <p>3. THE PURSUIT OF GREATER AND REAL KNOWLEDGE</p> <p>4. THE BEGINNING OF SPIRITUAL KNOWLEDGE/RUDIMENTARY SPIRITUAL KNOWLEDGE</p> <p>5. CAREFUL STUDY OF THE PAST AND FUTURE</p> <p>6. KNOWLEDGE BY WHICH ONE UNDIVIDED SPIRITUAL NATURE IS SEEN IN ALL LIVING ENTITIES, THOUGH THEY ARE DIVIDED INTO INNUMERABLE (material) FORMS</p>	<p>1. THE UNDERSTANDING THAT CONSCIOUSNESS EXPIRES WHEN THE MATERIAL BODY EXPIRES</p> <p>2. KNOWLEDGE BY WHICH ONE SEES THAT IN EVERY DIFFERENT BODY THERE IS A DIFFERENT TYPE OF LIVING ENTITY</p> <p>3. KNOWLEDGE GATHERED THROUGH THE MATERIAL SENSES (EMPIRICAL KNOWLEDGE)</p> <p>4. ACQUIRING SCIENTIFIC KNOWLEDGE ON THE MATERIAL BODY/MATERIAL WORLD</p> <p>5. KNOWLEDGE PRODUCING MANY THEORIES AND DOCTRINES BY DIRT OF MUNDANE LOGIC AND MENTAL SPECULATION Such theories typically change</p>	<p>1. IGNORANCE/NESCIENCE/THE GENERAL LACKING OF BOTH MATERIAL AND NON-MATERIAL KNOWLEDGE</p> <p>2. ILLUSION/DELUSION</p> <p>3. ACQUISITION OF KNOWLEDGE WITHOUT ANY HIGHER PURPOSE</p> <p>4. KNOWLEDGE BY WHICH ONE IS ATTACHED TO ONE KIND OF WORK ONLY, EVEN IF SUCH WORK IS VERY MEAGER AND DEVOID OF THE TRUTH AS REVEALED THROUGH SCRIPTURE</p> <p>5. FOOLISH MATERIALISTIC KNOWLEDGE</p> <p>6. DARKNESS DUE TO LACK OF KNOWLEDGE</p>

	<p>7. THE UNDERSTANDING BY WHICH ONE KNOWS WHAT OUGHT TO BE DONE AND WHAT OUGHT NOT TO BE DONE, AND WHAT OUGHT TO BE FEARED AND WHAT OUGHT NOT TO BE FEARED, WHAT IS BINDING AND WHAT IS LIBERATING</p> <p>8. KNOWLEDGE CONCERNING THE SPIRIT SOUL BEYOND THE (MATERIAL) BODY</p> <p>9. ABSOLUTE KNOWLEDGE</p> <p>10. ADHERENCE TO SCRIPTURAL KNOWLEDGE</p> <p>11. KNOWLEDGE ON WHAT IS BENEFICIAL FOR ALL SPECIES OF LIFE (MATERIAL AND NON-MATERIAL BENEFITS)</p> <p>12. A SENSE OF ADVANCEMENT IN MATERIAL KNOWLEDGE Thus the individual experiences a sense of understanding the functioning and workings of the material realm.</p> <p>13. TRUTHFULNESS/PRESENTING ACCURATE KNOWLEDGE/HONESTY</p> <p>14. KNOWLEDGE THAT ADVANCES HUMAN BEHAVIOUR IN LEARNING HOW TO RESTRICT THE MATERIAL SENSES</p>	<p>with time, as new knowledge is accepted and the old is rejected.</p> <p>6. THE UNDERSTANDING THAT THE MATERIAL BODY IS THE LIVING ENTITY</p> <p>7. THE UNDERSTANDING WHICH CAN NOT DISTINGUISH RELIGION FROM IRRELIGION, NOR ETHICAL/MORAL FROM UNETHICAL/AMORAL PRACTICES Unethical practices means practices that cause harm, distress or death to others without any higher ethical and spiritual purposes. Higher ethical purposes means consideration for the individual living being at all times, under all circumstances. <i>Higher spiritual purposes</i> means purposes for spiritual advancement or wellbeing.</p> <p>8. ADHERENCE TO MUNDANE KNOWLEDGE/STUNTED KNOWLEDGE</p> <p>9 KNOWLEDGE THAT IS DEPENDENT ON MUNDANE CIRCUMSTANCES</p> <p>10. ONE SPECULATES ABOUT THE REALITY OF ONE'S OWN EXISTENCE AND OF THE WORLD AROUND ONESELF</p> <p>11. KNOWLEDGE BASED ON DUALITY</p>	<p>7. KNOWLEDGE CONCERNED ONLY WITH KEEPING THE BODY COMFORTABLE</p> <p>8. FALSE EXPECTATIONS, INDULGENCE IN FALSE HOPES</p> <p>9. KNOWLEDGE (BASED ON) THE SATISFACTION OF BODILY DEMANDS</p> <p>10. ACQUIRING KNOWLEDGE FOR SENSE GRATIFICATION, ABSORBING THE MIND IN VARIETIES OF EATING, SLEEPING, DEFENDING AND SEX, WITHOUT ANY HIGHER PURPOSE</p> <p>11. BEING UNINTERESTED IN AND UNCONCERNED ABOUT SPIRITUAL MATTERS.</p> <p>12. LOSS OF MEMORY</p> <p>13. FIXING ONE'S MIND ON THE SENSE OBJECTS WITHOUT HIGHER AWARENESS, PERCEIVING THINGS AS A SMALL CHILD OR A RETARDED PERSON DOES</p> <p>14. DISHONESTY/DELIBERATELY PRESENTING INACCURATE KNOWLEDGE/DECEPTION</p> <p>15. FOOLISHNESS</p>
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	15. PROMOTES ELEVATED MUNDANE KNOWLEDGE		16. BEWILDERMENT
2. ACTION	<p>1. THAT ACTION WHICH IS REGULATED AND WHICH IS PERFORMED WITHOUT ATTACHMENT, WITHOUT LOVE OR HATRED, AND WITHOUT DESIRE FOR FRUITIVE RESULTS</p> <p>2. ACTS THAT ENCOURAGE LIBERATION FROM MATERIAL ENTANGLEMENT</p> <p>3. ACTION THAT IS RESPONSIBLE TO BOTH MATERIAL AND NON-MATERIAL NEEDS OF OTHERS</p> <p>4. ACTION THAT MAINTAINS/ SUSTAINS/PRESERVES</p>	<p>1. ACTIVITY</p> <p>2. ACTION PERFORMED WITH GREAT EFFORT BY ONE SEEKING TO GRATIFY ONE'S DESIRES, AND ENACTED FROM A SENSE OF FALSE EGO</p> <p>3. ACTION RESULTING IN MISERY</p> <p>4. UNDERSTANDING WHICH CANNOT DISTINGUISH BETWEEN RELIGION AND IRRELIGION, BETWEEN ACTION THAT SHOULD BE DONE AND ACTION THAT SHOULD NOT BE DONE</p> <p>5. ACTS THAT CAUSE OTHER INDIVIDUALS FURTHER MATERIAL ENTANGLEMENT</p> <p>6. INTENSE ENDEAVOUR</p> <p>7. THE INDIVIDUAL IS ENGAGED IN FRUITIVE ACTIVITY</p> <p>8. ACTION THAT CREATES/RE-CREATES</p>	<p>1. ACTION PERFORMED IN ILLUSION, IN DISREGARD OF SCRIPTURAL INJUNCTIONS, AND WITHOUT CONCERN FOR FUTURE BONDAGE OR FOR VIOLENCE OR DISTRESS CAUSED TO OTHERS</p> <p>2. ACTING WHIMSICALLY, FOR NO PURPOSE</p> <p>3. ALTHOUGH CONSCIOUSNESS IS GOING ON, LIFE IS INACTIVE</p> <p>4. ACTS THAT CAUSE OTHER INDIVIDUALS FURTHER MATERIAL ENTANGLEMENT</p> <p>5. THE FAILING OF AWARENESS OF GREATER/HIGHER (MATERIAL OR NON-MATERIAL) INCENTIVES FOR ACTION</p> <p>6. ACTS THAT END IN DESTRUCTION</p> <p>7. IRRESPONSIBLE ACTION</p> <p>8. ACTION THAT DESTROYS/ ANNIHILATES</p>
3. WORK AND THE WORKER	<p>1. OFFERING THE RESULTS OF WORK TO THE SUPREME</p> <p>2. AWARENESS OF AND INTEREST IN</p>	<p>1. AMBITION FOR MATERIAL PURSUITS/CAREER-MINDEDNESS/DESIRING CAREER ACHIEVEMENT/PERSONAL AMBITION</p>	<p>1. WORK IMPELLED BY VIOLENCE AND/OR ENVY</p> <p>2. LACK OF AWARENESS OF, OR</p>

	<p>HIGHER ETHICAL AND SPIRITUAL PURPOSES OF WORK</p> <p>3. WORK PERFORMED AS AN OFFERING TO THE SUPREME, WITHOUT CONSIDERATION OF THE FRUIT (RESULTS)</p> <p>4. A WORKER FREE OF ATTACHMENT</p> <p>5. ONE WHO PERFORMS HIS DUTY ... WITHOUT FALSE EGO, WITH GREAT DETERMINATION AND ENTHUSIASM, AND WITHOUT WAVERING IN SUCCESS OR FAILURE</p>	<p>2. HARD WORK/GREAT ENDEAVOUR TO ENJOY MATERIAL COMFORTS</p> <p>3. THE WORKER WHO IS ATTACHED TO WORK AND THE FRUITS OF WORK, DESIRING TO ENJOY THOSE FRUITS, AND WHO IS GREEDY, ALWAYS ENVIOUS, IMPURE, AND MOVED BY JOY AND SORROW</p> <p>4. HARD WORK TO ACQUIRE PRESTIGE AND FORTUNE/WORK PRIORITIES ARE TO MAKE MONEY</p> <p>5. A WORKER BLINDED BY PERSONAL DESIRE</p> <p>6. AN INSATIABLE DESIRE FOR RESULTS</p>	<p>INTEREST IN, HIGHER ETHICAL AND SPIRITUAL PURPOSES OF WORK</p> <p>3. WORKING, BUT MAKING NO ENDEAVOUR</p> <p>4. THE WORKER WHO IS ALWAYS ENGAGED IN WORK AGAINST THE INJUNCTIONS OF THE SCRIPTURE, WHO IS MATERIALISTIC, OBSTINATE, CHEATING AND EXPERT IN INSULTING OTHERS, AND WHO IS LAZY, ALWAYS MOROSE AND PROCRASTINATING</p> <p>5. ILLUSORY WORK</p>
4. DETERMINATION	<p>DETERMINATION WHICH IS UNBREAKABLE, WHICH IS SUSTAINED WITH STEADFASTNESS BY YOGA PRACTICE, AND WHICH THUS CONTROLS THE ACTIVITIES OF THE MIND, LIFE AND SENSES</p>	<p>DETERMINATION BY WHICH ONE HOLDS FAST TO FRUITIVE RESULTS IN RELIGION, ECONOMIC DEVELOPMENT AND SENSE GRATIFICATION</p>	<p>DETERMINATION THAT CAN NOT GO BEYOND DREAMING, FEARFULNESS, LAMENTATION, MOROSENESS AND/OR ILLUSION</p>
5. AWARENESS OF A HIGHER SPIRITUAL NATURE	<p>1. SELF AWARENESS/AWARENESS OF ONE'S OWN SPIRITUAL IDENTITY/AWARENESS OF THE SPIRITUAL IDENTITIES OF OTHERS</p> <p>2. ALERTNESS/WAKEFULNESS</p> <p>3. CLEAR AWARENESS OF THE EXISTENCE OF A HIGHER, SPIRITUAL</p>	<p>1. AWARENESS OF ONE'S OWN MATERIAL DESIRES, YET NOT THE MEANING OF THOSE DESIRES ACCORDING TO HIGHER PRINCIPLES</p> <p>2. CONFUSION ABOUT THE EXISTENCE OF A HIGHER SPIRITUAL NATURE WITHIN ALL LIVING ENTITIES</p>	<p>1. DULLNESS/LACK OF AWARENESS OF ONE-SELF AND OTHERS/GENERALLY UNAWARE OF ONESELF, OF OTHERS AND ONE'S SURROUNDINGS</p> <p>2. THE FAILING OF AWARENESS OF A HIGHER SPIRITUAL NATURE WITHIN ALL MANIFESTATIONS</p>

	<p>NATURE WITHIN ALL ENTITIES</p> <p>4. AWARENESS OF NON-MATERIAL PHENOMENA, SUCH AS CONSCIOUSNESS</p>		<p>3. IGNORANCE ABOUT THE EXISTENCE OF A HIGHER SPIRITUAL NATURE WITHIN ALL ENTITIES</p>
<p>6. THE SENSES, THE MIND, THE INTELLECT AND THE SELF</p>	<p>1. CONTROL OF THE MIND AND THE SENSES/CONTROL OF THE SELF</p> <p>2. DETACHMENT FROM THE MATERIAL MIND</p> <p>3. THE SENSES ARE DETACHED FROM MATTER/FROM MATERIAL COMMODITIES AND ENJOYMENT</p> <p>4. THAT WHICH IN THE BEGINNING MAY BE JUST LIKE POISON (DUE TO THE SENSES BEING RESTRICTED) BUT AT THE END IS JUST LIKE NECTAR (DUE TO EXPERIENCES OF A HIGHER SPIRITUAL NATURE) AND WHICH AWAKENS ONE TO SELF-REALIZATION IS SAID TO BE HAPPINESS IN THE MODE OF GOODNESS</p> <p>5. STEADY, FOCUSED INTELLECT/CLEAR-MINDEDNESS/CLEAR-SIGHTEDNESS</p>	<p>1. SENSE ENJOYMENT/SENSE GRATIFICATION (BOTH CONCENTRATED AND EXTENDED). Bhaktivedanta at times discusses concentrated and extended sense gratification as being non-different from concentrated and extended selfishness. Within rajas guna unrestricted sense gratification results in increased material opulence, which further facilitates enjoyment of the material world.</p> <p>2. DESIRING A LUXURIOUS LIFESTYLE</p> <p>3. THAT HAPPINESS WHICH IS DERIVED FROM CONTACT OF THE SENSES WITH THEIR OBJECTS AND WHICH APPEARS LIKE NECTAR AT FIRST (DUE TO THE SENSES BEING STIMULATED) BUT POISON AT THE END (DUE TO SUCH STIMULATION EXPIRING, LEADING TO DISAPPOINTMENT AND CONSEQUENTLY UNHAPPINESS)</p> <p>4. THE INABILITY OF THE PERCEIVING SENSES TO DISENTANGLE THEMSELVES FROM MUNDANE OBJECTS</p> <p>5. UNSTEADY PERPLEXITY OF THE MIND</p> <p>6. DISTORTION OF THE INTELLECT DUE TO TOO MUCH ACTIVITY Activity here refers to physical, mental and intellectual</p>	<p>1. UNRESTRICTED SENSE ENJOYMENT/SENSE GRATIFICATION (BOTH CONCENTRATED AND EXTENDED) Within tamas guna unrestricted sense gratification leads to exploitation and ends in destructive, hopeless and extremely immoral behaviour).</p> <p>2. WHEN ONE'S HIGHER AWARENESS FAILS AND FINALLY DISAPPEARS AND ONE IS THUS UNABLE TO CONCENTRATE ONE'S ATTENTION, ONE'S MIND IS RUINED AND MANIFESTS IGNORANCE AND DEPRESSION</p> <p>3. THE INTELLECT IS OVERCOME BY MATTER, CAUSING FOOLISHNESS.</p> <p>4. SEVERELY CLOUDED MIND AND INTELLECT</p> <p>5. LACK OF CONTROL OF THE SENSES, THE MIND, THE INTELLECT AND THE SELF</p>

		activity for material purposes.  7. CLOUDY MIND AND INTELLECT  8. POOR CONTROL OF THE SENSES, THE MIND, THE INTELLECT AND THE SELF	
7. CLEANLINESS	1. CLEANLINESS/TIDINESS/BEING WELL-ORGANISED AND EFFICIENT Cleanliness and being well-organised applies to subtle material elements such as the mind and the intellect, as well as to gross material elements such as one's material body and one's physical environment.  2. PURITY	IMPURITY	1. UNCLEANLINESS/UNTIDINESS/BEING UNORGANISED  2. IMPURITY
8. TOLERANCE	TOLERANCE/PATIENCE	-	INTOLERANT ANGER/IMPATIENCE
9. MATERIALISM	1. VALUES MATERIAL RESOURCES IN RELATION TO THEIR SPIRITUAL ORIGINS  2. MATERIAL SIMPLICITY/NON-COMPLEXITY  3. MINIMAL UTILISATION OF MATERIAL RESOURCES/UTILISING MATERIAL COMMODITIES PREDOMINANTLY TO FURTHER HIGHER ETHICAL AND SPIRITUAL PURPOSES	1. MATERIALISM- BOTH THEORETICAL AND PRAGMATIC  2. MATERIAL COMPLEXITY/MATERIAL AFFLUENCE AND LUXURY  3. THE UTILISING OF MATERIAL RESOURCES FOR MATERIAL PURPOSES/SPENDING EXCESSIVE AMOUNTS OF MONEY FOR MATERIAL PURPOSES/EXCESSIVE USAGE OF MATERIAL RESOURCES	1. NO REGARD FOR MATERIAL VALUE, WHETHER SIMPLE OR COMPLEX  2. WASTE, MISUSE AND ABUSE OF MATERIAL RESOURCES  3. LACK OF PRAGMATISM
10. PURPOSE-FULLNESS/ INTENT	ACTING PURPOSEFULLY ACCORDING TO HIGHER SPIRITUAL AND ETHICAL PRINCIPLES	1. ACTING ACCORDING TO THE SENSES, WITH CONFUSION OR UNCLARITY ABOUT WHAT CONSTITUTES HIGHER PURPOSES	ACTING WHIMSICALLY WITHOUT ANY CONSIDERATION FOR HIGHER PURPOSES

		2. MOTIVE FOR MATERIAL ENJOYMENT	
11. PROPRIETORSHIP	NON-PROPRIETORSHIP: NO CLAIMS OF OWNERSHIP	PROPRIETORSHIP: CLAIMS OF OWNERSHIP THROUGH ARGUMENT AND ENDEAVOUR	PROPRIETORSHIP: CLAIMS OF OWNERSHIP THROUGH VIOLENCE, THEFT AND DECEIT
12. TREATMENT OF MATERIAL RESOURCES	<p>1. THE DESIRE TO MAINTAIN/SUSTAIN/PRESERVE</p> <p>2. MAINTENANCE, SUSTAINABILITY AND PRESERVATION OF THE MATERIAL ENVIRONMENT, ACHIEVABLE THROUGH ACCURATE MATERIAL KNOWLEDGE ON THE INTERACTION OF MATERIAL AND NON-MATERIAL CAUSAL FACTORS</p> <p>3. THE LACK OF DESIRE TO MANIPULATE OR CONTROL MATERIAL NATURE/THE ABILITY TO CONTROL THE DESIRE TO MANIPULATE THE MATERIAL ENVIRONMENT</p> <p>4. PRESIDING DEITY OVER SATTVA GUNA: LORD VISHNU. SATTVA GUNA'S FUNCTION: MAINTENANCE</p>	<p>1. CREATION AND REPEATED RE-CREATION OF/WITHIN THE MATERIAL ENVIRONMENT (REPEATED DAMAGING AND MENDING) DUE TO THE INABILITY TO MAINTAIN/SUSTAIN, OCCURING THROUGH KNOWLEDGE ON THE ENVIRONMENT'S MATERIAL CAUSAL FACTORS ONLY</p> <p>2. THE PROPENSITY TO MANIPULATE AND CONTROL MATERIAL NATURE/LORD IT OVER MATERIAL NATURE</p> <p>3. PRESIDING DEITY OVER RAJAS GUNA: LORD BRAHMA. RAJAS GUNA'S FUNCTION: CREATION</p>	<p>1. DESTRUCTION/ANNIHILATION OF THE MATERIAL ENVIRONMENT, WITHOUT SUSTAINABILITY NOR CREATION OR RE-CREATION, OCCURING THROUGH A GENERAL LACK OF KNOWLEDGE ON BOTH MATERIAL AND NON-MATERIAL PHENOMENA</p> <p>2. PRESIDING DEITY OVER TAMAS GUNA: LORD SHIVA. TAMAS GUNA'S FUNCTION: DESTRUCTION</p>
13. APPRECIATION AND TREATMENT OF SELF AND OTHERS	<p>1. ADULATION AND APPRECIATION OF OTHERS, ESPECIALLY SPIRITUALLY ADVANCED PERSONS</p> <p>2. SHOWING COMPASSION TOWARDS OTHERS</p> <p>3. IDENTIFICATION WITH ONE'S SPIRITUAL SOUL, NOT WITH ONE'S MATERIAL BODY</p>	<p>1. SELF ADMIRATION</p> <p>2. THE INABILITY TO SEE THE VALUE OF SPIRITUALLY ADVANCED PERSONS</p> <p>3. SELF IMPORTANCE</p> <p>4. IDENTIFICATION WITH ONE'S MATERIAL BODY, RATHER THAN WITH ONE'S SPIRITUAL SOUL</p>	<p>1. SELFISHNESS: THE FOCUS IS ON ONE'S OWN IMMEDIATE NEEDS (PERCEIVED NEEDS) AND ON ONE'S OWN IMMEDIATE PLEASURES AND COMFORTS</p> <p>2. SLANDER, CRITICISM AND VILIFICATION OF OTHERS, INCLUDING SPIRITUALLY ADVANCED PERSONS</p>

	<p>4. UNSELFISHNESS: THE FOCUS IS ON THE WANTS AND NEEDS OF OTHERS</p> <p>5. DISTASTE FOR KILLING ANY LIVING BEING, OR WITNESSING THE KILLING OF ANY LIVING BEING</p> <p>6. DISTASTE FOR HARMING ANY LIVING BEING, OR WITNESSING THE HARMING OF ANY LIVING BEING. HARMING MEANS PHYSICAL, EMOTIONAL, PSYCHOLOGICAL AND SOCIAL HARMING</p> <p>7. THE FOCUS IS ON SELF-REALISATION (REALISATION OF SPIRITUAL AND ETHICAL CONSIDERATIONS, RATHER THAN MATERIAL CONSIDERATIONS)</p>	<p>5. THE FOCUS IS ON ONE'S OWN WANTS AND DESIRES AND ON ONE'S OWN AMBITIONS AND SOCIAL STATUS</p> <p>6. CONSIDERING ONESELF DIFFERENT FROM AND BETTER THAN OTHERS</p> <p>7. CONCENTRATED SELFISHNESS (CENTRED ON THE NON-PHYSICAL SELF'S PHYSICAL BODY) AND EXTENDED SELFISHNESS (CENTRED ON THE SELF'S MUNDANE FAMILY, COUNTRY, WORK ORGANISATION ETC.)</p> <p>10. THE FOCUS IS ON MATERIAL ENJOYMENT WITH LITTLE, IF ANY, SELF-REALISATION</p> <p>11. SELF-INDULGENCE</p> <p>12. UNETHICAL TREATMENT OF OTHERS DUE TO CONFUSION AS TO WHAT IS ETHICAL AND WHAT IS UNETHICAL</p>	<p>3. BOTH CONCENTRATED AND EXTENDED SELFISHNESS, COMBINED WITH DESPERATION, HELPLESSNESS AND OFTEN VIOLENCE TOWARDS OTHERS</p> <p>4. VIOLENCE TOWARDS OTHERS/ CAUSING OTHERS HARM Harm is not exclusive to physical damage, it includes psychological, emotional and social harm.</p> <p>5. THE TAKING OF PLEASURE IN KILLING ANOTHER LIVING BEING</p> <p>6. THE TAKING OF LIFE WITHOUT A HIGHER ETHICAL AND SPIRITUAL REASON Unethical practices means practices that cause harm, distress or death to others without any higher ethical and spiritual purposes. Higher ethical and spiritual purposes means consideration for the individual living being's material and spiritual welfare at all times, under all circumstances.</p> <p>7. THE FOCUS IS ON IMMEDIATE BODILY SATISFACTION, WITH NO SELF-REALISATION</p> <p>8. UNETHICAL TREATMENT DUE TO INTENT TO CAUSE HARM AND/OR NEGLECT AND/OR IGNORANCE AS TO WHAT CAUSES HARM</p>
14. ENVY	-	ENVY MOTIVATED BY MATERIAL DESIRES FOR SENSE ENJOYMENT	ENVY MIXED WITH DESPAIR, DESPERATION AND DESTRUCTIVENESS

15. MORALITY/ ETHICS	<p>1. MORALITY/ETHICAL PRACTICES ACCORDING TO VEDIC SCRIPTURE</p> <p>2. ACTIVITIES AND ATTITUDES BASED ON SPIRITUAL ADVANCEMENT AND PROSPERITY</p> <p>3. PERFORMING ACTIONS IN TERMS OF THE DIRECTIONS OF THE SCRIPTURES IS CALLED ... EXECUTING ACTIONS THAT DESERVE TO BE PERFORMED. AND ACTIONS WHICH ARE NOT SO DIRECTED ARE NOT TO BE PERFORMED. ONE WHO DOES NOT KNOW THE SCRIPTURAL DIRECTIONS BECOMES ENTANGLED IN THE ACTIONS AND REACTIONS OF WORK</p> <p>4. UNDERSTANDING WHICH DISCRIMINATES BY INTELLIGENCE</p>	<p>1. THE WORK ETHIC, BASED ON THE GLORIFICATION OF MATERIAL ADVANCEMENT AND PROSPERITY</p> <p>2. UNDERSTANDING WHICH CANNOT DISTINGUISH BETWEEN ETHICAL AND UNETHICAL BEHAVIOUR</p>	<p>1. UNETHICAL/AMORAL PRACTICES, ACTIVITIES AND ATTITUDES, ACCORDING TO VEDIC SCRIPTURE Unethical/amoral practices means practices that cause harm, distress or death to others without any higher ethical and spiritual purposes. Higher ethical purposes means consideration for the individual living being at all times, under all circumstances.</p> <p>2. UNDERSTANDING WHICH CONSIDERS IRRELIGION TO BE RELIGION AND RELIGION TO BE IRRELIGION, UNDER THE SPELL OF ILLUSION AND DARKNESS, AND STRIVES ALWAYS IN THE WRONG DIRECTION</p>
16. HAPPINESS	<p>1. LASTING HAPPINESS, JOYFULNESS</p> <p>2. SOME RELIEF FROM SUFFERING WITHIN THE MATERIAL REALM</p> <p>3. SUSTAINED HAPPINESS FROM THE PRACTICE OF AUSTERITY</p> <p>4. HAPPINESS DERIVED FROM SELF-REALISATION</p> <p>5. A SENSE OF HAPPINESS AND KNOWLEDGE</p>	<p>1. MISERY</p> <p>2. SUFFERING FROM MATERIAL ATTACHMENTS</p> <p>3. HAPPINESS DERIVED FROM GRATIFICATION OF THE MATERIAL SENSES</p> <p>4. HAPPINESS THAT ENDS IN MISERY</p>	<p>1. UNHAPPINESS, SADNESS</p> <p>2. MUCH SUFFERING FROM MATERIAL ENTANGLEMENTS AND ILLUSION</p> <p>3. HAPPINESS DERIVED FROM INERTIA AND ILLUSION</p>

	6. HAPPINESS THAT IS SUSTAINED		
17. RELIGIOSITY	1. RELIGIOUS AND PIOUS BY NATURE  2. UNDERSTANDS WHAT IS RELIGION AND WHAT IS NOT RELIGION, AND ACTS ACCORDINGLY  3. UNDERSTANDS WHAT IS AUSPICIOUS AND WHAT IS INAUSPICIOUS	1. CONFUSION ABOUT WHAT CONSTITUTES RELIGION AND WHAT CONSTITUTES IRRELIGION  2. CONFUSION ABOUT WHAT IS AUSPICIOUS AND WHAT IS INAUSPICIOUS	1. UNDERSTANDING WHICH CONSIDERS IRRELIGION TO BE RELIGION AND RELIGION TO BE IRRELIGION, UNDER THE SPELL OF ILLUSION AND DARKNESS, AND STRIVES ALWAYS IN THE WRONG DIRECTION  2. UNDERSTANDING WHICH CONSIDERS THAT WHICH IS AUSPICIOUS TO BE INAUSPICIOUS AND VICE VERSA
18. TEMPERAMENT	1. CALM, PEACEFUL, TRANQUIL, 2. ENTHUSIASTIC  3. SATISFIED/CONTENT WITHIN ONESELF	1. PASSIONATE, EMOTIONAL  2. STRESSED, ANXIOUS, FRUSTRATED  3. DISSATISFIED, EVEN IN GAIN  4. HANKERING AND LAMENTING	1. DEPRESSED  2. VIOLENT  3. LAZY/INDOLENT/INERT  4. FEARFUL  5. INTOLERANT WITH ANGER
19. FAITH	FAITH DIRECTED TOWARD SPIRITUAL LIFE	FAITH ROOTED IN FRUITIVE WORK, AIMED AT ATTAINING A BETTER QUALITY OF MATERIAL LIFE FOR ONESELF AND ONE'S FAMILY, FRIENDS AND SOCIETY	FAITH RESIDING IN IRRELIGIOUS ACTIVITIES/FAITHLESSNESS
20. FOOD (FOR HUMANS)	FOODS DEAR TO THOSE IN THE MODE OF GOODNESS INCREASE THE DURATION OF LIFE, PURIFY ONE'S EXISTENCE AND GIVE STRENGTH, HEALTH, HAPPINESS AND SATISFACTION. SUCH FOODS ARE JUICY, FATTY, WHOLESOME, AND PLEASING TO THE HEART	FOODS THAT ARE TOO BITTER, TOO SOUR, SALTY, HOT, PUNGENT, DRY AND BURNING ARE DEAR TO THOSE IN THE MODE OF PASSION. SUCH FOODS CAUSE DISTRESS, MISERY AND DISEASE	1. FOOD PREPARED MORE THAN THREE HOURS BEFORE BEING EATEN, FOOD THAT IS TASTELESS, DECOMPOSED AND PUTRID, AND FOOD CONSISTING OF REMNANTS AND UNTOUCHABLE THINGS (ANIMAL FLESH) IS DEAR TO THOSE IN THE MODE OF DARKNESS

	(VEGETARIAN FOODS)		2. THE TAKING OF INTOXICATION
21. RESIDENCE	1. RESIDENCE IN A SELCUDED PLACE AWAY FROM MATERIALISTIC LIFE (SUCH AS IN A FOREST OR IN THE COUNTRY-SIDE)  2. RESIDENCE WHERE SPIRITUAL LIFE CAN BE MAINTAINED	RESIDENCE IN A CITY/TOWN (WHERE MATERIALISM IS PREVALENT)	RESIDENCE IN A BROTHEL, GAMBLING HOUSE ETC.
21. SACRIFICE	SACRIFICE PERFORMED ACCORDING TO THE DIRECTIONS OF SCRIPTURE, AS A MATTER OF DUTY	SACRIFICE PERFORMED FOR SOME MATERIAL BENEFIT, OR FOR THE SAKE OF PRIDE	SACRIFICE PERFORMED WITHOUT REGARD FOR THE DIRECTIONS OF SCRIPTURE
22. SPEECH	SPEAKING WORDS THAT ARE TRUTHFUL, PLEASING, BENEFICIAL, AND NOT AGITATING TO OTHERS, AND ALSO IN REGULARLY RECITING VEDIC LITERATURE	1. ADVERTISING ONE'S OWN PROWESS  2. SELF ADULATION	1. SPEAKING (PUBLICISING) WITHOUT SCRIPTURAL AUTHORITY  2. QUARRELLING/ARGUING  3. VILIFICATION/BLASPHEMY/SLANDER
23. CHASTITY	BEING EMBARRASSED AT IMPROPER ACTION	-	THE LACK OF BEING EMBARRASSED AT IMPROPER ACTION
24. PRIDE	HUMBLENESS/HUMILITY	PRIDE/FALSE PRIDE	-
25. ATTACHMENT/ DETACHMENT TO THE MATERIAL REALM	1. DETACHMENT/BEING ALOOF FROM THE MATERIAL BODY/ BEING ALOOF FROM MATERIAL/MUNDANE CIRCUMSTANCES  2. DETACHMENT FROM RESULTS OF ACTIVITY  3. ONE PERFORMS ONE'S PRESCRIBED DUTY ONLY BECAUSE IT OUGHT TO BE DONE, AND RENOUNCES ALL MATERIAL ASSOCIATION AND ALL	1. ATTACHMENT TO THE MATERIAL BODY AND THE MATERIAL WORLD BASED ON IDEAS OF HOW TO UTILISE THEM BOTH FOR THE PLEASURE OF THE MATERIAL SENSES  2. ATTACHMENT TO THE RESULTS OF ACTIVITY, SUCH AS HARD WORK  3. ATTACHMENT TO A FALSE SENSE OF SELF/FALSE EGO, INCLUDING ONE'S FAMILY MEMBERS	1. ATTACHMENT TO THE MATERIAL BODY AND MATERIAL WORLD, BASED ON IDEAS OF HOW TO EXPLOIT IT, EVEN IF SUCH EXPLOITATION MEANS DESTRUCTIVENESS  2. ATTACHMENT TO OTHER PEOPLE'S MATERIAL COMMODITIES, INCLUDING THE RESULTS OF OTHER PEOPLE'S WORK (WITH THE INTENTION OF TAKING ADVANTAGE OF SUCH COMMODITIES AND RESULTS OF WORK)

	<p>ATTACHMENT TO THE FRUIT</p> <p>4. REGULATED OCCUPATIONAL DUTIES, AS PRESCRIBED IN THE SCRIPTURES IN TERMS OF THE DIFFERENT ORDERS AND DIVISIONS OF SOCIETY, PERFORMED WITHOUT ATTACHMENT OR PROPRIETARY RIGHTS AND THEREFORE WITHOUT ANY LOVE OR HATRED, AND PERFORMED FOR THE SATISFACTION OF THE SUPREME, WITHOUT SELF-GRATIFICATION</p> <p>5. DETACHMENT FROM SPECIFIC MATERIAL CONCEPTIONS</p> <p>6. UNINTERESTED IN MATERIAL PURSUITS</p> <p>7. DESIRING TO DISASSOCIATE ONESELF FROM MATERIALISTIC LIFE</p> <p>8. GENEROSITY</p>	<p>4. ATTACHMENT TO SPECIFIC MATERIAL CONCEPTIONS</p> <p>5. ATTACHMENT TO MATERIAL CIRCUMSTANCES/ATTACHMENT TO SPECIFIC MATERIAL DESIGNATIONS</p> <p>6. ATTACHMENT TO MATERIAL COMMODITIES</p> <p>7. GREED AND UNLIMITED HANKERING FOR SENSE ENJOYMENT/MATERIALISM</p> <p>8. ECONOMIC CONCERNS/INTERESTS/PRIORITISATION</p> <p>9. THE ACCUMULATION AND/OR SPENDING OF MONEY FOR MATERIAL PURPOSES</p>	<p>3. STINGINESS</p> <p>4. GREED SPRINGING FROM DESPAIR, DESPERATION, ANGER, VIOLENCE AND CORRUPTION</p>
NO PARALLEL TOPICS ↓	SATTVA	RAJAS	TAMAS
26.		SEEKING FAME, GLORIFICATION AND ADMIRATION/A FONDNESS FOR HEARING ONESELF PRAISED/ SEEKING HONOUR, RECOGNITION AND STATUS WITHIN SOCIETY	HELPLESSNESS/HOPELESSNESS/ INCAPABILITY
27.		NATIONALISM	VIOLENT HATRED
28.		LUST	ABSORBING THE MIND IN SLEEPING/ EXCESSIVE SLEEP
29.			LIVING AS A PARASITE/EXPLOITATION

30.			PROCRASTINATION
31.			HYPOCRISY

APPENDIX B: Complete Abhidharma Factor Guide and Guide for Assessing Correlation Between the Vedic Triguna and Abhidharma Factors (CAFG-GACTA) Bhaktivedanta 1970, chap. 85; 1987-8, 11:chap.13, chap.25; 1989, chaps.14-18; 1992, chap.5; Buddhaghosa 2004, IX:124; Burger 1998, 8, 169-74; Das 1987, 7-9; Dhammapala 1996, 10-6; Flood 1996, 234-5; Guenther and Kawamura 1975, 38-98; Mohan and Sandhu 1986, 47-9; Mohan and Sandhu 1988, 24-8; Nyanatiloka 2004, 125-6; Rabten 1992, 125-62; Rao and Harigopal 1979, 64; Totton and Jacobs 2001, 94; Singh 1971, 149-50; Sitamma and Rao 1995, 185-6; Sitamma, Sridevi and Rao 1995, 13-6; Stempel et al. 2006, 262; Varela, Thompson and Rosch 1991, 256-8; Wolf 1999, 1381).

- Correlation between triguna characteristics and Abhidharma factors should be accepted as approximate only (see section 3.1.2). Most entries represent exact wording from above-listed texts. Exceptions to this include grammatical adjustment and/or additional wording to accommodate the meanings of characteristics outside complete sentences provided in texts, as well as occasional entries of characteristics comprised from broader readings from above-listed texts and other Buddhist texts discussed throughout this thesis.
- The order in which Abhidharma factors are presented do not carry meaning as to their ranking of relevance within Factor Groups.

ABHI-DHARMA CATEGORY	CONTRAST	ABHIDHARMA FACTOR	FACTOR FUNCTION/MEANING	CORRESPONDING GUNA CHARACTERISTIC		
				SATTVA	RAJAS	TAMAS
MENTAL EVENT	POSITIVE  (GENERAL FUNCTION IS TO PROVIDE A BASIS FOR REFRAINING FROM EVIL BEHAVIOUR)	CONFIDENCE/TRUST/FAITH	The deep conviction, lucidity and longing for things that are real, have value and are possible. Produces a joyous state of mind free from the turmoil of the root and proximate afflictions. Clear-sightedness and seeing the intrinsic value in all things. It generates aspirations for wholesome qualities.	Clear-sightedness; faith directed towards spiritual life	-	-

	[corresponds primarily with sattva guna]	SELF-RESPECT	To refrain from what is objectionable by having made oneself the norm. To avoid unpleasant and unwholesome experiences that may entice one towards evil behaviour. Restrains one from harmful conduct of body, speech and mind. It is the basis for all moral disciplines.	Self-realisation/self-knowledge; acting and engaging in ethical behaviour	-	-
		DECORUM/ CONSIDERATION FOR OTHERS	To avoid what is objectionable in the eyes of others. Restrains harmful conduct of body, speech and mind. It acts to maintain the purity of one's moral discipline. It is an avoidance of evil action from making others the norm. The primary realm of restraint is the fear that one's guru and teacher and other people deserving respect would be annoyed. It is avoiding acts that may have negative ramifications for oneself and for others.	Awareness of self and others; compassion; unselfishness; appreciation of others; speaking words that are truthful, pleasing, beneficial, and not agitating to others, and also in regularly reciting Vedic literature; the distaste of harming or killing any living being, or witnessing the harming or killing of any living being	-	-

		NON-ATTACHMENT/ DETACHMENT	Awareness in which there is no discontentment and no attachment. It withdraws us from a compulsive involvement with the object through an understanding of its true nature. It functions in providing the basis for not being caught up in evil action. It is to not be attached to any specific material circumstance, object or to material life in general. It is acting without feeling the need to enjoy the fruits of one's labours.	Detachment from the material body; detachment from the results of activity; detachment from specific material conceptions	-	-
		NON-HATRED	Awareness in which there is no intention to inflict suffering. It is compassion for all sentient beings, as it is the choice to not cultivate emotions that may lead to the infliction of pain for others. It prevents hatred and increases love and acceptance. Prevents blind reaction to a situation and maintains clarity of mind, characterised by love, kindness and patience.	Tolerance; compassion; appreciation of others; detachment from the material mind; control of the senses	-	-

		NON-DELUDEDNESS/ NON-BEWILDERMENT	Distinct discriminatory awareness to counteract the deludedness that has its cause in either what one has been born into or what one has acquired (one's material circumstances). It acts as a remedy for ignorance and accompanies the form intelligence that thoroughly analyses the true nature of objects. It is clear-sightedness as to what constitutes the illusion of the material realm of existence. It is a remedy for ignorance. Non-bewilderment is not a type of intelligence but rather a lucid quality of mind.	Clear-mindedness; greater and real knowledge of the material manifestation, accompanied by the beginning of spiritual knowledge/understanding, whether that spiritual understanding is personal or impersonal; clear awareness of the existence of a higher, spiritual nature within all entities; knowledge that advances human behaviour in learning how to restrict the material senses; adherence to scriptural knowledge	-	-
		DILIGENCE/ ENTHUSIASM	Inclination towards the wholesome. It is the mind intent on being ever active, devoted, unshaken ... and indefatigable. Enthusiasm is the dynamic quality of mind necessary to effectively accomplish any spiritual growth and understanding. It is determination that is steady and aimed at producing tangible outcomes. Is a remedy for laziness and promotes engagement in wholesome activities.	Steady, focused intellect; one who performs his duty ... without false ego, with great determination and enthusiasm, and without wavering in success or failure	-	-

		ALERTNESS/ SUPPLESSNESS	Awareness in which the mind is made to serve the positive. It is the pliability of body and mind. Suppleness only refers to the supple quality of mind that refers to wholesome objects. Alertness is an awareness in which the mind is made to serve the positive. It is concentration on and interest in positive objectives. To be able to apply the mind to different types of activities.	Alertness/wakefulness	-	-
		CONCERN/ CONSCIENTIOUS- NESS	Intelligence which realises the positive and protects the mind from what is unreliable. Concern is the basis of immortality. Its function is to make complete and to realise all worldly and transworldly excellences. Concern with regards to things in the past. Concern with regard to things in the future. Concern with regards to things in the present. Concern with things which were to be done before. Living an unscientious existence is comparable to being spiritually dead. It is to care for the permanent or non-material. It aims to increase what is wholesome. Cherishes accumulated knowledge/wisdom and detracts from what is unwholesome.	Having an interest in spiritual knowledge and being concerned about spiritual matters; religious and pious by nature; compassion; careful study of the past and future	-	-

		EQUANIMITY	To make the mind fully concentrated on its objective by relying on means and techniques internally. It is a mind which abides in the state of non-attachment, non-hatred and non-deludedness coupled with assiduousness. It is the state of being unaffected by the dualities of the material world. It settles the mind on a wholesome consideration and keeps the mind balanced and calm, preventing it from becoming careless, unclear or dull.	This Abhidharma factor corresponds to the suddha-sattva characteristic of <i>looking upon a lump of earth, a stone and a piece of gold with an equal eye; remaining undisturbed regardless of favourable or unfavourable material circumstances and being equipoised in both happiness and distress</i> . As scientists are not being tested on transcendental qualities, this mental event will not be included in collecting or processing data.		
		NON-VIOLENCE	An attitude of loving-kindness. Its function is not to be malicious. It is to be compassionate. It is to self-sacrifice one's own indulgence in release from frustration, for the wellbeing of others. It is compassion.	Compassion; the distaste for killing any living being, or witnessing the killing of any living being; the distaste of harming any living being, or witnessing the harming of any living being	-	-
	NEGATIVE (GENERAL FUNCTION IS TO DISTRACT THE INDIVIDUAL FROM ETHICAL AND SPIRITUAL GOALS)	INDIGNATION/ WRATH	A vindictive intention which is associated with anger. It is a vindictive intention which intends to strike. It is judgement as to what is just, according to one's own material desires (to satisfy the senses). It is directed towards the object of anger.	-	Sense gratification; passion	Intolerant anger; failing of awareness of greater (material or non-material) incentives for action
		RESENTMENT	Not letting go of an obsession which develops through association with the anger which underlies it. It is bitterness at not having one's own material desires fulfilled.	-	Sense gratification	Anger; violent hatred

	[corresponds primarily with rajas and tamas guna]	SLYNESS- CONCEALMENT	To perpetuate a state of unresolvedness because of its association with dullness and stubbornness. It is concealing some or all one's unwholesome qualities as well as concealing them temporarily or permanently. It is to desire to not be transparent due to unwholesome or negative thoughts and plans of action. It is denial of one's own shortcomings and the shortcomings of others.	-	Sense gratification	Dullness/lack of awareness of one-self and others; the worker who is always engaged in work against the injunctions of the scripture, who is materialistic, obstinate, cheating and expert in insulting others, and who is lazy, always morose and procrastinating
		SPITE	A vindictive attitude preceded by indignation and resentment forming part of anger. Its function is to become the basis of harsh and strong words. It is associated with, dissatisfaction, a lack of trust and sometimes with revenge. It destroys the mental happiness of oneself and others.	-	Sense gratification	Anger; violent hatred; speaking without scriptural authority; quarrelling/arguing

		JEALOUSY/ENVY	A highly perturbed state of mind associated with aversion-hatred which is unable to bear others' excellences by being overly attached to gain and honour. Envy often contains an element of fear. It is desiring to have others' temporary material circumstances (especially material possessions), caused by illusion as to what constitutes real happiness. It is the inability to bear that others have good things.	-	Sense gratification; envy motivated by material wants/desires for sense enjoyment; attachment to the material body and the material world, based on ideas of how to utilise them both for the pleasure of the material senses; seeking honour in society	Envy mixed with despair, desperation and destructiveness; envy motivated by material needs; illusion; attachment to other people's material commodities, including the results of other people's work
		AVARICE	Over-concern with the material things in life stemming from over-attachment to wealth and honour, and it belongs to passion-lust. It is selfishness and is associated with the desire to satisfy the material senses. It is caused by illusion. It is miserliness.	-	Sense gratification; passion; lust; seeking honour in society; material complexity, material affluence and luxury; illusion; greediness and unlimited hankering for sense enjoyment/materialism	Greed springing from despair, desperation, anger, violence and corruption
		DECEIT/ PRETENSION	A display of what is not a real quality. Its function is to provide a basis for a perverse lifestyle. When one is overtly attached to respect and material gain, fabricates a particular excellent quality about oneself and then wishes to make it evident to others. It is to be associated with being attached to material exploitation and passion-lust.	-	Sense gratification; passion; lust;	Dishonesty/deliberately presenting inaccurate knowledge; attachment to the material body and material world, based on ideas of how to exploit it, even if such exploitation means destructiveness

		DISHONESTY	One's desire for wealth and honour. It is the intent to conceal one's shortcomings from others. When one is overtly attached to respect and material gain and wishes to confuse others by keeping one's faults unknown from them. It is withholding the truth due to fear or material desire. It is associated with passion-lust and bewilderment-erring. Dishonesty is aimed at cheating others, but in reality one only cheats oneself.	-	Sense gratification; passion; lust; seeking honour in society; material complexity, material affluence and luxury	Dishonesty/deliberately presenting inaccurate knowledge; bewilderment
		MENTAL INFLATION	Joy and rapture associated with passion-lust. Mental inflation is the root of unconcern. It is desiring social status through factors such as wealth, appearance, education, youth and power.	-	Sense gratification; passion; lust; false pride; seeking honour in society; the focus is on one's own wants and desires and on one's ambitions and social status	-
		MALICE/ CRUELTY	It belongs to the emotion anger, lacks loving-kindness, pity and affection and has the function of treating others abusively. It is the opposite of the wholesome mental factor of self-respect. It is a lack of pity and compassion. It is associated with selfishness. It is harming the good qualities of oneself and of others and creates turmoil. It is to intentionally and/or consciously harm others.	-	Sense gratification	Both concentrated and extended selfishness, combined with desperation, helplessness and often violence towards others; violent hatred; violence towards others/causing others harm; exploitation

		SHAMELESSNESS	It is not restraining oneself by taking one's perversions as one's norms. It is an emotional event associated with passion-lust, aversion-hatred and bewilderment-erring. It is the lack of embarrassment at improper thoughts and action, which are determined by ethical considerations. Shamelessness fails to avoid the unwholesome.	-	Sense gratification; passion; lust	Violent hatred; bewilderment; the lack of being embarrassed at improper action
		LACK OF SENSE OF PROPRIETY/ INCONSIDERATION FOR OTHERS	Not restraining oneself by taking others as the norm. Self-respect is a Bodhisattva's self-restraint in the knowledge that any indulgences in impropriety is not his way. Decorum is this restraint in fear and respect of others. It is an emotional event associated with passion-lust, aversion-hatred and bewilderment-erring. It is acting unethically. It is being unable to control the impulses of the senses. The word 'others' above includes non-human living individuals.	-	Sense gratification; passion; lust	Bewilderment; unethical/amoral practices, activities and attitude; slander, criticism and inconsideration of others, including the vilification of spiritually advanced persons

		GLOOMINESS/ DULNESS	The way in which the mind can not function properly and is associated with listlessness. It is heaviness of body and heaviness of mind. It is a state of physical inertness and mental inalertness. It is associated with sluggishness, illusion and the desire to satisfy the material senses. It causes one to not perceive things clearly. It also causes the mind to become insensitive, meaning it can not comprehend matters properly. It causes the mind to lapse into darkness.	-	Sense gratification	Inertia/laziness; indolence/absorbing the mind in sleeping; procrastination; dullness/lack of awareness of one-self and others; the failing of awareness of a higher spiritual nature; ignorance/nescience/the general lacking of both material or non-material knowledge; darkness due to lack of knowledge
		EBULLIENCE/ RESTLESSNESS/ DISTRACTION	It is the unsettled mind. Its function is to obstruct quietness. It is restlessness of mind which is associated with passion-lust that gets involved with things considered to be enjoyable. It causes the power of concentration to deteriorate. It distracts the individual from achieving his/her goals. It is being distracted by the demands of the senses.	-	Sense gratification; passion; lust; stress, anxiety, frustration; motive for material enjoyment; the inability of the perceiving senses to disentangle themselves from mundane objects; unsteady perplexity of the mind; distortion of the intellect due to too much activity; cloudy mind and intellect; poor control of the senses, the mind, the intellect and the self	When one's higher awareness fails and finally disappears and one is thus unable to concentrate one's attention, one's mind is ruined and manifests ignorance and depression; the intellect is overcome by matter, causing foolishness; severely clouded mind and intellect; lack of control of the mind, the senses, the mind, the intellect and the self

		LACK OF TRUST/ FAITHLESSNESS	It is the mind associated with the category bewilderment-erring which does not have deep conviction. It causes one to have no belief or respect for that which is worthy of confidence. It is the lack of confidence in the laws of <i>karma</i> and in the benefits of virtuous behaviour. The lack of conviction as to the credibility of the four noble truths.	-	-	Faithlessness; bewilderment; faith residing in irreligious activities; fear; darkness due to lack of knowledge; fear/fearfulness
		LAZINESS	An unwilling mind ... relying on pleasures of drowsiness, lying down and not getting up. Its function is to obstruct and hinder one in applying himself to positive things. It is associated with illusion that comes from material sense satisfaction, namely that happiness is found through material enjoyment. Laziness is overcome by enthusiasm. It is unwillingness to seek spiritual understandings of material phenomena.	-	Sense gratification	Inertia/laziness; indolence/absorbing the mind in sleeping; procrastination; dullness; knowledge concerned only with keeping the body comfortable; acquires knowledge for sense gratification, absorbing the mind in varieties of eating, sleeping, defending and sex, without any higher purpose

		UNCONCERN/ UNCONSCIEN- TIOUSNESS	To persevere in passion-lust, aversion-hatred, and bewilderment-erring aggravated by laziness. When one wishes to act in an unrestrained manner without cultivating virtue or guarding the mind against contaminated phenomena. It has the function of increasing non-virtue and obscuring virtue as well as causing any positive qualities to be destroyed. It is to prioritise and pursue sensuous, temporary things over eternal things. It is to act whimsically.	-	Sense gratification; passion; lust; concentrated selfishness (centred on the self's physical body) and extended selfishness (centred on the self's family, country, work organisation etc.)	Bewilderment; acting whimsically, for no purpose; being uninterested in and unconcerned about spiritual matters; work that is responsible to neither the material nor non-material needs of others; selfishness: the focus is on one's own immediate needs (perceived needs) and on one's own immediate bodily pleasures and comforts
		FORGETFULNESS	A fleeting inspection which is simultaneous with and on the same level as the emotions. It is a flash of awareness in which the mind is not made clear. It is a form of recollection that disturbs the mind by involving it with contaminated objects. It is the inability of the mind to focus on what is important.	-	Sense gratification	Indolence/absorbing the mind in sleeping; procrastination; dullness/lack of awareness of one-self and others; the failing of awareness of a higher spiritual nature

		INATTENTIVE- NESS	An emotionally tainted discriminating awareness which lacks watchfulness with regard to the activities of body, speech, and mind and is not associated with carefulness. Causes one to enter a state of careless indifference. It refers to any state of afflicted intelligence. It is being distracted from one's goal by material/bodily considerations.	-	Unsteady perplexity of the mind; distortion of the intellect due to too much activity; cloudy mind and intellect; of a passionate nature	Acting whimsically, for no purpose; determination that can not go beyond dreaming, fearfulness, lamentation, moroseness and/or illusion; acquires knowledge for sense gratification, absorbing the mind in varieties of eating, sleeping, defending and sex, without any higher purpose; when one's higher awareness fails and finally disappears and one is thus unable to concentrate one's attention, one's mind is ruined and manifests ignorance and depression; the intellect is succumb by matter, causing foolishness; severely clouded mind and intellect; lack of control of the mind, the senses, the mind, the intellect and the self
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		DESULTORINESS/ NON- DISCERNMENT	To be a scatter-brain and belongs to the categories of passion-lust, aversion-hatred, and bewilderment-erring. The mind is scattered over the five desirable objects of the sensuous world. It is the inability to focus on one's goals and to persevere with what one has started.	-	Sense gratification; passion; lust; unsteady perplexity of the mind; distortion of the intellect due to too much activity; cloudy mind and intellect; of a passionate nature	Bewilderment
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EMOTIONS	<p>NEGATIVE</p> <p>(DESCRIBED BY RABTEN (1992) AS 'ROOT AFFLICTIONS' : GENERAL FUNCTION IS TO PRODUCE FRUSTRATIONS)</p> <p>[corresponds primarily with both rajas and tamas guna]</p>	ATTACHMENT	<p>The hankering after things. Its function is to produce frustration. It is attachment to material life. It is self-satisfaction that interferes with the attainment of higher qualities. It is selfishness. Attachment out of our misconceiving an object to be more attractive and agreeable than it really is. We project a false image, cling to it, and yearn to possess the apparently beautiful object that we have embellished with our own imaginations. This attachment is a mistaken conception that can arise towards any object that seems attractive: one's own body, wealth, social position as well as the bodies and possessions of others... Although attachment may superficially take on the aspect of wanting to benefit others, it is essentially selfish- only striving to satiate one's own desires... Attachment always results in suffering whereas love and compassion only increase well-being. Rabten (1992, 140) describes attachment as a mental event within the context of the mind becoming attracted to materially contaminated phenomena.</p>	-	<p>Sense gratification; attachment to the material body and the material world, based on ideas of how to utilise them both for the pleasure of the material senses; attachment to the results of activity, such as hard work; attachment to a false sense of self/false ego; attachment to specific material conceptions</p>	<p>Attachment to the material body and material world, based on ideas of how to exploit it, even if such exploitation means destructiveness; attachment to other people's material commodities, including the results of other people's work</p>
		ANGER	<p>A vindictive attitude towards sentient beings. Its function is to serve as a basis for fault-finding and for never finding even a moment of happiness. It can lead to unethical acts and has the potential to destroy good qualities.</p>	-	<p>Sense gratification; lust</p>	<p>Intolerant anger; violent hatred</p>

		ARROGANCE/ SELF- IMPORTANCE	An inflated mind as to what is perishable and its function is to serve as the basis for disrespect and frustration. It is associated with pride and the lack of humbleness. It is based on the view of “I” and “mine”. It is self-importance. Self-importance can be overcome by cultivating humility and by deflating the image we have of ourselves. Virtue and insight can then develop.	-	Sense gratification; passion; lust; false pride; seeking honour in society; the focus is on one’s own wants and desires and on one’s ambitions and social status; self adulation/appreciation, the inability to see the value of spiritually advanced persons; self importance; advertising one’s own prowess; a fondness for hearing oneself praised; considering oneself different from and better than others; concentrated and extended selfishness	Selfishness: the focus is on one’s own immediate needs (perceived needs) and on one’s own immediate bodily pleasures and comforts; concentrated and extended selfishness
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		<p>LACK OF INTRINSIC AWARENESS/IGNORANCE</p> <p>A mental event that is confused about reality as it is. Confusedness and pervertedness. Confusedness about the relationship between one's action and its result. Confusedness about the ultimate. ... It is the root of wandering about in <i>samsara</i> and the foundation of all actions and emotions.</p> <p>Intrinsic awareness pertains to awareness of inner, spiritual considerations. The lack of such awareness causes the individual to make mistakes in relation to his/her own spiritual welfare and that of others. The lack of intrinsic awareness is also to invest oneself in enjoyment of the senses instead of focusing on one's spiritual goals. This results in ignorance about what constitutes material and non-material considerations.</p> <p>As the lack of intrinsic awareness is the root cause of the individual's 'wandering about in <i>samsara</i>', the gain of intrinsic awareness can put an end to such wanderings. It is the lack of awareness of the intrinsic nature of others as well as of oneself.</p> <p>The confused, bewildered quality of consciousness that obscures us from knowing things clearly.</p> <p>"Asanga and his brother who follow the <i>dgongs-pa rjes 'grel</i> (sandhinirmocanasutra) divide the buddha word into implicit and explicit statements and posit an <i>alayavijnana</i>. They declare the whole of reality to be of the nature of mere mentation [sems tsam gyi bdag-nyid]" (Guenther and Kawamura 1975, 15-16).</p>	-	<p>That knowledge by which one sees that in every different body there is a different type of living entity; the understanding which can not distinguish religion from irreligion, nor ethical from unethical practices</p>	<p>Ignorance/nescience/the general lacking of both material or non-material knowledge; acquisition of knowledge without any higher purpose; knowledge by which one is attached to one kind of work only, even if such work is very meagre and devoid of the truth as revealed through scripture; foolish materialistic knowledge; darkness due to lack of knowledge; knowledge concerned only with keeping the body comfortable; knowledge (based on) the satisfaction of bodily demands</p>
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		INDECISION	To be in two minds about the truth and its function is to serve as a basis for not becoming involved with positive things. One oscillates between extremes concerning the four noble truths.	-	Knowledge based on duality; unsteady perplexity of the mind; distortion of the intellect due to too much activity; cloudy mind and intellect; poor control of the senses, the mind, the intellect and the self	Severely clouded mind and intellect; lack of control of the mind, the senses, the mind, the intellect and the self
		OPINION-ATEDNESS/ AFFLICTED VIEWS	It is an emotionally tainted appreciation which is concerned with the five psycho-physical constituents as 'I' or 'mine'. It is associated with dogma and claim, and constitutes speculation about what is perishable and what is not perishable. Afflicted views include views of the transitory composite; extreme views; views of superiority; views that regard unsatisfactory moral and spiritual disciplines as supreme; and mistaken views.	-	Knowledge based on duality; sense gratification; knowledge producing many theories and doctrines by dint of mundane logic and mental speculation; false pride	Speaking without scriptural authority; quarrelling/arguing
PERFECT- IONS	POSITIVE  [corresponds primarily with sattva guna]	GIVING	It is giving as a source of pleasure, without discrimination; it is liberality; giving relinquishes; its function is to dispel greed for things that can be given away; it manifests non-attachment; an object that can be relinquished is its cause	Generosity; religious and pious by nature; shows compassion towards others; unselfishness; the senses are detached from matter/from material commodities and enjoyment;	-	-

		MORALITY/ VIRTUE	Morality/virtue is practiced in order to avoid doing harm to beings; it composes, coordinates and establishes; its function is to dispel moral depravity; it is blameless conduct; it is moral purity; shame and moral dread are its proximate cause	Morality/ethical practices according to scripture; activities and attitude, based on spiritual advancement and prosperity; religious and pious by nature; understands what is religion and what is not religion; shows compassion towards others; unselfishness; being embarrassed at improper action; maintenance	-	-
		RENUNCIATION	It is for the purpose of perfecting virtue; renunciation departs from sense pleasures and existence; its function is to verify their (sense pleasure and existence) unsatisfactoriness; it withdraws from sense pleasure and existence; a sense of spiritual urgency is its proximate cause	One performs one's prescribed duty only because it ought to be done, and renounces all material association and all attachment to the fruit; detachment from specific material conceptions; being uninterested in material pursuits; control of the mind and the senses; the senses are detached from matter/from material commodities and enjoyment; clear awareness of the existence of a higher, spiritual nature within all entities	-	-

		TRANSCENDENTAL WISDOM/ UNDERSTANDING	Wisdom cleanses understanding for the purpose of non-confusion about what is good and bad for beings; it penetrates the real specific nature (of phenomena); its function is to illuminate the objective field, like a lamp; it is non-confusion; concentration or the Four Noble Truths is its proximate cause	This Abhidharma factor, although listed as <i>wisdom</i> and not as <i>transcendental wisdom</i> corresponds most closely to the suddha-sattva platform of consciousness. This is due to its description in texts such as Dhammapala (1996, 27-9) in which its attributes are described as pertaining to wisdom about spiritual considerations. As such, it is entered in the CAFG-GACTA as <i>transcendental wisdom</i> in order to distinguish its qualities from any mundane type of wisdom. Specifically, it corresponds to the suddha-sattvic characteristic of <i>knowing</i> (understanding) <i>that the modes</i> (triguna) <i>alone are active</i> within this material world, by which the individual is clear-sighted as to his/her actual situatedness and functioning within the material realm of existence. As this is so, this perfection will not be included in collecting or processing data.		
		ENERGY	Energy is aroused when beings' welfare and happiness are acknowledged within the heart; it is striving; its function is to fortify; it is being indefatigability; an occasion for the arousing of energy, or a sense of spiritual urgency, is its proximate cause	One who performs his duty ... without false ego, with great determination and enthusiasm, and without wavering in success or failure; determination which is unbreakable, which is sustained with steadfastness by yoga practice, and which thus controls the activities of the mind, life and senses; clear awareness of the existence of a higher, spiritual nature within all entities	Hard work; intense endeavour; activity	-

		PATIENCE/ FORBEARANCE	Having acquired fortitude through supreme energy, one becomes patient with beings' many kinds of faults; it is acceptance; its function is to endure the desirable and undesirable; tolerance or non-opposition; seeing things as they really are is its proximate cause	Tolerance/patience; adulation and appreciation of others, especially spiritually advanced persons; shows compassion towards others	-	-
		TRUTHFULNESS/ DOES NOT DECEIVE	It is to deliver what is promised; it is non-deceptiveness in speech; its function is to verify in accordance with fact; it is excellence; honesty is its proximate cause	Truthfulness/presenting accurate knowledge/honesty; speaking words that are truthful, pleasing, beneficial, and not agitating to others, and also in regularly reciting Vedic literature	-	-
		DETERMINATION /RESOLUTION	Being unshakable in regards to beings' welfare and happiness; it focuses on the Requisites of Enlightenment; its function is to overcome their (Requisites of Enlightenment) opposites; the Requisites of Enlightenment are its proximate cause. (In traditional Buddhism there are 37 Requisites of Enlightenment including the eightfold path covered under the four noble truths; five roots; five powers; four perfect efforts; seven factors of enlightenment and four roads to power (McCormick).	Determination which is unbreakable, which is sustained with steadfastness by yoga practice, and which thus controls the activities of the mind, life and senses; one who performs his duty ... without false ego, with great determination and enthusiasm, and without wavering in success or failure	-	-

		LOVING-KINDNESS	It is placing others before oneself; promoting the welfare of living beings; its function is to provide for their welfare or to remove resentment; it is kindness; seeing the agreeable side of beings is its proximate cause. Genuine care for sentient being brings about their well-being.	Shows compassion towards others; unselfishness: the focus is on the wants and non-material needs of others; the distaste of harming any living being, or witnessing the harming of any living being (harming means physical, emotional, psychological and social harming); the distaste for killing any living being, or witnessing the killing of any living being; speaking words that are truthful, pleasing, beneficial, and not agitating to others, and also in regularly reciting Vedic literature	-	-
		EQUANIMITY	It is to expect no reward; it promotes the aspect of neutrality; its function is to see things impartially; it is the subsiding of attraction and repulsion; reflection upon the fact that all beings inherit the results of their own karma is its proximate cause	This Abhidharma factor corresponds to the suddha-sattvic characteristics of <i>looking upon a lump of earth, a stone and a piece of gold with an equal eye; remaining undisturbed regardless of favourable or unfavourable material circumstances and being equipoised in both happiness and distress</i> . As with the above-discussed mental event of equanimity and perfection of <i>transcendental wisdom/understanding</i> , this perfection will not be included in the collection or processing of data.		

## APPENDIX C: AASI Statement Formulation and Listing

Each AASI statement is formulated to represent at least one guna characteristic. Whilst some statements represent more than one guna characteristic from the same guna, no statements represent guna characteristics from more than one guna.

STATE- MENT NO.	AASI STATEMENT	GUNA:	GUNA CHARACTERISTIC
1	I am passionate about my work.	RAJAS	Passionate/emotional temperament.
2	My higher awareness often fails me, resulting in a lack of focus on my work.	TAMAS	When one's higher awareness fails and finally disappears and one is thus unable to concentrate his attention, his mind is ruined and manifests ignorance and depression; the failing of awareness of greater/higher (material or non-material) incentives for action; lack of awareness of, or interest in, higher ethical and spiritual purposes of work; dullness/lack of awareness of one-self and others/generally unaware of oneself, of others and one's surroundings; the failing of awareness of a higher spiritual nature; ignorance about the existence of a higher spiritual nature within all entities.
3	I like to engage my senses to experience things "Antarctic" (seeing pictures of Antarctica, hearing about expeditions etc.).	RAJAS	Sense enjoyment; sense gratification (extended).
4	I often carry out my work tasks without really making an effort.	TAMAS	Working but making no endeavour; determination which cannot go beyond dreaming, fearfulness, lamentation, moroseness and illusion-such unintelligent determination.

5	I am usually aware of the state or condition of my own consciousness during my working day.	SATTVA	Self awareness; alertness/wakefulness; awareness of non-material phenomena, such as consciousness.
6	I often suffer from inertia and lethargy at work.	TAMAS	Laziness and inertia.
7	I am driven by the desire to enjoy the benefits reaped from working hard.	RAJAS	The worker who is attached to work and the fruits of work, desiring to enjoy those fruits, and who is greedy, always envious, impure, and moved by joy and sorrow; sense gratification; hard work to acquire prestige and fortune/work priorities are to make money; attachment to the results of activity, such as hard work; ambition for material pursuits/career-mindedness/desiring career achievement/personal ambition.
8	Although I usually don't talk about it, I am envious of other scientists who have excelled in their scientific fields.	TAMAS	Work impelled by violence and/or envy.
9	It is very important to me to be thoroughly honest in all of my work as a scientist.	SATTVA	Truthfulness/presenting accurate knowledge/honesty.
10	I believe spiritual insight and wisdom should play an active role in contemporary scientific research such as physics and biology.	SATTVA	The pursuit of greater and real knowledge; knowledge concerning the spirit soul beyond the (material) body; being interested in and concerned about spiritual matters; clear awareness of the existence of a higher, spiritual nature within all entities.
11	I maintain that when the material body of a living being expires (death), the consciousness of the deceased individual dissolves (ceases to exist).	RAJAS	The understanding that consciousness expires when the material body expires; the understanding that the material body is the living entity.
12	As I believe that no person can assert proprietorship over the Earth or any part of her, I support the view that claimant nations such as Australia should withdraw their territorial claims on Antarctica.	SATTVA	Non-proprietorship: no claims of ownership.

13	I would describe myself as detached and aloof from my physical body.	SATTVA	Detachment/being aloof from the material body/ being aloof from material/mundane circumstances; detachment from specific material conceptions; detachment from the material mind; the senses are detached from matter/from material commodities and enjoyment.
14	I do/would enjoy seeing my name appear in scientific publications, or even just mentioned within science-circles.	RAJAS	Seeking fame, glorification and admiration/a fondness for hearing oneself praised/ seeking honour, recognition and status within society.
15	My research often forces me to indulge in false hopes, as such predicaments are a part of the empirical research process.	TAMAS	False expectations; indulgence in false hopes.
16	I describe myself as a very alert person, aware of myself, my immediate environment and my remote environments.	SATTVA	Alertness/wakefulness.
17	For most of my professional life I have strived towards attaining an enjoyable and comfortable lifestyle for my family and myself.	RAJAS	Sense enjoyment/sense gratification; concentrated selfishness (centred on the non-physical self's physical body) and extended selfishness (centred on the self's mundane family, country, work organisation etc.); attachment to a false sense of self/false ego, including one's family members; attachment to the results of activity, such as hard work; the accumulation and/or spending of money for material purposes.
18	I would describe myself as ambitious, as I am always endeavouring towards greater facility for achieving my goals as a scientist.	RAJAS	Ambition for material pursuits/career-mindedness/ desiring career achievement/personal ambition; determination by which one holds fast to fruitive results in religion, economic development and sense gratification.
19	It is my opinion that scientific research into the consciousness of Antarctic fauna should be made a	SATTVA	The pursuit of greater and real knowledge; knowledge concerning the spirit soul beyond the body; awareness

	research priority by Australian Antarctic management.		of non-material phenomena, such as consciousness; clear awareness of the existence of a higher, spiritual nature within all entities.
20	I tend to seek out scientific projects that are satisfying to my sense of curiosity and stimulating for my mind.	RAJAS	Sense gratification (the mind is described as the sixth sense) (Bhaktivedanta 1998, 3:2).
21	I do not consider it important or relevant to understand the higher purpose of the work I carry out.	TAMAS	Acquiring knowledge for sense gratification ... without any higher purpose; the failing of awareness of a higher spiritual nature; ignorance about the existence of a higher spiritual nature within all entities.
22	I never think about giving up my professional position for a simpler life.	RAJAS	Material complexity/material affluence and luxury; materialism- both theoretical and pragmatic; attachment to the material body and the material world (one's material circumstances) based on ideas of how to utilise them both for the pleasure of the material senses; attachment to the results of activity, such as hard work; attachment to material commodities; economic concerns/interests/ prioritisation; the accumulation and/or spending of money for material purposes.
23	I maintain that acquiring scientific knowledge on the physical natural environment is the most important factor for achieving environmental sustainability.	RAJAS	Acquiring scientific knowledge on the material body/ material world; knowledge producing many theories and doctrines by dint of mundane logic and mental speculation; adherence to mundane knowledge.
24	I consider the exploitation of non-human faunal and floral species by humans as acceptable.	TAMAS	Living as a parasite (exploitation); violence towards others/causing others harm; amoral practices.
25	I agree with the premise that consciousness can be reduced to the workings of physical structures such as atoms, molecules, organic cells and neural networks.	RAJAS	The understanding that consciousness expires when the material body expires; the understanding that the material body is the living entity.
26	It is important to me to work in an environment that is clean, smoke-free, light, airy and free from foul language.	SATTVA	Cleanliness/tidiness/being well-organised and efficient.

27	Ordinarily I am well organised, self-controlled and regulated in my work duties.	SATTVA	Control of the mind and the senses/control of the self; cleanliness; tidiness; being well organised and efficient.
28	I am attached to my work and do not foresee myself ever changing my vocation, even if my work should somehow become very meager or somehow fail to contribute anything substantial.	TAMAS	Knowledge by which one is attached to one kind of work as the all in all, without knowledge of the truth, and which is very meager; acquisition of knowledge without any higher purpose.
29	It is my understanding that every living being on Earth has a different intrinsic nature, with greater variation occurring amongst different taxonomical phyla and classes, than amongst genera and species etc.	RAJAS	Knowledge by which one sees that in every different body there is a different type of living entity; the understanding that the material body is the living entity.
30	I do not seek, nor do I feel the need to seek authorisation from scriptural injunctions in order to present my scientific findings.	TAMAS	Speaking (publicising) without scriptural authority.
31	Whether or not I achieve my desired results, I usually remain steadfast and equipoised in my determination to carry out my duties as a scientist.	SATTVA	Determination which is unbreakable, which is sustained with steadfastness by yoga practice, and which thus controls the activities of the mind, life and senses; performance of duty...with great determination and enthusiasm, and without wavering in success or failure.
32	I am uninterested in researching spiritual dimensions of the Antarctic environment.	TAMAS	Being uninterested in and unconcerned about spiritual matters.
33	I am proud of Australia's standing within the Antarctic Treaty System (ATS).	RAJAS	False pride; nationalism (extended selfishness/sense gratification).
34	It is my opinion that Australian Antarctic scientific research should include careful study of both the past and the future.	SATTVA	The pursuit of greater and real knowledge; careful study of the past and future.
35	I understand the difference between auspicious and inauspicious work.	SATTVA	Understanding by which one knows what ought to be done and what ought not to be done, what is to be feared and what is not to be feared, what is binding and what is liberating; understands what is auspicious and what is

			inauspicious.
36	Two of the main reasons for me becoming an Antarctic scientist have been that the science is interesting and the setting (the Antarctic environment) is stimulating.	RAJAS	Sense gratification; sense enjoyment.
37	I usually experience a sense of happiness during my working day.	SATTVA	Lasting happiness, joyfulness; some relief from suffering within the material realm; sustained happiness from the practice of austerity; happiness derived from self-realisation; a sense of happiness and knowledge; happiness that is sustained; peacefulness; satisfaction/contentment within oneself.
38	One of the main reasons for me becoming an Antarctic scientist is that the 'otherworldly' nature of the Antarctic environment allows me to escape mundane realities.	SATTVA	Clear awareness of the existence of a higher, spiritual nature within all entities; being interested in and concerned about spiritual matters.
39	I have a desire to be honoured as an Antarctic scientist by my colleagues and by the rest of society.	RAJAS	Seeking fame, glorification and admiration/a fondness for hearing oneself praised/ seeking honour, recognition and status within society.
40	I try to give myself as much relaxation time and rest as is possible during my working day.	TAMAS	The worker who is ... lazy, always morose and procrastinating; working but making no endeavour; laziness; inertia; absorbing the mind in sleeping.
41	I am content to carry out my work duties without attachment for specific results.	SATTVA	One performs one's prescribed duty only because it ought to be done, and renounces all material association and all attachment to the fruit; detachment from results of activity.
42	I am proud to be an Antarctic scientist.	RAJAS	False pride.
43	I am uninterested in whether or not species of Antarctic fauna and flora have (or are) a spiritual soul.	TAMAS	Being uninterested in and unconcerned about spiritual matters.
44	I adhere to knowledge that is based on the bodily functioning of floral and faunal species, not to knowledge	RAJAS	That knowledge by which one sees that in every different body there is a different type of living entity;

	that is based on the spiritual functioning of species.		the understanding that the material body is the living entity; adherence to mundane knowledge.
45	I am interested in how the spiritual soul is situated within the physical body of a living being.	SATTVA	The pursuit of greater and real knowledge; knowledge concerning the spirit soul beyond this body; being interested in and concerned about spiritual matters.
46	I work with the understanding that advancement of sciences based in physics and mathematics will undoubtedly lead to advancements in the quality of life.	TAMAS	Ignorance/nescience; acquiring knowledge for sense gratification, absorbing the mind in varieties of eating, sleeping, defending and sex, without any higher purpose; foolish materialistic knowledge.
47	Much of the time, the science I engage in is not directed towards any specific goal.	TAMAS	Acquiring knowledge for sense gratification, ... without any higher purpose; acting whimsically, for no purpose.
48	Outside my knowledge of the compulsory ethical guidelines established by my professional organisation, I would not describe myself as knowledgeable in the field of ethics.	RAJAS	The understanding which can not distinguish religion from irreligion, nor ethical/moral from unethical/amoral practices.
49	Antarctica's aesthetic nature inspires me to seek my spiritual self.	SATTVA	The pursuit of greater and real knowledge; being interested in and concerned about spiritual matters
50	I believe real progress in science means an increase in knowledge by which one can distinguish material from non-material elements and understand their interaction within this world.	SATTVA	The pursuit of greater and real knowledge; greater and real knowledge; absolute knowledge; the beginning of spiritual knowledge/rudimentary spiritual knowledge; promotes elevated mundane knowledge.
51	I often procrastinate in my daily schedule.	TAMAS	Procrastination.
52	If a project I am working on ends in disaster or just disappointment, I tend to become distressed and upset.	RAJAS	Action resulting in misery; attachment to the results of activity, such as hard work; the worker who is attached to work and the fruits of work, desiring to enjoy those fruits, and who is greedy, always envious, impure, and moved by joy and sorrow; an insatiable desire for results; emotional temperament.

53	In carrying out daily professional tasks, my determination is usually dissipated by thoughts about my leisure-life that awaits me at the end of the day.	TAMAS	Determination which cannot go beyond dreaming, fearfulness, lamentation, moroseness and illusion -such unintelligent determination.
54	I maintain that the purer one's consciousness is, the better scientist one is.	SATTVA	Purity; knowledge concerning the spirit soul beyond the body; clear awareness of the existence of a higher, spiritual nature within all entities; awareness of non-material phenomena, such as consciousness.
55	I often experience a sense of helplessness in striving to achieve environmental sustainability.	TAMAS	Helplessness/hopelessness/incapability.
56	I work towards acquiring knowledge for the purpose of creating a more comfortable and enjoyable life, regardless of whether or not such acquisition involves a higher purpose.	TAMAS	Acquiring knowledge for sense gratification, absorbing the mind in varieties of eating, sleeping, defending and sex, without any higher purpose; knowledge concerned only with keeping the body comfortable.
57	I am happy to carry out my professional duties for the satisfaction of the Supreme.	SATTVA	Regulated occupational duties ... performed without attachment or proprietary rights and therefore without any love or hatred, and performed for the satisfaction of the Supreme, without self-satisfaction or self-gratification.
58	It is not unusual for me to consume alcohol during my lunch-break at work.	TAMAS	The taking of intoxication.
59	I support the view that contemporary approaches to empirical 'hard' sciences contain all the methodology necessary to learn about causal factors within the universe.	RAJAS	Acquiring scientific knowledge on the material body/material world; one speculates about the reality of one's own existence and of the world around oneself; adherence to mundane knowledge; knowledge derived through the material senses (empirical knowledge); materialism- both theoretical and pragmatic; knowledge based on duality.
60	I tend to quarrel and argue a lot with my work-colleagues.	TAMAS	Quarrelling/arguing.



## APPENDIX D: AASI and IGSQ Data Collecting Procedures

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ITEM D1: Initial email sent to potential participants in the AASI

Dear Antarctic Scientist,

This email is relevant to all scientists within ACE CRC and IASOS, including staff members, PhD students, Masters students and Honours students. It is not relevant to any social scientists.

Within the next few days you will receive a questionnaire either in your pigeonhole or personally delivered to your office. This questionnaire forms one part of the data collection items for the PhD thesis of Elli Widolf, who is currently enrolled through IASOS. As an Australian Antarctic scientist or student of Antarctic science, you will be invited to participate in the questionnaire, which aims at retrieving information on scientist consciousness and behaviour. It is a completely anonymous questionnaire and will be distributed to a number of science organisations within Hobart employing Antarctic scientists.

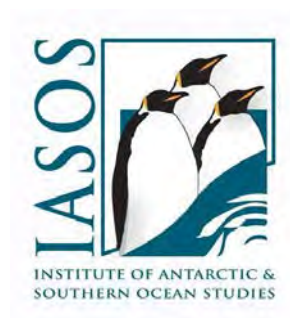
Specifically, this research aims at increasing knowledge about the significance of scientist consciousness in relation to scientist activities. As the community of Australian Antarctic scientists is limited in size, your participation in the questionnaire will be greatly appreciated. The questionnaire has ethics approval through the Southern Tasmanian Social Sciences Human Research Ethics Committee.

If you have already been asked to participate in an interview for the same research project, your participation in the questionnaire will still be appreciated.

Thank you,

Elli Widolf

## ITEM D2: Information Sheet for potential AASI participants



### INFORMATION SHEET 1

Date: 28/04/04

Title of Investigation: AUSTRALIAN ANTARCTIC SCIENTIST  
CONSCIOUSNESS and BEHAVIOUR: QUESTIONNAIRE

Chief Investigator: Dr Julia Jabour, Lecturer and Honours coordinator, Institute of  
Antarctic and Southern Ocean Studies

Purpose of the study: The results of this study will contribute towards data for the PhD thesis of Elli Widolf, IASOS. The purpose of this investigation is to gain insight into Antarctic scientists' consciousness in relation to attitude and behaviour. By gaining data on Antarctic scientist consciousness, attitudes and behaviour, deliberations can be put forth on the qualitative differences of specific conservation behaviour of scientists. Such information will be used to deliver prescriptions for scientists addressing the behavioural choices that are available to them, for purposes of engaging in superior conservation techniques. As a participant in this study, the benefit to you is that you or your friends or family may become the recipients of improvements made to environmental science research approaches and methodology. Specifically, results of this research will be processed and published for the benefit of the broader scientific community, as well as the public in general. This project aims at providing solid academic arguments with the support of data such as that collected through this questionnaire, to assist environmental scientists in improving global environmental sustainability programs.

Exclusion criteria: As this is a minimum risk study, there are no criteria for exclusion in relation to potential risks. Social scientists are excluded in this project.

Study procedures: As a potential questionnaire participant, you have already been sent this invitation by the investigator Elli Widolf. All instructions for completing the questionnaire are contained at the beginning of the questionnaire. The questionnaire will most likely not longer than 15 minutes to complete. You may take as long as you

want to. Every potential participant will be provided with an envelope in which to place the completed questionnaire with instructions on where to deliver the envelope.

Confidentiality: As a questionnaire participant, your identity will remain anonymous. Responses retrieved from the questionnaire will be kept in a hard copy format in a lockable cabinet in the office of Elli Widolf at the University of Tasmania (Room 156 Mathematics), as well as on a secure computer server at the university. After a period of five years the hard copy of the data will be disposed of by incineration, and the electronic copy will be deleted from the computer hard-drive.

Freedom to refuse or withdraw: You may withdraw at any time during this study. You will not be prejudiced for this.

Contact persons: If you wish to contact a person involved in this study, please refer to the following details: Dr Julia Jabour, IASOS Ph: 03/62262978 Email: [Julia.Jabour@utas.edu.au](mailto:Julia.Jabour@utas.edu.au)

or

Elli Widolf  
Ph: 03/62262324 Email: [hewidolf@utas.edu.au](mailto:hewidolf@utas.edu.au)

Statement regarding approval: This project has received approval from the Southern Tasmania Social Sciences Human Research Ethics Committee.

Concerns or complaints: If you have any concerns of an ethical nature or complaints about the manner in which this project is conducted, you may contact the Chair or Executive Officer of the Southern Tasmania Social Sciences Human Research Ethics Committee:

Chair: A/Professor Gino Dal Pont (6226 2078)  
Executive Officer: Amanda McAully (6226 2763)

Results of investigation: You may wish to be informed of the overall results of the study, or personal data at its conclusion. If this is the case, then please refer to the contact details provided above.

You will be provided with a copy of this information sheet to keep.

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Dr Julia Jabour

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Elli Widolf

ITEM D3: Initial email sent to all potential Australian Antarctic scientist participants in the IGSQ

Dear Antarctic Scientist/Student of Antarctic Science,

This email is not relevant to social scientists.

This email is to invite you to participate in a short questionnaire (attached) that I have designed for my PhD thesis, entitled *Australian Antarctic Scientists: Consciousness and Behaviour*. The questionnaire seeks to secure your opinion, as an Australian Antarctic scientist, on the role that certain psychological qualities may play for you, and for other Antarctic scientists, who work towards achieving specific science-orientated goals. Four of the six goals presented are the Australian government's goals for the Australian Antarctic program. The remaining two are from the United Nations Environmental Program (UNEP) and the WorldWide Fund for Nature (WWF).

Your participation in this questionnaire will be greatly appreciated. If you have already participated in this research project, either as an interviewee or questionnaire participant, your participation in this questionnaire will still be appreciated. Completion of this questionnaire is estimated to not exceed 10 minutes.

This questionnaire has approval through the Southern Tasmania Social Sciences Human Research Ethics Committee. Any queries regarding the questionnaire can be forwarded to me at this email address.

Thank you,

Elli H. Widolf

ITEM D4: Initial email sent to all potential conservation psychologist participants in the IGSQ

Dear Conservation Psychologists,

This email is to invite all of you to participate in a short questionnaire (attached) that I have designed for my PhD research. I am currently enrolled through the University of Tasmania, Australia. The title of my PhD is *Australian Antarctic Scientists: Consciousness and Behaviour*.

The questionnaire seeks to secure the opinion of conservation psychologists on the role that certain psychological qualities may play for environmental scientists, working towards achieving specific conservation goals. Qualities listed in the questionnaire are derived from descriptions of qualities of consciousness presented in the ancient Vedic literature of India.

Your participation in this questionnaire will be greatly appreciated. Completion of the questionnaire is estimated to not exceed 10 minutes.

Thank you,

Elli Helena Widolf

## ITEM D5: Information Sheet for interviewees



### INFORMATION SHEET 2

Date: 28/04/04

Title of Investigation: AUSTRALIAN ANTARCTIC SCIENTIST  
CONSCIOUSNESS and BEHAVIOUR: INTERVIEWS

Chief Investigator: Dr Julia Jabour, Lecturer and Honours coordinator, Institute of  
Antarctic and Southern Ocean Studies

Purpose of the study: The results of this study will contribute towards data for the PhD thesis of Elli Widolf, IASOS. The purpose of this investigation is to gain insight into Antarctic scientists' consciousness in relation to attitude and behaviour. By gaining data on Antarctic scientist consciousness, attitudes and behaviour, deliberations can be put forth on the qualitative differences of specific conservation behaviours of scientists. Such information will be used to deliver prescriptions for scientists addressing the behavioural choices that are available to them, for purposes of engaging in superior conservation techniques.

As a participant in this study, the benefit to you is that you or your friends or family may become the recipients of improvements made to environmental science research approaches and methodology. Specifically, results of this research will be processed and published for the benefit of the broader scientific community, as well as the public in general. This project aims at providing solid academic arguments with the support of data such as that collected through this questionnaire, to assist environmental scientists in improving global environmental sustainability programs.

Exclusion criteria: As this is a minimum risk study, there are no criteria for exclusion in relation to potential risks. Social scientists are excluded in this project.

Study procedures: As a participating interviewee, you may select a date, time and venue for your interview. If you do not wish to nominate these, then the investigator Elli Widolf will suggest a suitable date, time and location. During the interview, you may make your responses as short or lengthy as you choose, and if you do not want to answer any specific questions you will not be coerced to do so. Your interview will be recorded on a digital audio-recorder. A series of questions will be asked of you. Whilst specific questions have been prepared for this interview, if you wish to elaborate on any specific issues, then please feel free to do so. Upon completion, you

will be given an approximate date at which you can expect to receive the documented responses, giving you the opportunity to make any adjustments to your responses if you wish.

Confidentiality: As an interviewee, you will be identified in the processing of your responses. You will also be identified in the final text of the thesis, as this identification is one of the purposes of your interview i.e. you have been selected to participate in this interview because your responses will be significant due to your professional position. Your name, professional position and place of employment will thus be published in the text of the thesis, along with your responses to questions. Responses retrieved from interviews will be kept in a hard copy format in a lockable cabinet in the office of Elli Widolf at the University of Tasmania (Room 156 Mathematics), as well as on a secure computer server at the university. After a period of five years the hard copy of the data will be disposed of by incineration, and the electronic copy will be deleted from the computer hard-drive.

Freedom to refuse or withdraw: You may withdraw at any time during this study. You will not be prejudiced for this.

Contact persons: If you wish to contact a person involved in this study, please refer to the following details:

Dr Julia Jabour  
Ph: 03/62262978  
Email: [Julia.Jabour@utas.edu.au](mailto:Julia.Jabour@utas.edu.au)

or

Elli Widolf  
Ph: 03/62262324  
Email: [hewidolf@utas.edu.au](mailto:hewidolf@utas.edu.au)

Statement regarding approval: This project has received approval from the Southern Tasmania Social Sciences Human Research Ethics Committee.

Concerns or complaints: If you have any concerns of an ethical nature or complaints about the manner in which this project is conducted, you may contact the Chair or Executive Officer of the Southern Tasmania Social Sciences Human Research Ethics Committee:

Chair:	A/Professor Gino DalPont	(6226 2078)
Executive Officer:	Amanda McAully	(6226 2763)

Results of investigation: You may wish to be informed of the overall results of the study, or personal data at its conclusion. If this is the case, then please refer to the contact details provided above.

You will be provided with a copy of this information sheet and a copy of the statement of informed consent, to keep.

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Dr Julia Jabour

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Elli Widolf

ITEM D6: Consent Form for interviewees



**CONSENT FORM**

Title of Project: AUSTRALIAN ANTARCTIC SCIENTIST CONSCIOUSNESS and BEHAVIOUR: INTERVIEW

1. I have read and understood the 'Information Sheet' for this study.
2. The nature and possible effects of the study have been explained to me.
3. I understand that the study involves the following procedures: The interview will take approximately 45 minutes to complete. It will be conducted on a date, time and at a venue that is still to be confirmed.
4. I understand that the following risks are involved: I have been informed that there are no foreseeable risks to me as a participant. I understand that my professional identity will be disclosed in the final publication of the thesis if I consent and approve that I be identified.
5. I understand that all research data will be securely stored on the University of Tasmania premises for a period of 5 years. The data will be destroyed at the end of 5 years.
6. Any questions that I have asked have been answered to my satisfaction.
7. I agree that research data gathered for the study may be published, only after I have viewed my responses within the interview transcript, and only after I have been given the opportunity to amend any of these responses. I do not agree to any of my responses being accessed by any persons except the chief investigator and other nominated investigators, until this viewing and amendments (if any) have been made.
8. I agree to participate in this investigation and understand that I may withdraw at any time without any effect to my academic standing or employment.

Name of participant

Signature of participant

Date

9. I have explained this project and the implications of participation in it to this volunteer and I believe that the consent is informed and that he/she understands the implications of participation.

Name of investigator

Signature of investigator

Date

# APPENDIX E: Raw AASI Scores Including Their Percentage Value (n = 115)

- Values represent number of participants.
- Column One Key: S = sattva guna; R = rajas guna; T = tamas guna

Statement No. & GUNA	Strongly agree	Basically agree	Neutral	Basically disagree	Strongly disagree	No response selection	Blank/ No response at all
1 R	54 = 46.95 %	47 = 40.86 %	11 = 9.56 %	2 = 1.73 %	-	-	1 = .86 %
2 T	2 = 1.73 %	12 = 10.43 %	24 = 20.86 %	37 = 32.17 %	30 = 26.08 %	8 = 6.95 %	2 = 1.73 %
3 R	37 = 32.17 %	52 = 45.21 %	15 = 13.04 %	9 = 7.82 %	-	1 = .86 %	1 = .86 %
4 T	-	9 = 7.82 %	4 = 3.47 %	35 = 30.43 %	66 = 57.39 %	-	1 = .86 %
5 S	31 = 26.95 %	56 = 48.69 %	19 = 16.52 %	4 = 3.47 %	3 = 2.60 %	2 = 1.73 %	-
6 T	5 = 4.34 %	13 = 11.30 %	14 = 12.17 %	52 = 45.21 %	29 = 25.21 %	2 = 1.73 %	-
7 R	23 = 20 %	50 = 43.47 %	27 = 23.47 %	12 = 10.43 %	3 = 2.60 %	-	-
8 T	7 = 6.08 %	31 = 26.95 %	23 = 20 %	27 = 23.47 %	26 = 22.60 %	-	1 = .86 %
9 S	88 = 76.52 %	21 = 18.26 %	5 = 4.34 %	-	-	-	1 = .86 %
10 S	15 = 13.04 %	20 = 17.39 %	32 = 27.82 %	17 = 14.78 %	20 = 17.39 %	8 = 6.95 %	3 = 2.60 %
11 R	32 = 27.82 %	32 = 27.82 %	26 = 22.60 %	9 = 7.82 %	6 = 5.21 %	7 = 6.08 %	3 = 2.60 %
12 S	4 = 3.47 %	9 = 7.82 %	28 = 24.34 %	31 = 26.95 %	31 = 26.95 %	10 = 8.69 %	2 = 1.73 %
13 S	3 = 2.60 %	1 = .86 %	9 = 7.82 %	43 = 37.39 %	52 = 45.21 %	6 = 5.21 %	1 = .86 %
14 R	28 = 24.34 %	67 = 58.26 %	15 = 13.04 %	1 = .86 %	1 = .86 %	2 = 1.73 %	1 = .86 %
15 T	4 = 3.47 %	19 = 16.52 %	30 = 26.08 %	34 = 29.56 %	23 = 20 %	4 = 3.47 %	1 = .86 %
16 S	36 = 31.30 %	61 = 53.04 %	12 = 10.43 %	5 = 4.34 %	1 = .86 %	-	-
17 R	32 = 27.82 %	54 = 46.95 %	13 = 11.30 %	10 = 8.69 %	3 = 2.60 %	3 = 2.60 %	-
18 R	20 = 17.39 %	53 = 46.08 %	21 = 18.26 %	16 = 13.91 %	4 = 3.47 %	1 = .86 %	-
19 S	6 = 5.21 %	11 = 9.56 %	31 = 26.95 %	21 = 18.26 %	40 = 34.78 %	5 = 4.34 %	1 = .86 %
20 R	53 = 46.08 %	49 = 42.60 %	7 = 6.08 %	4 = 3.47 %	-	2 = 1.73 %	-
21 T	4 = 3.47 %	2 = 1.73 %	8 = 6.95 %	47 = 40.86 %	50 = 43.47 %	4 = 3.47 %	-

22 R	7 = 6.08 %	19 = 16.52 %	15 = 13.04 %	58 = 50.43 %	14 = 12.17 %	2 = 1.73 %	-
23 R	27 = 23.47 %	47 = 40.86 %	14 = 12.17 %	20 = 17.39 %	4 = 3.47 %	2 = 1.73 %	1 = .86 %
24 T	11 = 9.56 %	50 = 43.47 %	9 = 7.82 %	22 = 19.13 %	18 = 15.65 %	5 = 4.34 %	-
25 R	16 = 13.91 %	26 = 22.60 %	25 = 21.73 %	28 = 24.34 %	14 = 12.17 %	5 = 4.34 %	1 = .86 %
26 S	42 = 36.52 %	50 = 43.47 %	13 = 11.30 %	3 = 2.60 %	3 = 2.60 %	2 = 1.73 %	2 = 1.73 %
27 S	42 = 36.52 %	50 = 43.47 %	6 = 5.21 %	15 = 13.04 %	2 = 1.73 %	-	-
28 T	2 = 1.73 %	12 = 10.43 %	22 = 19.13 %	44 = 38.26 %	34 = 29.56 %	1 = .86 %	-
29 R	24 = 20.86 %	47 = 40.86 %	18 = 15.65 %	6 = 5.21 %	1 = .86 %	19 = 16.52 %	-
30 T	67 = 58.26 %	25 = 21.73 %	7 = 6.08 %	5 = 4.34 %	2 = 1.73 %	9 = 7.82 %	-
31 S	30 = 26.08 %	68 = 59.13 %	12 = 10.43 %	3 = 2.60 %	1 = .86 %	1 = .86 %	-
32 T	33 = 28.69 %	35 = 30.43 %	30 = 26.08 %	14 = 12.17 %	3 = 2.60 %	-	-
33 R	23 = 20 %	57 = 49.56 %	25 = 21.73 %	4 = 3.47 %	-	6 = 5.21 %	-
34 S	54 = 46.95 %	47 = 40.86 %	11 = 9.56 %	2 = 1.73 %	-	1 = .86 %	-
35 S	16 = 13.91 %	51 = 44.34 %	22 = 19.13 %	12 = 10.43 %	3 = 2.60 %	10 = 8.69 %	1 = .86 %
36 R	54 = 46.95 %	40 = 34.78 %	10 = 8.69 %	5 = 4.34 %	3 = 2.60 %	1 = .86 %	2 = 1.73 %
37 S	35 = 30.43 %	47 = 40.86 %	27 = 23.47 %	5 = 4.34 %	-	1 = .86 %	-
38 S	2 = 1.73 %	24 = 20.86 %	20 = 17.39 %	36 = 31.30 %	29 = 25.21 %	2 = 1.73 %	2 = 1.73 %
39 R	7 = 6.08 %	27 = 23.47 %	45 = 39.13 %	16 = 13.91 %	17 = 14.78 %	2 = 1.73 %	1 = .86 %
40 T	3 = 2.60 %	22 = 19.13 %	23 = 20 %	44 = 38.26 %	23 = 20 %	-	-
41 S	7 = 6.08 %	31 = 26.95 %	10 = 8.69 %	40 = 34.78 %	20 = 17.39 %	6 = 5.21 %	1 = .86 %
42 R	36 = 31.30 %	47 = 40.86 %	31 = 26.95 %	-	1 = .86 %	-	-
43 T	22 = 19.13 %	31 = 26.95 %	30 = 26.08 %	22 = 19.13 %	6 = 5.21 %	4 = 3.47 %	-
44 R	37 = 32.17 %	48 = 41.73 %	18 = 15.65 %	6 = 5.21 %	-	6 = 5.21 %	-
45 S	4 = 3.47 %	25 = 21.73 %	34 = 29.56 %	23 = 20 %	26 = 22.60 %	3 = 2.60 %	-
46 T	9 = 7.82 %	32 = 27.82 %	30 = 26.08 %	26 = 22.60 %	15 = 13.04 %	3 = 2.60 %	-
47 T	-	11 = 9.56 %	7 = 6.08 %	37 = 32.17 %	58 = 50.43 %	2 = 1.73 %	-
48 R	11 = 9.56 %	35 = 30.43 %	20 = 17.39 %	31 = 26.95 %	13 = 11.30 %	5 = 4.34 %	-
49 S	7 = 6.08 %	23 = 20 %	37 = 32.17 %	27 = 23.47 %	16 = 13.91 %	5 = 4.34 %	-
50 S	7 = 6.08 %	30 = 26.08 %	36 = 31.30 %	18 = 15.65 %	12 = 10.43 %	8 = 6.95 %	4 = 3.47 %

51 T	12 = 10.43 %	24 = 20.86 %	24 = 20.86 %	41 = 35.65 %	13 = 11.30 %	-	1 = .86 %
52 R	7 = 6.08 %	38 = 33.04 %	20 = 17.39 %	39 = 33.91 %	9 = 7.82 %	2 = 1.73 %	-
53 T	-	10 = 8.69 %	21 = 18.26 %	54 = 46.95 %	30 = 26.08 %	-	-
54 S	1 = .86 %	12 = 10.43 %	46 = 40%	24 = 20.86 %	18 = 15.65 %	14 = 12.17 %	-
55 T	13 = 11.30 %	34 = 29.56 %	23 = 20%	31 = 26.95 %	11 = 9.56 %	3 = 2.60 %	-
56 T	21 = 18.26 %	53 = 46.08 %	24 = 20.86 %	12 = 10.43 %	-	3 = 2.60 %	2 = 1.73 %
57 S	2 = 1.73 %	12 = 10.43 %	29 = 25.21 %	17 = 14.78 %	29 = 25.21 %	25 = 21.73 %	1 = .86 %
58 T	4 = 3.47 %	-	-	12 = 10.43 %	97 = 84.34 %	1 = .86 %	1 = .86 %
59 R	21 = 18.26 %	31 = 26.95 %	22 = 19.13 %	19 = 16.52 %	7 = 6.08 %	15 = 13.04 %	-
60 T	2 = 1.73 %	2 = 1.73 %	4 = 3.47 %	33 = 28.69 %	73 = 63.47 %	1 = .86 %	-

Person	R1	T2	R3	T4	S5	T6	R7	T8	
P 1		2	5	2	5	2	4	2	3
P 2		3	5	2	2	2	4	4	4
P 3		1	5	3	5	3	5	1	3
P 4		2	1	3	4	1	3	4	5
P 5		1	5	1	5	1	5	4	5
P 6		2	3	1	5	1	2	1	1
P 7		1	4	2	3	2	3	2	4
P 8		2	4	1	4	2	4	2	4
P 9		1	4	1	5	2	5	2	2
P 10		1	3	2	4	3	4	3	3
P 11		1	6	2	2	3	1	3	2
P 12		2	4	2	5	1	5	1	5
P 13		1	4	3	5	3	4	2	3
P 14		1	4	1	5	5	5	2	3
P 15		1	4	4	5	2	4	2	4
P 16		1	4	2	5	1	5	2	5
P 17		1	6	1	5	6	4	2	5
P 18		1	4	2	5	1	5	2	4
P 19		3	4	3	4	4	2	4	5
P 20		2	4	6	4	2	3	2	4
P 21		2	3	1	3	2	2	2	1
P 22		2	4	4	5	2		4	4
P 23		1	5	2	2	2	4	3	1
P 24		2	2	1	4	2	4	2	2
P 25		1	5	2	5	2	4	1	2
P 26		1	5	3	5	2	4	1	4
P 27		2	1	1	4	1	4	2	1
P 28		1	3	4	5	2	5	3	2
P 29		2	5	2	5	2	3	2	1
P 30		4	3	1	2	2	1	4	2
P 31		1	3	2	5	3	3	3	3
P 32		1	6	2	5	2	5	1	4
P 33		3	2	2	4	3	2	3	2
P 34		1	5	3	5	3	4	2	4
P 35		1	2	1	3	3	4	1	2
P 36		1	5	1	5	1	5	2	4
P 37		2	3	1	4	3	3	3	3
P 38		3	2	3	4	2	1	4	2
P 39		1	4	1	5	2	4	2	4
P 40		2	4	2	5	2	4	1	1
P 41		1	5	2	5	2	4	3	4
P 42		2	2	2	4	2	1	2	2
P 43		2	5	1	2	1	4	2	2
P 44		1	3	3	5	2	2	2	3
P 45		2	5	3	4	1	4	2	3
P 46		1	3	2	4	2	2	2	5
P 47		1	6	2	5	2	4	1	2
P 48		3	4	2	4	2	3	3	5
P 49		3	3	1	4	2	2	3	4
P 50		1	3	1	5	3	4	1	5
P 51		2	2	1	4	2	2	2	2
P 52		1	5	2	5	2	5	1	5
P 53		1	3	4	4	3	2	3	3
P 54		2	6	3	5	6	6	5	5
P 55		3	2	2	4	3	3	2	2

P 56	2	4	2	4	2	4	5	4
P 57	2	4	2	5	3	5	2	5
P 58	2	2	1	4	1	2	2	2
P 59	2	4	1	5	2	4	1	2
P 60	1	5	1	5	2	5	2	3
P 61	2	6	3	5	2	5	3	4
P 62	2	3	4	5	2	4	3	3
P 63	2	6	2	5	2	4	2	5
P 64	2	4	1	5	3	3	1	3
P 65	1	5	1		1	4	1	
P 66	1	5	2	5	5	5	4	5
P 67	1	5	1	5	2	4	2	3
P 68	1	2	1	5	1	5	1	2
P 69	1	5	1	5	1	5	1	2
P 70	1	5	3	5	1	5	2	3
P 71	2	3	2	4	2	4	3	2
P 72	2	2	1	4	3	4	2	2
P 73	1	2		5	4	5	3	3
P 74	2	4	2	4	5	2	4	4
P 75	3	3	4	4	2	3	4	4
P 76	2	4	2	5	2	4	2	3
P 77	1	5	2	5	2	5	2	4
P 78	3	4	2	4	1	4	3	4
P 79	1	3	2	4	3	4	2	3
P 80	1	4	2	5	2	4	2	2
P 81	3	3	4	3	2	3	2	4
P 82	1	5	2	5	1	5	2	5
P 83	2	4	2	5	3	4	1	4
P 84	1	5	2	5	1	5	2	5
P 85	4	3	2	4	2	2	3	4
P 86	2	4	1	2	2	3	3	4
P 87	2	6	2	4	4	4	4	2
P 88	1	5	2	5	1	4	2	2
P 89			2	5	1	5	3	4
P 90	2	4	2	5	3	4	3	5
P 91	1	5	4	5	2	5	2	
P 92	2	5	4	5	2	5	5	5
P 93	1	3	2	5	2	3	2	2
P 94	2	3	2	5	1	4	2	2
P 95	2	5	3	5	2	4	3	5
P 96	2	5	2	4	2	5	3	5
P 97	3	2	3	5	1	2	3	2
P 98	2	3	2	5	3	4	4	5
P 99	2	4	1	5	2	4	2	5
P 100	2	6	3	5	1	4	3	5
P 101	2	4	1	2	1	4	2	4
P 102	2	4	1	5	2	4	1	2
P 103	1	5	1	5	1	5	1	3
P 104	1	3	1	4	4	4	2	3
P 105	2	4	2	4	2	4	1	2
P 106	2	4	1	5	2	4	2	2
P 107	1	4	2	4	1	4	2	2
P 108	1	4	1	4	1	5	1	3
P 109	1	4	2	5	2	4	3	3
P 110	1	4	1	4	1	5	1	3
P 111	1	5	2	2	1	1	2	4

P 112	1	4	2	2	1	4	3	5
P 113	2	3	2	4	1	3	3	2
P 114	1	4	1	5	2	4	2	5
P 115	1	3	2	5	2	4	1	1

S9	S10	R11	S12	S13	R14	T15	S16	R17	
	1	1	1	4	5	2	5	1	2
	1	5	2	3	4	2	2	2	2
	1	2	2	5	3	2	3	1	1
	1	2	1	3	5	3	5	2	6
	1	1	5	3	4	5	5	1	2
	1	1	4	4	5	1	4	1	1
	2	4	2	4	4	2	3	2	2
	2	4	6	4	4	3	3	2	4
	1	3	2	1	4	2	5	1	2
	1	5	1	3	4	2	3	2	2
	1	4	3	6	3	2	2	2	2
	1	1	6	6	5	2	2	1	1
	1	5	1	3	5	2	5	2	3
	1	5	3	5	3	3	3	2	2
	1	3	3	5	5	2	4	2	1
	1	1	3	4	4	2	4	2	2
	1	5	3	6	5	3	6	2	4
	1	3	2	2	4	3	5	2	3
	2	2	5	4	4	4	3	4	2
	1	3	2	2	6	2	4	1	1
	1	3	2	4	4	2	3	3	2
	1	2	6		4	2	5	2	6
	1	5	1	3	5	1	4	1	2
	1	2	2	4	4	1	2	2	2
	1	5	1	4	4	2	4	1	1
	2	3	3	5	4	2	4	2	2
	1	4	1	4	5	1	4	1	2
	1	5	1	3	5	1	2	2	3
	1	6	6	5	5	2	5	2	2
	1	1	3	4	5	2	2	3	4
	3	2	3	3	3	1	3	3	1
	1	6	5	4	5	6	5	1	2
	1	5	2	5	3	2	3	3	2
	1	3	3	5	3	2	4	2	2
	1	3	2	4	5	1	1	3	4
	1	5	1	5	5	2	4	1	2
	2	3	1	4	4	2	4	3	3
	1	6	1	1	4	2	3	4	5
	1	2	2	3	4	2	4	3	1
	1	4	4	4	5	1	4	2	1
	1	3	2	4	5	3	4	2	2
	2	2	3	3	4	2	2	2	3
	1	4	1	5	5	2	4	1	2
	2	2	1	4	4	2	2	2	2
	1	1	3		5	2	5	1	5
	2	2	1	3	3	2	3	4	3
	1	3	4	6	5	1	2	1	1
	1	5	2	3	5	2	3	2	2
	2	6	2	4	4	3	3	1	1
	1	6	2	6	3	1	2	2	1
	2	3	3	4	4	2	3	4	4
	1	2	5	5	5	3	4	2	2
	1	5	3	3	4	1	4	2	2
	1	3	3	3	6	1	2	1	6
	1	1	5	6	4	2	4	3	3

1	4	2	5	5	2	5	1	2
1	5	1	4	3	1	2	1	1
1	3	2	3	4	2	2	2	1
2	3	1	4	4	2	4	2	2
1	1	5	3	5	1	5	1	1
2	4	1	4	5	3	4	2	2
1	5	6	1	4	2	2	1	4
1	3	5	5	4	2	4	2	2
1	3	3	2	4	2	3	2	2
1	1		5	5	3	3	1	4
1	5	1	5	5	3	5	5	1
1	2	1	3	4	2	3	2	2
1	1	4	2	1	1	5	1	2
1	1	1	6	5	2	5	1	1
1	5	1	2	5	1	5	1	1
2	3	2	5	4	2	3	2	2
1	2	2	4	4	2	4	2	1
1	3	2	3	5	1	4	1	4
1	4	4	5	5	1	2	2	2
2	1	3	4	2	2	2	3	2
1	2	3	4	5	1	5	2	2
1	2	1	5	5	1	5	2	2
1	3	1	5	5	2	3	2	1
2	2	2	3	6	2	3	2	2
1	3	2	3	4	2	3	2	2
3	4	2	3	6	2	6	2	2
1	4	2	3	4	2	4	2	2
1	4	1	6	4	2	1	2	5
2	4	2	5	5	2	5	2	1
1	4	3	4	1	2	4	3	2
1	3	3	5	4	2	4	2	3
1	2	2	4	5	2	2	2	2
1	5	2	2	5	1	4	1	2
1	3	1	3	4	6	4	1	1
2	5	1	2	4	2	4	4	2
							2	3
1	6	1	5	1	1	5	2	4
1	3	1	3	4	1	3	2	1
1	3	4	5	4	1	3	1	1
1	3	2	4	5	2	2	2	2
1	6	6	5	6	2	6	1	1
2	3	2	3	5	2	3	3	1
1	4	2	5	5	2	5	2	4
2	4	3	4	4	2	4	2	1
1	5	3	2	4	2	5	2	2
2	1	3	3	5	2	3	2	2
1	3	1	5	5	1	4	2	2
1		1	1	5	3	1	1	2
1	5	4	3	5	2	3	3	3
2	3	2	4	4	2	3	2	2
1	2	3	4	5	1	2	1	1
1	3	3	5	5	2	4	2	1
3	6	6	5	6	3	3	1	1
1	3	4	2	4	2	4	2	3
3	6	6	5	5	3	3	1	1
1	2	1	6	5	2	5	1	2

1	2	3	5	5	2	4	2	3
1	4	2	5	5	1	3	2	1
1	3	4	5	5	3	6	2	3
1	1	1	3	5	1	1	1	2

R18	S19	R20	T21	R22	R23	T24	R25	S26	
2		5	1	5	4	3		2	2
3		3	4	2	4	2	4	2	1
1		5	1	5	3	3	2	5	1
5		1	1	5	5	2	2	4	1
3		3	1	5	6	4	3	5	3
2		3	1	5	5	1	1	3	4
2		3	2	4	4	2	4	4	3
5		5	2	4	4	4	6	4	2
2		4	2	4	4	2	5	2	1
2		4	2	3	2	3	3	2	2
2		5	2	4	4	3	2	3	2
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S54	T55	T56	S57	T58	R59	T60	Person
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4	4	2	4	1	2	4	P 15
3	4	2	3	4	2	5	P 16
6	6	6	6	5	1	5	P 17
3	4	2	6	5	2	4	P 18
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3	2	2	3	5	4	5	P 24
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3	3	4	5	5	2	5	P 79
3	3	3	3	5	2	4	P 80
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2	2	1	4	5	2	4	P 93
2	3	2	2	5	2	5	P 94
4	4	3	2	4	5	5	P 95
3	4	3	6	5	4	3	P 96
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4	4	2	4	4	1	4	P 99
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2	2	2	3	5	4	5	P 101
3	4	3	3	5	2	5	P 102
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3	2	2	4	5	1	4	P 106
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6	3	2	6	5	2	4	P 110
6	4	2	5	5	6	4	P 111

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4	3	2	5	5	6	4	P 113
4	2	3	3	5	1	4	P 114
2	1	1	3	5	2	5	P 115

R1	T2	R3	T4	S5	T6	Person	R2	Person	
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3		1	4	4	4	2 P 2		2 P 2	
5		1	3	1	3	1 P 3		3 P 3	
4		5	3	2	5	3 P 4		1 P 4	
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4		3	5	1	5	4 P 6		5 P 6	
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S19	R20	T21	R22	R23	T24	R25	S26	S27	
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2	2	2	2	3	2	2	2	2
4	2	2	3	3	3	4	3	3
5	2	4	2	3	1	1	2	3
3	1	4	3	1	4	1	1	1
5	2	2	4	4	2	4	2	2
1	1	1	2	1	4	4	2	3
4	4	3	4	4	2	2	3	4
3	1	3	3	3	4	4	4	3
5	1	3	1	5	1	3	1	2
1	2	5	3	5	3	5	2	3
3	1	4	2	2	3	3	2	3
4	1	4	2	3	2	2	2	3
3	2	2	3	3	2	2	2	4
4	1	0	0	4	3	2	2	0
3	2	4	4	3	2	4	2	3
4	3	0	1	4	1	2	2	0
2	1	2	1	1	2	2	1	0

2	1	4	3	3	2	4	1	3
4	0	2	1	1	4	3	4	2
1	1	3	3	3	2	4	1	2
2	2	2	3	4	4	5	1	4

T55	T56	S57	T58	R59	T60	sattva1	rajas1	tamas1	
3	4	4	2	1	4	1	3.26	3.65	2.47
4	4	4	0	1	3	1	2.94	3.25	2.9
1	3	3	0	5	0	1	3.53	3.79	2.45
4	4	4	3	1	2	1	3.7	3	2.21
2	2	2	1	1	1	1	3.85	2.95	1.85
5	5	5	4	1	2	2	3.47	4	3
3	3	3	3	1	3	2	3.2	3.55	2.63
2	2	2	0	1	4	2	3.11	3.22	2.26
2	4	4	4	1	3	2	3.85	4.1	2.2
2	3	3	1	1	3	2	3	3.8	2.95
4	4	4	3	1	4	1	3.16	3.8	3.53
4	2	2	2	2	2	2	3.67	3.32	2.25
2	5	5	1	1	4	1	2.5	3.83	2.42
5	2	2	4	1	3	2	3.55	3.5	2.2
2	4	4	2	5	4	2	2.95	3.85	2.4
2	4	4	3	2	4	1	3.7	3.6	2.1
0	0	0	0	1	5	1	2.69	3.78	2.87
2	4	4	0	1	4	2	3.72	3.58	2
4	4	4	4	1	2	2	2.8	2.85	3
3	4	4	1	1	4	0	3.35	3.59	2.89
4	4	4	2	1	3	2	3.3	3.8	2.85
4	3	3	6	2	2	1	3.41	2.61	2.06
4	4	4	1	1	0	1	3.05	3.42	2.65
4	4	4	3	1	2	1	3.7	4.2	2.85
2	5	5	0	1	5	1	2.79	4.15	2.26
1	4	4	3	2	4	1	3.25	4.11	2.26
2	4	4	1	1	0	1	3.18	4.05	2.74
4	2	2	1	1	5	2	2.95	4.05	2.65
1	4	4	5	1	4	2	3.32	3.22	2.3
5	5	5	4	1	2	1	3.5	3.15	3.15
3	4	4	0	0	3	1	3.37	3.25	2.74
2	3	3	1	1	5	1	3.22	4.11	1.95
3	2	2	2	1	5	1	2.5	3.4	2.9
2	4	4	2	1	3	1	3.15	3.65	2.25
3	3	3	3	1	1	1	2.95	4.2	3.05
2	3	3	1	1	5	4	2.85	4.25	2.85
2	3	3	3	1	3	2	3.1	3.55	2.65
4	2	2	1	5	0	5	2.78	3.32	3.6
4	4	4	0	1	0	1	3.65	4	2.37
5	3	3	2	1	5	1	3.1	4.15	2.89
2	4	4	3	1	2	2	3.2	3.35	2.2
5	4	4	3	1	3	1	3.4	3.75	2.8
2	4	4	3	1	5	1	3	3.95	2.75
2	4	4	2	1	5	1	3	4.11	2.55
5	3	3	4	1	1	4	3.26	2.75	2.6
4	4	4	2	5	3	1	3.15	3.3	2.8
4	4	4	0	1	0	1	3.92	3.72	2.84
4	5	5	1	1	4	1	2.75	3.25	2.75
5	5	5	0	1	0	1	3.53	3.73	2.75
5	4	4	3	1	3	2	3.47	3.95	2.45
4	3	3	3	1	3	1	3.3	3.6	2.75
3	4	4	3	1	2	1	3.5	3.5	1.9
1	5	5	3	2	5	5	2.95	4.05	3.25
3	3	3	0	1	0	0	3.35	3.59	2.65
4	0	0	3	1	2	1	3.83	3.11	2.39

2	3	0	1	3	1	3.53	3.6	2.55
4	6	1	1	5	1	2.94	4.15	2.16
3	5	4	1	3	1	3.6	3.55	2.65
4	4	3	1	3	1	3.55	3.95	2.4
4	2	1	1	5	2	3.6	4	1.85
0	0	1	1	4	2	2.93	3.33	2.21
4	4	4	2	1	1	3.58	3.17	2.79
4	4	3	1	3	1	3.35	3.4	2.11
2	4	0	1	4	3	3.6	3.94	2.42
5	5	6	1	5	3	4.18	3.84	2.82
1	4	1	1	3	1	2.35	3.8	2.05
4	5	1	1	5	1	3.4	4.3	2.7
2	5	5	1	2	1	4.15	4.21	2.55
4	5	3	1	4	1	3.68	4.26	2.4
1	5	4	1	4	1	3.5	3.95	2.2
3	4	3	1	3	2	3.2	3.55	3.1
3	3	4	1	2	1	3.8	3.6	2.45
4	3	2	1	4	2	3.35	3.63	2.55
2	2	2	2	4	1	2.7	3.65	2.55
4	2	3	1	2	2	3.05	2.85	3.05
2	3	3	1	2	2	3.2	3.6	2.45
2	5	1	1	5	1	2.3	3.2	2.3
4	4	1	1	4	1	3.44	3.7	2.75
3	2	1	1	4	1	3	3.55	2.9
3	3	3	1	4	2	3.4	3.85	2.47
3	0	0	2	0	3	3.33	3.44	3
4	4	0	1	0	1	3.41	3.61	2.2
0	5	0	1	2	1	3	3.26	2.26
1	5	1	6	5	1	2.47	3.89	2.39
2	3	1	1	0	1	2.95	3.37	2.74
4	4	1	1	4	1	3	3.42	2.9
3	4	0	2	4	2	2.94	3.72	2.84
1	4	1	1	3	1	3.3	4.1	2.4
5	3	0	1	5	1	3.76	3.69	2.26
3	4	3	1	4	1	2.7	3.65	2.5
2	4	2	1	4	1	3.31	3.72	2.28
5	5	0	1	1	1	2.94	3.17	2
4	5	2	1	4	2	3.6	4.2	2.9
3	4	4	1	4	1	3.53	3.75	2.5
2	3	4	2	1	1	3.11	2.95	2.3
2	3	0	1	2	3	3.44	3.61	2.39
3	3	1	1	2	1	3.25	3.15	2.8
1	4	0	1	0	1	2.35	3.39	2.55
2	4	2	2	5	2	3.55	4.16	2.68
1	4	2	1	0	2	2.85	2.84	2.21
4	4	3	1	2	1	3.65	3.45	2.75
2	3	3	1	4	1	3.25	4.05	2.45
3	5	1	1	1	1	3.61	4.1	2.85
2	2	1	1	5	1	3.05	3.95	2.55
4	4	2	1	4	1	3.1	3.7	2.7
4	4	2	1	5	2	3.25	4.2	2.9
4	4	0	1	3	1	3.63	3.56	2.32
3	4	0	1	4	2	3.6	4.12	2.56
5	5	3	2	2	1	3.55	3.6	2.35
3	4	0	1	4	2	3.24	4.24	2.63
2	4	1	1	0	2	2.94	4.28	2.95

3	4	3	1	3	1	3.45	3.55	2.25
3	4	1	1	0	2	3.05	3.89	3.16
4	3	3	1	5	2	3.2	3.72	2
5	5	3	1	4	1	3.45	3.9	2.85

sattva2	rajas2	tamas2	sattva	rajas	tamas
3.15	3.67	1.92	3	3.5	2
2.77	3.22	2.5	3	3	2.5
3.31	3.71	1.75	3.5	3.5	2
4.07	2.76	1.92	4	3	2
3.79	3	1.42	4	3	1.5
3.23	4.22	2.58	3	4	2.5
3.07	3.61	2.64	3	3.5	2.5
2.85	3.18	2.25	3	3	2.5
3.93	4.06	1.83	4	4	2
2.64	3.78	2.58	2.5	4	2.5
2.69	3.83	3.36	2.5	4	3.5
3.58	3.39	1.83	3.5	3.5	2
2.14	3.81	1.45	2	4	1.5
3.14	3.61	1.92	3	3.5	2
2.71	4	1.83	2.5	4	2
3.64	3.78	1.42	3.5	4	1.5
1.75	3.94	2	2	4	2
3.69	3.56	1.83	3.5	3.5	2
2.64	2.94	2.67	2.5	3	2.5
3.25	3.53	2.36	3.5	3.5	2.5
3.14	3.83	2.92	3	4	3
3.45	2.53	1.55	3.5	2.5	1.5
2.71	3.29	2.08	2.5	3.5	2
3.5	4.22	2.67	3.5	4	2.5
2.46	4.22	1.58	2.5	4	1.5
3	4.12	1.75	3	4	2
3	4.18	2.42	3	4	2.5
2.64	4	2.08	2.5	4	2
3.08	3.18	2.17	3	3	2
3.57	3.22	3.17	3.5	3	3
3.38	3.28	2.5	3.5	3.5	2.5
2.67	4.31	1.27	2.5	4.5	1.5
2.21	3.39	2.92	2	3.5	3
2.93	3.72	1.67	3	3.5	1.5
2.64	4.28	2.83	2.5	4.5	3
2.86	4.39	2.25	3	4.5	2.5
3	3.56	2.67	3	3.5	2.5
2.08	3.12	3.5	2	3	3.5
3.55	4	1.83	3.5	4	2
3	4.28	2.42	3	4.5	2.5
3.14	3.33	1.75	3	3.5	2
3.57	3.78	2.83	3.5	4	3
2.86	3.89	2.08	3	4	2
2.86	4.06	2.42	3	4	2.5
3.38	2.83	2.67	3.5	3	2.5
3	3.28	2.17	3	3.5	2
3.83	4	2.36	4	4	2.5
2.43	3.33	2	2.5	3.5	2
3.67	3.69	2.67	3.5	3.5	2.5
3.09	4.06	2.17	3	4	2
3.14	3.56	2.67	3	3.5	2.5
3.57	3.72	1.42	3.5	3.5	1.5
2.64	4.06	3	2.5	4	3
2.83	3.6	2.78	3	3.5	3
4	3.13	2.45	4	3	2.5

3.23	3.61	2	3	3.5	2
2.25	4.22	1.58	2.5	4	1.5
3.71	3.67	2.67	3.5	3.5	2.5
3.43	3.89	2	3.5	4	2
3.57	4.35	1.42	3.5	4.5	1.5
2.78	3.31	1.7	3	3.5	1.5
3.31	3.12	2.58	3.5	3	2.5
3.29	3.61	1.55	3.5	3.5	1.5
3.4	4	2.17	3.5	4	2
4.45	4	2.11	4.5	4	2
1.79	3.67	1.25	2	3.5	1.5
3.14	4.39	2.25	3	4.5	2.5
4.21	4.35	2.17	4	4.5	2
3.85	4.35	1.67	4	4.5	1.5
3.36	4	1.75	3.5	4	2
3.21	3.56	2.92	3	3.5	3
3.79	3.56	2.25	4	3.5	2.5
3.29	3.71	2.08	3.5	3.5	2
2.43	3.72	2.33	2.5	3.5	2.5
2.64	2.94	2.75	2.5	3	3
3.14	3.56	2.17	3	3.5	2
1.71	3.17	1.58	1.5	3	1.5
3.08	3.61	2.08	3	3.5	2
2.71	3.56	2.67	2.5	3.5	2.5
3.43	3.89	2.17	3.5	4	2
3.2	3.38	2.82	3	3.5	3
3.09	3.69	1.33	3	3.5	1.5
2.82	3.18	1.75	3	3	2
2.23	4	1.27	2	4	1.5
2.85	3.35	2.5	3	3.5	2.5
2.79	3.53	2.25	3	3.5	2.5
2.73	3.69	2.45	2.5	3.5	2.5
3.43	4.11	1.92	3.5	4	2
3.36	3.57	1.45	3.5	3.5	1.5
2.5	3.72	1.67	2.5	3.5	1.5
3.33	3.71	1.3	3.5	3.5	1.5
2.58	3	1.08	2.5	3	1
3.57	4.22	2.42	3.5	4	2.5
3.69	4	2.33	3.5	4	2.5
2.92	2.94	2.08	3	3	2
3.27	3.71	2	3.5	3.5	2
3.29	3.06	2.33	3.5	3	2.5
2.15	3.31	2	2	3.5	2
3.36	4.35	1.91	3.5	4.5	2
2.5	2.94	1.55	2.5	3	1.5
4	3.5	2.67	4	3.5	2.5
3.21	4.06	2.42	3	4	2.5
3.38	4.11	2	3.5	4	2
2.86	4	2.42	3	4	2.5
2.93	3.67	2.25	3	3.5	2.5
3.14	4.28	2.33	3	4.5	2.5
3.69	3.69	1.92	3.5	3.5	2
3.6	4.12	2.08	3.5	4	2
3.5	3.67	1.83	3.5	3.5	2
3.27	4.24	2	3.5	4	2
2.82	4.38	2.5	3	4.5	2.5

3.5	3.56	1.92	3.5	3.5	2
2.64	4	3.36	2.5	4	3.5
2.86	3.88	1.36	3	4	1.5
3.29	3.94	2.5	3.5	4	2.5

## APPENDIX G: Pearsons' Correlation Analysis for AASI Scores

### ITEM G1: Correlations for Sattva Statements - First Ten

Pearson's correlation measures the tendency of two variables of a single phenomenon to increase or decrease simultaneously i.e. it is a "statistic representing the degree of linear relationship between two variables" (Colman 2003, 587).

**Correlations**

		sattva1	rajas1	tamas1
S5	Pearson Correlation	.373**	.061	-.051
	Sig. (2-tailed)	.000	.520	.590
	N	113	113	113
S9	Pearson Correlation	.054	.052	-.169
	Sig. (2-tailed)	.565	.586	.072
	N	114	114	114
S10	Pearson Correlation	.532**	-.135	-.056
	Sig. (2-tailed)	.000	.172	.574
	N	104	104	104
S12	Pearson Correlation	.238*	-.022	.132
	Sig. (2-tailed)	.016	.828	.183
	N	103	103	103
S13	Pearson Correlation	.092	-.142	.023
	Sig. (2-tailed)	.345	.144	.815
	N	108	108	108
S16	Pearson Correlation	.374**	.308**	-.174
	Sig. (2-tailed)	.000	.001	.063
	N	115	115	115
S19	Pearson Correlation	.551**	.023	-.132
	Sig. (2-tailed)	.000	.814	.170
	N	109	109	109
S26	Pearson Correlation	.320**	.083	.060
	Sig. (2-tailed)	.001	.389	.530
	N	111	111	111
S27	Pearson Correlation	.292**	.278**	-.225*
	Sig. (2-tailed)	.002	.003	.016
	N	115	115	115
S31	Pearson Correlation	.118	.283**	-.072
	Sig. (2-tailed)	.212	.002	.447
	N	114	114	114

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).

# ITEM G2: Correlations for Sattva Statements - Second Ten

## Correlations

		sattva1	rajas1	tamas1
S34	Pearson Correlation	.061	.000	-.132
	Sig. (2-tailed)	.518	.997	.162
	N	114	114	114
S35	Pearson Correlation	.311**	.133	-.222*
	Sig. (2-tailed)	.001	.180	.024
	N	104	104	104
S37	Pearson Correlation	.258**	.321**	-.162
	Sig. (2-tailed)	.006	.001	.085
	N	114	114	114
S38	Pearson Correlation	.356**	.033	.123
	Sig. (2-tailed)	.000	.727	.200
	N	111	111	111
S41	Pearson Correlation	.111	-.027	.200*
	Sig. (2-tailed)	.255	.779	.038
	N	108	108	108
S45	Pearson Correlation	.606**	-.229*	-.204*
	Sig. (2-tailed)	.000	.015	.031
	N	112	112	112
S49	Pearson Correlation	.592**	-.223*	-.243*
	Sig. (2-tailed)	.000	.019	.010
	N	110	110	110
S50	Pearson Correlation	.513**	.249*	.015
	Sig. (2-tailed)	.000	.011	.882
	N	103	103	103
S54	Pearson Correlation	.567**	.130	-.071
	Sig. (2-tailed)	.000	.196	.480
	N	101	101	101
S57	Pearson Correlation	.478**	-.179	-.059
	Sig. (2-tailed)	.000	.093	.585
	N	89	89	89

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).

### ITEM G3: Correlations for Rajas Statements - First Ten

#### Correlations

		sattva1	rajas1	tamas1
R1	Pearson Correlation	.115	.466**	-.333**
	Sig. (2-tailed)	.223	.000	.000
	N	114	114	114
R3	Pearson Correlation	.271**	.400**	.035
	Sig. (2-tailed)	.004	.000	.714
	N	113	113	113
R7	Pearson Correlation	.298**	.535**	-.113
	Sig. (2-tailed)	.001	.000	.229
	N	115	115	115
R11	Pearson Correlation	-.268**	.186	.148
	Sig. (2-tailed)	.006	.058	.132
	N	105	105	105
R14	Pearson Correlation	-.059	.319**	.219*
	Sig. (2-tailed)	.537	.001	.020
	N	112	112	112
R17	Pearson Correlation	.179	.350**	-.105
	Sig. (2-tailed)	.060	.000	.270
	N	112	112	112
R18	Pearson Correlation	.170	.613**	-.054
	Sig. (2-tailed)	.070	.000	.566
	N	114	114	114
R20	Pearson Correlation	.185	.257**	-.068
	Sig. (2-tailed)	.050	.006	.476
	N	113	113	113
R22	Pearson Correlation	-.048	.380**	.044
	Sig. (2-tailed)	.613	.000	.645
	N	113	113	113
R23	Pearson Correlation	.098	.486**	-.038
	Sig. (2-tailed)	.303	.000	.692
	N	112	112	112

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).

# ITEM G4: Correlations for Rajas Statements - Second Ten

## Correlations

		sattva1	rajas1	tamas1
R25	Pearson Correlation	-.187	.552**	.110
	Sig. (2-tailed)	.051	.000	.254
	N	109	109	109
R29	Pearson Correlation	.128	.247*	.145
	Sig. (2-tailed)	.215	.015	.159
	N	96	96	96
R33	Pearson Correlation	.024	.369**	-.038
	Sig. (2-tailed)	.802	.000	.691
	N	109	109	109
R36	Pearson Correlation	.266**	.411**	.016
	Sig. (2-tailed)	.005	.000	.868
	N	112	112	112
R39	Pearson Correlation	.081	.412**	.359**
	Sig. (2-tailed)	.396	.000	.000
	N	112	112	112
R42	Pearson Correlation	.119	.510**	.012
	Sig. (2-tailed)	.204	.000	.903
	N	115	115	115
R44	Pearson Correlation	-.312**	.437**	.292**
	Sig. (2-tailed)	.001	.000	.002
	N	109	109	109
R48	Pearson Correlation	.013	.028	.033
	Sig. (2-tailed)	.890	.773	.729
	N	110	110	110
R52	Pearson Correlation	.109	.239*	.130
	Sig. (2-tailed)	.250	.011	.170
	N	113	113	113
R59	Pearson Correlation	-.304**	.524**	.037
	Sig. (2-tailed)	.002	.000	.712
	N	100	100	100

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).

# ITEM G5: Correlations for Tamas Statements - First Ten

## Correlations

		sattva1	rajas1	tamas1
T2	Pearson Correlation	.098	-.060	.444**
	Sig. (2-tailed)	.322	.546	.000
	N	105	105	105
T4	Pearson Correlation	-.091	-.126	.499**
	Sig. (2-tailed)	.335	.180	.000
	N	114	114	114
T6	Pearson Correlation	-.156	-.190*	.624**
	Sig. (2-tailed)	.100	.044	.000
	N	113	113	113
T8	Pearson Correlation	.197*	.332**	.413**
	Sig. (2-tailed)	.037	.000	.000
	N	113	113	113
T15	Pearson Correlation	.036	.069	.488**
	Sig. (2-tailed)	.705	.472	.000
	N	110	110	110
T21	Pearson Correlation	-.170	.074	.336**
	Sig. (2-tailed)	.075	.439	.000
	N	111	111	111
T24	Pearson Correlation	-.333**	.059	.317**
	Sig. (2-tailed)	.000	.544	.001
	N	109	109	109
T28	Pearson Correlation	-.148	.216*	.270**
	Sig. (2-tailed)	.116	.022	.004
	N	113	113	113
T30	Pearson Correlation	-.094	.112	.050
	Sig. (2-tailed)	.338	.251	.609
	N	106	106	106
T32	Pearson Correlation	-.367**	.066	.234*
	Sig. (2-tailed)	.000	.483	.012
	N	115	115	115

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).

ITEM G6: Correlations for Tamas Statements - Second Ten

**Correlations**

		sattva1	rajas1	tamas1
T40	Pearson Correlation	.058	-.067	.354**
	Sig. (2-tailed)	.540	.478	.000
	N	115	115	115
T43	Pearson Correlation	-.538**	.231*	.292**
	Sig. (2-tailed)	.000	.015	.002
	N	111	111	111
T46	Pearson Correlation	.164	.351**	.110
	Sig. (2-tailed)	.083	.000	.248
	N	112	112	112
T47	Pearson Correlation	.155	-.225*	.371**
	Sig. (2-tailed)	.102	.017	.000
	N	113	113	113
T51	Pearson Correlation	-.146	-.191*	.480**
	Sig. (2-tailed)	.122	.042	.000
	N	114	114	114
T53	Pearson Correlation	.062	-.051	.427**
	Sig. (2-tailed)	.510	.591	.000
	N	115	115	115
T55	Pearson Correlation	.318**	-.141	.237*
	Sig. (2-tailed)	.001	.139	.012
	N	112	112	112
T56	Pearson Correlation	.084	.226*	.059
	Sig. (2-tailed)	.385	.018	.541
	N	110	110	110
T58	Pearson Correlation	-.065	-.096	.120
	Sig. (2-tailed)	.491	.310	.206
	N	113	113	113
T60	Pearson Correlation	-.038	.012	.281**
	Sig. (2-tailed)	.689	.903	.003
	N	113	113	113

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).

## APPENDIX F: Further Processing of AASI Scores

### ITEM F1: Correlations between original and revised scales

**Correlations**

		sattva1	rajas1	tamas1	sattva2	rajas2	tamas2
sattva1	Pearson Correlation	1	.104	-.169	.941**	.140	-.015
	Sig. (2-tailed)		.267	.071	.000	.135	.870
	N	115	115	115	115	115	115
rajas1	Pearson Correlation	.104	1	.115	.050	.975**	-.021
	Sig. (2-tailed)	.267		.221	.593	.000	.821
	N	115	115	115	115	115	115
tamas1	Pearson Correlation	-.169	.115	1	-.165	.088	.861**
	Sig. (2-tailed)	.071	.221		.078	.349	.000
	N	115	115	115	115	115	115
sattva2	Pearson Correlation	.941**	.050	-.165	1	.085	.010
	Sig. (2-tailed)	.000	.593	.078		.369	.916
	N	115	115	115	115	115	115
rajas2	Pearson Correlation	.140	.975**	.088	.085	1	-.039
	Sig. (2-tailed)	.135	.000	.349	.369		.680
	N	115	115	115	115	115	115
tamas2	Pearson Correlation	-.015	-.021	.861**	.010	-.039	1
	Sig. (2-tailed)	.870	.821	.000	.916	.680	
	N	115	115	115	115	115	115

\*\* . Correlation is significant at the 0.01 level (2-tailed).

### ITEM F2: Descriptives

Descriptive statistics describe the basic characteristics of data in a study. They summarise numerical data in different ways in order to give a broader picture of the entire data profile.

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
sattva1	115	2.30	4.18	3.2603	.37021
rajas1	115	2.61	4.30	3.6643	.38322
tamas1	115	1.85	3.60	2.5638	.34394
sattva2	115	1.71	4.45	3.1003	.51721
rajas2	115	2.53	4.39	3.6987	.41988
tamas2	115	1.08	3.50	2.1528	.50185
Valid N (listwise)	115				

### ITEM F3: General Linear Model

General linear models are statistical models (mathematical models) represented by a linear equation or by a system of linear equations, in which “the relationship between the variables is a straight line when plotted on a graph” (Colman 2003, 412). They serve to quantify the relationship shared by different independent and dependent variables.

Multivariate tests investigate “the influence of one or more independent variable acting on more than one dependent variable. The *mutli*- in the name refers to the multiplicity of dependent variables” (Colman 2003, 471).

#### Within-Subjects Factors

Measure: MEASURE\_1

gunas2	Dependent Variable
1	sattva2
2	rajas2
3	tamas2

#### Multivariate Tests<sup>b</sup>

Effect		Value	F	Hypothesis df	Error df	Sig.
gunas2	Pillai's Trace	.844	306.441 <sup>a</sup>	2.000	113.000	.000
	Wilks' Lambda	.156	306.441 <sup>a</sup>	2.000	113.000	.000
	Hotelling's Trace	5.424	306.441 <sup>a</sup>	2.000	113.000	.000
	Roy's Largest Root	5.424	306.441 <sup>a</sup>	2.000	113.000	.000

a. Exact statistic

b.

Design: Intercept

Within Subjects Design: gunas2

### Mauchly's Test of Sphericity<sup>b</sup>

Measure: MEASURE\_1

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon <sup>a</sup>		
					Greenhous e-Geisser	Huynh-Feldt	Lower-bound
gunas2	.981	2.168	2	.338	.981	.998	.500

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

b.

Design: Intercept

Within Subjects Design: gunas2

### Tests of Within-Subjects Effects

Measure: MEASURE\_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
gunas2	Sphericity Assumed	139.755	2	69.877	306.981	.000
	Greenhouse-Geisser	139.755	1.963	71.205	306.981	.000
	Huynh-Feldt	139.755	1.997	69.991	306.981	.000
	Lower-bound	139.755	1.000	139.755	306.981	.000
Error(gunas2)	Sphericity Assumed	51.899	228	.228		
	Greenhouse-Geisser	51.899	223.749	.232		
	Huynh-Feldt	51.899	227.631	.228		
	Lower-bound	51.899	114.000	.455		

### Tests of Within-Subjects Contrasts

Measure: MEASURE\_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
gunas2	Linear	51.627	1	51.627	200.820	.000
	Quadratic	88.128	1	88.128	444.698	.000
Error(gunas2)	Linear	29.307	114	.257		
	Quadratic	22.592	114	.198		

### Tests of Between-Subjects Effects

Measure: MEASURE\_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	3071.862	1	3071.862	12778.250	.000
Error	27.405	114	.240		

ITEM F4: Estimated Marginal Means gunas 2

### Estimates

Measure: MEASURE\_1

gunas2	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	3.100	.048	3.005	3.196
2	3.699	.039	3.621	3.776
3	2.153	.047	2.060	2.245

### Pairwise Comparisons

Measure: MEASURE\_1

(I) gunas2	(J) gunas2	Mean Difference (I-J)	Std. Error	Sig. <sup>a</sup>	95% Confidence Interval for Difference <sup>a</sup>	
					Lower Bound	Upper Bound
1	2	-.598*	.059	.000	-.743	-.454
	3	.948*	.067	.000	.785	1.110
2	1	.598*	.059	.000	.454	.743
	3	1.546*	.062	.000	1.395	1.697
3	1	-.948*	.067	.000	-1.110	-.785
	2	-1.546*	.062	.000	-1.697	-1.395

Based on estimated marginal means

\*. The mean difference is significant at the .05 level.

a. Adjustment for multiple comparisons: Bonferroni.

### Multivariate Tests

	Value	F	Hypothesis df	Error df	Sig.
Pillai's trace	.844	306.441 <sup>a</sup>	2.000	113.000	.000
Wilks' lambda	.156	306.441 <sup>a</sup>	2.000	113.000	.000
Hotelling's trace	5.424	306.441 <sup>a</sup>	2.000	113.000	.000
Roy's largest root	5.424	306.441 <sup>a</sup>	2.000	113.000	.000

Each F tests the multivariate effect of gunas2. These tests are based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Exact statistic

## APPENDIX I: Alternative Processing to Determine Consistency of AASI Scores within Each Individual Guna

TABLE II: Alternative processing to determine consistency of AASI scores within each individual guna: consistency of scientists' support for AASI statements represented by the same guna characteristic

- This alternative processing examines consistency of scientists' support for AASI statements that were underpinned by the same guna characteristic. Such incidences, where more than one AASI statement were represented by the same guna characteristic, meaning they also represented by the same guna, were few: 5 incidences of sattva guna statements; 6 incidences of rajas guna statements; and 3 incidences for tamas guna statements.
- Scores have been rounded off to their nearest whole value.

GROUP NO.	GROUPS: STATEMENTS REPRESENTING THE SAME OR SIMILAR GUNA CHARACTERISTICS (Numbering of entries represent original AASI numbering)	GUNA CHARACTERISTICS REPRESENTED	STATEMENT SCORES	COMMENTS REGARDING CONSISTENCY
▼ SATTVA GUNA ▼				
S-1 (sattva group 1)	<p>5. I am usually aware of the state or condition of my own consciousness during my working day.</p> <p>16. I describe myself as a very alert person, aware of my myself, my immediate environment and my remote environments.</p>	Self awareness; alertness/wakefulness; awareness of non-material phenomena, such as consciousness.	<p>5. SA = 27 % BA = 49 % NEU = 17 % BD = 3 % SD = 3 % NRS = 2 % BL = 0</p> <p>16. SA = 31 % BA = 53 % NEU = 10 % BD = 4 %</p>	SA + BA for Statement No.5 = 76 %, and SA + BA for Statement No.16 = 84 %. These scores show a high incidence of correlation of scores for the two statements. The neutral positions for the two statements were 17 % for Statement No.5 and 10 % for Statement No. 16, showing a moderate to low correlation. Scores affirm the scientific community's general position with regards to the topic of self-awareness and alertness.

			SD = 1 % NRS = 0 BL = 0	
S-2	<p>5. I am usually aware of the state or condition of my own consciousness during my working day.</p> <p>19. It is my opinion that scientific research into the consciousness of Antarctic fauna should be made a research priority by Australian Antarctic management.</p> <p>54. I maintain that the purer one's consciousness is, the better scientist one is</p>	<p>Self awareness; alertness/wakefulness; awareness of non-material phenomena, such as consciousness; the pursuit of greater and real knowledge; knowledge concerning the spirit soul beyond the body; clear awareness of the existence of a higher, spiritual nature within all entities; purity; knowledge concerning the spirit soul beyond the body.</p>	<p>5. SA = 27 % BA = 49 % NEU = 17 % BD = 3 % SD = 3 % NRS = 2 % BL = 0</p> <p>19. SA = 5 % BA = 10 % NEU = 27 % BD = 18 % SD = 35 % NRS = 4 % BL = 1 %</p> <p>54. SA = 1 % BA = 10 % NEU = 40 % BD = 21 % SD = 16 % NRS = 12 % BL = 0</p>	<p>SA + BA = 76 % for Statement No.5, SA + BA = 15 % for Statement No.19 and SA + BA = 11 % for Statement No.54. Scores for the latter two statements show high correlation, whilst scores for the third, Statement No.5, varies significantly. The extreme difference between the scores for this one statement and the other two, could be due to: 1) scientists considering that the topic of consciousness, regardless of whose consciousness it is (human or non-human) is not worth researching (Statement No.19); and/or 2) purity of consciousness not being acknowledged by scientists as important, or maybe not even as being a viable phenomenon (Statement No.54).</p>

S-3	<p>31. Whether or not I achieve my desired results, I usually remain steadfast and equipoised in my determination to carry out my duties as a scientist.</p> <p>41. I am content to carry out my work duties without attachment for specific results.</p>	<p>Determination which is unbreakable, which is sustained with steadfastness by yoga practice, and which thus controls the activities of the mind, life and senses; performance of duty...with great determination and enthusiasm, and without wavering in success or failure; one performs one's prescribed duty only because it ought to be done, and renounces all material association and all attachment to the fruit; detachment from results of activity.</p>	<p>31. SA = 26 % BA = 59 % NEU = 10 % BD = 3 % SD = 1 % NRS = 1 % BL = 0</p> <p>41. SA = 6 % BA = 27 % NEU = 9 % BD = 35 % SD = 17 % NRS = 5 % BL = 1 %</p>	<p>In this group, SA + BA for Statement No.31. = 85 % and SA + BA for Statement No.41 = 33 %. The lack of correlation for these two statements is not clear. The rajasic characteristic of <i>an insatiable desire for results</i> means that within sattva guna the individual aims to achieve desired results, with frustration, anxiety and stress eventuating if such results are not achieved. There is strong correlation between the scores for the neutral positions for the two statements (10 % and 9 %) but overall correlation between scores is not high enough to be significant. If scientists specifically identify with the qualities of <i>determination</i> and <i>steadfastness</i> (characteristics included in Statement No. 31, but <i>not</i> in Statement No.41) a lower score for Statement No.41 may be understandable.</p>
S-4	<p>26. It is important to me to work in an environment that is clean, smoke-free, light, airy and free from foul language.</p> <p>27. Ordinarily I am well</p>	<p>Control of the mind and the senses/control of the self; cleanliness; tidiness; being well organised and efficient.</p>	<p>26. SA = 37 % BA = 43 % NEU = 11 % BD = 3 % SD = 3 %</p>	<p>SA + BA = 80 % for both Statements No.26 and No.27. This shows exact correlation for these kin sattva guna features, with further correlation being that the two values of SA and BA were distributed equally. The characteristics of <i>cleanliness, tidiness, being well organised and self-controlled</i></p>

	organised, self-controlled and regulated in my work duties.		<p>NRS = 2 % BL = 2 %</p> <p>27. SA = 37 % BA = 43 % NEU = 5 % BD = 13 % SD = 2 % NRS = 0 BL = 0</p>	are therefore very consistent within the Australian Antarctic scientific community.
S-5	<p>10. I believe spiritual insight and wisdom should play an active role in contemporary scientific research such as physics and biology.</p> <p>45. I am interested in how the spiritual soul is situated within the physical body of a living being.</p> <p>49. Antarctica's aesthetic nature inspires me to seek my spiritual self.</p>	Knowledge concerning the spirit soul beyond the (material) body; being interested in and concerned about spiritual matters; clear awareness of the existence of a higher, spiritual nature within all entities; the pursuit of greater and real knowledge.	<p>10. SA = 13 % BA = 17 % NEU = 28 % BD = 15 % SD = 17 % NRS = 7 % BL = 3 %</p> <p>45. SA = 3 % BA = 22 % NEU = 30 % BD = 20 % SD = 23 % NRS = 3 % BL = 0</p> <p>49.</p>	SA + BA = 30 % for Statement No.10, SA + BA = 25 % for Statement No. 45 and SA + BA = 26 % for Statement No.49. These three scores show moderate to high correlation, supporting the community's position on the characteristics of <i>being interested in and concerned about spiritual matters and clear awareness of the existence of a higher, spiritual nature within all entities</i> . Further correlation is found within the neutral position of the three scores (28 %, 30 % and 32 %).

			SA = 6 % BA = 20 % NEU = 32 % BD = 23 % SD = 14 % NRS = 4 % BL = 0	
▼ RAJAS GUNA ▼				
R-1 (rajas group 1)	<p>3. I like to engage my senses to experience things “Antarctic” (seeing pictures of Antarctica; hearing about expeditions etc.).</p> <p>20. I tend to seek out scientific projects that are satisfying to my sense of curiosity and stimulating for my mind.</p> <p>36. Two of the main reasons for me becoming an Antarctic scientist have been that the science is interesting and the setting (the Antarctic environment) is stimulating.</p>	Sense enjoyment/sense gratification.	<p>3. SA = 32 % BA = 45 % NEU = 13 % BD = 8 % SD = 0 NRS = 1 % BL = 1 %</p> <p>20. SA = 46 % BA = 43 % NEU = 6 % BD = 3 % SD = 0 NRS = 2 % BL = 0</p> <p>36. SA = 47 % BA = 35 %</p>	SA + BA = 77 % for Statement No.3, SA + BA = 89 % for Statement No.20 and SA + BA = 82 % for Statement No.36. The scores for these three statements show moderate to high correlation, indicating moderate consistency in scientists’ subjection to the rajas guna characteristic of <i>sense gratification</i> . Statement No.20 scored the highest, which is predictable within a community of scientists, who, by the very nature of their vocation, are expected to place greater emphasis on enjoying through the subtle material mind, rather than the other five material senses.

			NEU = 9 % BD = 4 % SD = 3 % NRS = 1 % BL = 2 %	
R-2	<p>7. I am driven by the desire to enjoy the benefits reaped from working hard.</p> <p>17. For most of my professional life I have strived towards attaining an enjoyable and comfortable lifestyle for my family and myself.</p>	<p>The worker who is attached to work and the fruits of work, desiring to enjoy those fruits, and who is greedy, always envious, impure, and moved by joy and sorrow; sense gratification; hard work to acquire prestige and fortune/work priorities are to make money; attachment to the results of activity, such as hard work; ambition for material pursuits/career-mindedness/desiring career achievement/personal ambition; selfishness; attachment to a false sense of self/false ego, including one's family members;</p>	<p>7.          SA = 20 %          BA = 43 %          NEU = 23 %          BD = 10 %          SD = 3 %          NRS = 0          BL = 0</p> <p>17.          SA = 28 %          BA = 47 %          NEU = 11 %          BD = 9 %          SD = 3 %          NRS = 3 %          BL = 0</p>	<p>SA + BA = 63 % for Statement No.7 and SA + BA = 75 % for Statement No.17. This shows moderate correlation between scores, suggesting that Australian Antarctic scientists are fairly well established in their normative behaviour in relation to the rajasic characteristic of <i>the worker who is attached to work and the fruits of work, desiring to enjoy those fruits</i>, underpinned by <i>sense gratification</i>.</p>

		the accumulation and/or spending of money for material purposes.		
R-3	<p>33. I am proud of Australia's standing within the ATS.</p> <p>42. I am proud to be an Antarctic scientist.</p>	False pride; nationalism (extended selfishness/sense gratification).	<p>33. SA = 20 % BA = 50 % NEU = 22 % BD = 3 % SD = 0 NRS = 5 % BL = 0</p> <p>42. SA = 31 % BA = 41 % NEU = 27 % BD = 0 SD = 1 % NRS = 0 BL = 0</p>	SA + BA = 70 % for Statement No.33 and SA + BA = 72 % for Statement No. 42, showing very strong correlation between the two statements. <i>Nationalism</i> and <i>false pride</i> are thus confirmed as being prominent characteristics within the Australian Antarctic scientific community.
R-4	<p>14. I do/would enjoy seeing my name appear in scientific publications, or even just mentioned within science-circles.</p> <p>39. I have a desire to be honoured as an Antarctic scientist by my colleagues and by the rest of society.</p>	Seeking fame, glorification and admiration/a fondness for hearing oneself praised/ seeking honour, recognition and status within society.	<p>14. SA = 24 % BA = 58 % NEU = 13 % BD = 1 % SD = 1 % NRS = 2 % BL = 1 %</p>	SA + BA = 82 % for Statement No.14 and SA + BA = 29 % for Statement No.39. These scores do not show any correlation, hence inconsistency. Statement No.39 scored quite high on the neutral position (39 %) indicating that many scientists were not specifically committed to either agreeing or disagreeing with this statement. Differences in scores between the two statements may be due to scientists perceiving <i>recognition</i> differently from

			39. SA = 6 % BA = 23 % NEU = 39 % BD = 14 % SD = 15 % NRS = 2 % BL = 1 %	<i>honour</i> . Statement No.14 addresses scientists being <i>recognised</i> (which could be interpreted as meaning <i>acknowledged</i> , <i>known</i> or <i>noticed</i> ) for their achievements, whereas Statement No.39 addresses scientists being <i>honoured</i> (which could be interpreted as meaning <i>glorified</i> , <i>revered</i> or <i>exalted</i> ) for their achievements. This factor may have been responsible for differences in scores.
R-5	<p>23. I maintain that acquiring scientific knowledge on the physical natural environment is the most important factor for achieving environmental sustainability.</p> <p>44. I adhere to knowledge that is based on the bodily functioning of floral and faunal species, not to knowledge that is based on the spiritual functioning of species.</p> <p>59. I maintain that scientific knowledge that produces theories based on secular and common-sense logic is superior to other types of knowledge when it comes to learning about the natural environment.</p>	Acquiring scientific knowledge on the material body/ material world; knowledge producing many theories and doctrines by dint of mundane logic and mental speculation; adherence to mundane knowledge; knowledge by which one sees that in every different body there is a different type of living entity; the understanding that the material body is the living entity; one speculates about the reality of one's own existence and of the world around oneself;	<p>23.  SA = 23 %  BA = 41 %  NEU = 12 %  BD = 17 %  SD = 3 %  NRS = 2 %  BL = 1 %</p> <p>44.  SA = 32 %  BA = 42 %  NEU = 16 %  BD = 5 %  SD = 0  NRS = 5 %  BL = 0</p> <p>59.  SA = 18 %  BA = 27 %  NEU = 19 %</p>	SA + BA = 64 % for Statement No.23, SA + BA = 74 % for Statement No.44 and SA + BA = 45 % for Statement No.59. There is moderate correlation between the scores for Statement No.23 and Statement No.44. That Statement No. 59 received less support from scientists may be the statements' emphasis on 'commonsense logic,' rather than on scientific or academic knowledge, which is inferred within both Statements No. 23 and 44.

		knowledge derived through the material senses (empirical knowledge); materialism- both theoretical and pragmatic; knowledge based on duality.	BD = 17 % SD = 6 % NRS = 13 % BL = 0	
R-6	<p>11. I maintain that when the material body of a living being expires (death), the consciousness of the deceased individual dissolves (ceases to exist).</p> <p>25. I agree with the premise that consciousness can be reduced to the workings of physical structures such as atoms, molecules, organic cells and neural networks.</p> <p>29. It is my understanding that every living being on Earth has a different intrinsic nature, with greater variation occurring amongst different taxonomical phyla and classes, than amongst genera and species etc.</p>	The understanding that consciousness expires when the material body expires; the understanding that the material body is the living entity; knowledge by which one sees that in every different body there is a different type of living entity.	<p>11. SA = 28 % BA = 28 % NEU = 22 % BD = 8 % SD = 5 % NRS = 6 % BL = 3 %</p> <p>25. SA = 14 % BA = 23 % NEU = 22 % BD = 24 % SD = 12 % NRS = 4 % BL = 1 %</p> <p>29. SA = 21 %</p>	SA + BA = 56 % for Statement No.11, SA + BA = 37 % for Statement No.25 and SA + BA = 62 % for Statement No.29. Statements No.11 and No.29 show moderate to high consistency, with Statement No.25 showing weaker correlation. The relationships between these three scores are difficult to interpret, as specific issues addressed in Statements No.11 and No.25 are more similar than issues addressed in Statement No.29. The only apparent factor that may explain the lower score for Statement No.25 is that in this statement, the description of consciousness limits consciousness to material parameters, whereas in Statement no.11 consciousness is described as being dependent on physical matter, but not described as made of matter. Statement No.11 could therefore give scientists more room to maintain the view that consciousness is non-material in essence, yet is dependent on the physical body for its manifestation. Statement

			BA = 41 % NEU = 16 % BD = 5 % SD = 1 % NRS = 17 % BL = 0	No.11 does not accommodate such a perspective. In Statement No.29, consciousness itself is not mentioned.
▼ TAMAS GUNA ▼				
T-1 (tamas group 1)	4. I often carry out my work tasks without really making an effort.  6. I often suffer from inertia and lethargy at work.  40. I try to give myself as much relaxation time and rest as is possible during my working day.  53. In carrying out daily professional tasks, my determination is usually dissipated by thoughts about my leisure-life that awaits me at the end of the day.	Working but making no endeavour; determination which cannot go beyond dreaming, fearfulness, lamentation, moroseness and illusion-such unintelligent determination; laziness and inertia; the worker who is ... lazy, always morose and procrastinating.	4. SA = 0 BA = 8 % NEU = 3 % BD = 30 % SD = 57 % NRS = 0 BL = 1 %  6. SA = 4 % BA = 11 % NEU = 12 % BD = 45 % SD = 25 % NRS = 2 % BL = 0  40. SA = 3 % BA = 19 %	BD + SD = 87 % for Statement No.4, BD + SD = 70 % for Statement No.6, BD + SD = 58 % for Statement No.40 and BD + SD = 73 % for Statement No.53. Statements No. 6 and 53 show high correlation. Statement No.40 contains one factor that the other statements do not: the <i>intention</i> to rest and relax more. The other three statements, whilst addressing lethargy, laziness etc. do not present these factors as necessarily being <i>intentional</i> on behalf of the scientist. As scores show that scientists were <i>less</i> opposed to Statement No. 40 than what they were to the other statements, scientists show a weak tendency towards <i>intentionally</i> seeking out opportunities for relaxation during their working hours.

			NEU = 20 % BD = 38 % SD = 20 % NRS = 0 BL = 0  53. SA = 0 BA = 9 % NEU = 18 % BD = 47 % SD = 26 % NRS = 0 BL = 0	
2	<p>21. I do not consider it important or relevant to understand the higher purpose of the work I carry out.</p> <p>47. Much of the time, the science I engage in is not directed towards any specific goal.</p>	<p>Acquiring knowledge for sense gratification ... without any higher purpose; the failing of awareness of a higher spiritual nature; ignorance about the existence of a higher spiritual nature within all entities; acting whimsically, for no purpose.</p>	<p>21.  SA = 3 %  BA = 2 %  NEU = 7 %  BD = 41 %  SD = 43 %  NRS = 3 %  BL = 0</p> <p>47.  SA = 0  BA = 10 %  NEU = 6 %  BD = 32 %  SD = 50 %</p>	<p>BD + SD = 84 % for Statement No.21 and BD + SD = 82 % for Statement No.47. This shows a very high consistency in scientists' opposition to the tamasic characteristics such as <i>acquiring knowledge for sense gratification ... without any higher purpose</i> and <i>acting whimsically, for no purpose</i>. Results indicate that Australian Antarctic scientists are generally not inclined to engage in work without understanding its higher purpose, or acting whimsically without a specific goal. The AASI glossary defined <i>higher purpose</i> as 'a reason for a cause that exceeds ordinary or mundane reasons.' Scientists' goals, however, may themselves be situated within one of the two lower material modes, which would most likely be</p>

			NRS = 2 % BL = 0	rajas guna, as within tamas guna there is very little goal setting at all.
3	<p>32. I am uninterested in researching spiritual dimensions of the Antarctic environment.</p> <p>43. I am uninterested in whether or not species of Antarctic fauna and flora have (or are) a spiritual soul.</p>	Being uninterested in and unconcerned about spiritual matters.	<p>32. SA = 29 % BA = 30 % NEU = 26 % BD = 12 % SD = 3 % NRS = 0 BL = 0</p> <p>43. SA = 19 % BA = 27 % NEU = 26 % BD = 19 % SD = 5 % NRS = 3 % BL = 0</p>	<p>SA + BA = 59 % for Statement No.32 and SA + BA = 46 % for Statement No.43, showing a moderate correlation between scores.</p> <p>Interestingly, the neutral position for both statements were identical (26 %) indicating that whilst scientists may not be resolute in their position on <i>interest in or concern about spiritual matters</i>, they show consistency in their non-committal to such matters. Overall consistency for these two statements, representing the very same tamasic characteristic, is considered substantial.</p>

The following table further investigates if scores for qualities are consistent across the three gunas, by assessing differences in scores for the same topic presented within each guna. In other words, the following analysis determines whether or not high scoring qualities within one guna received low scores within other gunas by examining scores for a single topic. If such distributions of scores is not found, then it will be considered that there is a lack of consistency within overall scores, as VCS maintains that the three gunas do not present equally within any one given scenario or for any one topic. An equal representation of gunas within a single topic is therefore not expected to be found within the data. The topic chosen to be examined was *determination* and scientists' general effort in carrying out their scientific duties.

TABLE I2: The Topic of Determination: Consistency of AASI Scores within Each Individual Guna

Scores have been rounded off to their nearest whole value.

AASI STATE- MENT NO. and GUNA	STATEMENT	STATEMENT SCORES	COMMENTS REGARDING CONSISTENCY
31: SATTVA	Whether or not I achieve my desired results, I usually remain steadfast and equipoised in my determination to carry out my duties as a scientist.	SA = 26 % BA = 59 % NEU = 10 % BD = 3 % SD = 1 % NRS = 1 % BL = 0	In order to determine if there is consistency in scores across the three gunas, support (SA + BA) for each of the three adjacent statements (one from each of the three gunas, all addressing the topic of <i>determination</i> ) have been added together. The results were for sattva: SA+ BA= 85 %; for rajas: SA+ BA= 63 %; and for tamas: SA+ BA= 8 %. According to these results, scientists primarily affiliate with <i>determination</i> within sattva guna, followed by <i>determination</i> in rajas guna and lastly by <i>determination</i> in tamas guna. As scores show that differences in support for sattva and rajas gunas varies significantly (22%) and radically between rajas and tamas gunas (55%), consistency of scores across all three gunas, within the context of the topic of <i>determination</i> , is verified. It is further supported by the fact that the gradient of differences in scores between the three gunas run parallel to the order in which the gunas present within the triguna hierarchy.
18: RAJAS	I would describe myself as ambitious, as I am always endeavouring towards greater facility for achieving my goals as a scientist.	SA = 17 % BA = 46 % NEU = 18 % BD = 14 % SD = 3 % NRS = 1 % BL = 0	
4: TAMAS	I often carry out my work tasks without really making an effort.	SA = 0 BA = 8 % NEU = 3 % BD = 30 % SD = 57 % NRS = 0 BL = 1 %	



## APPENDIX J: IGSQ Raw Scores

### ITEM J1: Scores for IGSQ Goals 1 to 6

KEY = D: Definitely beneficial; P: Possible beneficial; N: Not at all beneficial

#### IGSQ: GOAL 1

QUALITY ↓	CONSERVATION PSYCHOLOGISTS n = 11			QUALITY ↓	ANTARCTIC SCIENTISTS n = 9			QUALITY ↓	VEDIC EXPERTS/ SCHOLARS n = 13		
	D	P	N		D	P	N		D	P	N
1	11	-	-	1	7	2	-	1	11	2	-
2	2	8	1	2	3	5	1	2	5	7	1
3	9	2	-	3	7	1	1	3	13	-	-
4	-	3	8	4	1	2	6	4	-	-	13
5	3	7	1	5	4	4	1	5	1	3	9
6	6	4	1	6	-	7	2	6	6	4	3
7	-	3	8	7	-	1	8	7	-	-	13

8	8	3	-	8	3	4	2	8	1	6	6
9	10	1	-	9	8	-	1	9	11	2	-
10	1	2	8	10	2	1	6	10	-	-	13
11	1	6	4	11	1	5	3	11	-	6	7
12	7	2	2	12	3	2	4	12	-	4	9

IGSQ: GOAL 2

QUALITY ↓	CONSERVATION PSYCHOLOGISTS n = 11			QUALITY ↓	ANTARCTIC SCIENTISTS n = 9			QUALITY ↓	VEDIC EXPERTS/ SCHOLARS n = 13		
	D	P	N		D	P	N		D	P	N
1	11	-	-	1	8	1	-	1	12	1	-
2	3	8	-	2	2	5	2	2	8	3	2
3	11	-	-	3	9	-	-	3	13	-	-

4	-	3	8	4	1	2	6	4	1	-	12
5	1	9	1	5	3	5	1	5	1	2	10
6	6	4	1	6	-	5	4	6	6	4	3
7	-	3	8	7	-	1	8	7	-	-	13
8	9	2	-	8	3	5	1	8	2	6	5
9	10	1	-	9	9	-	-	9	13	-	-
10	1	3	7	10	2	2	5	10	-	-	13
11	-	7	4	11	-	5	4	11	-	6	7
12	6	3	2	12	3	3	3	12	-	3	10

### IGSQ: GOAL 3

QUALITY ↓	CONSERVATION PSYCHOLOGISTS n = 11			QUALITY ↓	ANTARCTIC SCIENTISTS n = 9			QUALITY ↓	VEDIC EXPERTS/ SCHOLARS n = 13		
	D	P	N		D	P	N		D	P	N

1	11	-	-	1	9	-	-	1	12	1	-
2	2	9	-	2	4	4	1	2	8	3	2
3	10	1	-	3	9	-	-	3	13	-	-
4	-	4	7	4	1	2	6	4	-	-	13
5	2	8	1	5	4	5	-	5	3	2	8
6	7	3	1	6	-	6	3	6	6	3	4
7	-	4	7	7	1	1	7	7	-	-	13
8	11	-	-	8	5	3	1	8	3	5	5
9	11	-	-	9	8	1	-	9	13	-	-
10	1	3	7	10	4	1	4	10	-	-	13
11	-	6	5	11	-	5	4	11	-	6	7
12	5	3	3	12	3	2	4	12	-	4	9

IGSQ: GOAL 4

QUALITY ↓	CONSERVATION PSYCHOLOGISTS n = 11			QUALITY ↓	ANTARCTIC SCIENTISTS n = 9			QUALITY ↓	VEDIC EXPERTS/ SCHOLARS n = 13		
	D	P	N		D	P	N		D	P	N
1	11	-	-	1	8	1	-	1	12	1	-
2	5	6	-	2	2	7	-	2	8	4	1
3	9	2	-	3	9	-	-	3	13	-	-
4	-	6	5	4	1	3	5	4	-	-	13
5	3	7	1	5	4	5	-	5	1	5	7
6	5	5	1	6	-	5	4	6	5	6	2
7	1	3	7	7	1	1	7	7	-	-	13
8	10	1	-	8	4	4	1	8	2	6	5
9	11	-	-	9	9	-	-	9	12	1	-

10	2	2	7	10	4	-	5	10	-	-	13
11	3	4	4	11	3	4	2	11	3	6	4
12	6	3	2	12	3	2	4	12	1	2	10

IGSQ: GOAL 5

QUALITY ↓	CONSERVATION PSYCHOLOGISTS n = 11			QUALITY ↓	ANTARCTIC SCIENTISTS n = 9			QUALITY ↓	VEDIC EXPERTS/ SCHOLARS n = 13		
	D	P	N		D	P	N		D	P	N
1	11	-	-	1	8	1	-	1	12	1	-
2	2	8	1	2	4	5	-	2	8	4	1
3	10	1	-	3	9	-	-	3	13	-	-
4	-	2	9	4	1	3	5	4	-	-	13
5	1	7	3	5	3	5	1	5	2	2	9

6	6	4	1	6	1	4	4	6	5	4	4
7	-	2	9	7	1	2	6	7	-	-	13
8	10	1	-	8	4	4	1	8	1	7	5
9	11	-	-	9	9	-	-	9	13	-	-
10	1	2	8	10	3	1	5	10	-	-	13
11	1	5	5	11	1	5	3	11	2	3	8
12	6	2	3	12	3	2	4	12	-	3	10

IGSQ: GOAL 6

QUALITY ↓	CONSERVATION PSYCHOLOGISTS n = 11			QUALITY ↓	ANTARCTIC SCIENTISTS n = 9			QUALITY ↓	VEDIC EXPERTS/ SCHOLARS n = 13		
	D	P	N		D	P	N		D	P	N
1	11	-	-	1	8	1	-	1	13	-	-

2	3	6	2	2	4	4	1	2	8	4	1
3	10	1	-	3	9	-	-	3	13	-	-
4	1	2	8	4	1	1	7	4	-	-	13
5	2	7	2	5	3	6	-	5	1	2	10
6	5	3	3	6	1	2	6	6	6	3	4
7	-	2	9	7	-	2	7	7	-	-	13
8	9	2	-	8	3	5	1	8	1	5	7
9	11	-	-	9	7	2	-	9	12	1	-
10	1	3	7	10	2	3	4	10	-	-	13
11	-	7	4	11	-	5	4	11	1	5	7
12	6	3	2	12	3	3	3	12	-	3	10

ITEM J2: Worksheet for individual data to record direct from questionnaires

These spreadsheets contain the raw data for Goals 1 and 2 where Definitely beneficial = 2, Possibly beneficial = 1, Not at all beneficial = 0.

Group: Conservation Psychologists

Participant	Goal 1												Goal 2											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1	2	1	1	0	1	1	0	2	2	1	1	2	2	1	2	0	1	1	1	1	2	0	1	2
2	2	1	2	0	1	2	0	2	2	0	1	2	2	1	2	0	1	2	0	2	2	0	1	2
3	2	1	2	1	2	2	1	2	2	2	1	2	2	2	2	1	2	2	0	2	2	2	1	2
4	2	1	2	1	1	1	1	2	2	1	1	1	2	1	2	1	1	1	1	2	2	1	1	1
5	2	1	2	1	1	2	0	2	2	0	0	2	2	1	2	1	1	2	0	2	2	0	0	2
6	2	1	1	0	1	2	0	2	2	0	1	2	2	1	2	0	1	2	0	2	2	0	1	2
7	2	2	2	0	2	1	0	2	2	0	0	2	2	2	2	0	1	1	0	2	2	0	0	1
8	2	1	2	0	2	1	0	1	2	0	2	0	2	2	2	0	1	1	0	1	2	1	1	0
9	2	1	2	0	0	0	1	2	2	0	0	0	2	1	2	0	0	0	1	2	2	0	0	0
10	2	0	2	0	1	2	0	1	1	0	1	1	2	1	2	0	1	2	0	2	1	1	1	1
11	2	2	2	0	1	2	0	1	2	0	0	2	2	1	2	0	1	2	0	2	2	0	0	2
12																								
13																								

Group: Conservation Psychologists

Participant	Goal 3												Goal 4											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1	2	1	1	1	1	2	1	2	2	1	0	1	2	2	1	1	1	1	1	2	2	1	0	2
2	2	1	2	0	1	2	0	2	2	0	1	2	2	1	2	0	1	2	0	2	2	0	1	2
3	2	2	2	1	2	2	0	2	2	2	1	2	2	2	2	1	2	2	0	2	2	2	1	2
4	2	1	2	1	1	1	1	2	2	1	1	1	2	1	2	1	1	1	1	2	2	1	1	1
5	2	1	2	1	1	2	0	2	2	0	0	2	2	1	2	1	2	2	0	2	2	0	0	2
6	2	1	2	0	1	2	0	2	2	0	0	2	2	2	2	1	1	2	0	2	2	0	2	2
7	2	2	2	0	1	1	0	2	2	0	0	1	2	2	2	0	1	1	0	2	2	0	0	1
8	2	1	2	0	2	1	0	2	2	1	1	0	2	1	2	0	1	1	0	1	2	0	2	0
9	2	1	2	0	0	0	1	2	2	0	0	0	2	1	2	0	0	0	1	2	2	0	0	0
10	2	1	2	0	1	2	1	2	2	0	1	0	2	2	1	1	2	1	2	2	2	2	2	1
11	2	1	2	0	1	2	0	2	2	0	1	2	2	1	2	0	1	2	0	2	2	1	1	1
12																								
13																								

Group: Conservation Psychologists

Participant	Goal 5												Goal 6											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1	2	1	1	0	1	1	0	2	2	1	0	2	2	1	1	2	1	1	0	1	2	1	0	2
2	2	1	2	0	1	2	0	2	2	0	1	2	2	1	2	0	1	2	0	2	2	0	1	2
3	2	2	2	1	2	2	0	2	2	2	1	2	2	2	2	1	2	2	0	2	2	2	1	2
4	2	1	2	1	1	1	1	2	2	1	1	1	2	1	2	1	1	1	1	2	2	1	1	1
5	2	0	2	0	0	2	0	2	2	0	0	2	2	0	2	0	1	2	0	2	2	0	0	2
6	2	1	2	0	1	2	0	2	2	0	1	2	2	0	2	0	1	0	0	2	2	0	1	2
7	2	2	2	0	1	1	0	2	2	0	0	1	2	2	2	0	1	1	0	2	2	0	0	1
8	2	1	2	0	1	1	0	1	2	0	2	0	2	2	2	0	2	0	0	1	2	1	1	0
9	2	1	2	0	0	0	1	2	2	0	0	0	2	1	2	0	0	0	1	2	2	0	0	0
10	2	1	2	0	0	2	0	2	2	0	0	0	2	1	2	0	0	2	0	2	2	0	1	1
11	2	1	2	0	1	2	0	2	2	0	1	2	2	1	2	0	1	2	0	2	2	0	1	2
12																								
13																								

ITEM J3: Worksheet for individual data to record direct from questionnaires

These spreadsheets contains the raw data for Goals 1 and 2 where Definitely beneficial = 2, Possibly beneficial = 1, Not at all beneficial = 0.

Group: Antarctic Scientists

Parti- cipant	Goal 1												Goal 2											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1	2	1	2	0	1	1	0	0	2	2	1	2	2	1	2	0	1	1	0	0	2	2	1	2
2	2	1	2	0	2	1	0	1	2	0	2	0	2	2	2	0	1	1	0	1	2	1	1	0
3	2	1	2	1	2	1	1	2	2	1	0	2	2	1	2	1	2	1	1	1	2	1	0	2
4	2	2	2	2	2	1	0	1	2	2	0	2	2	2	2	2	2	1	0	1	2	2	0	2
5	1	0	2	0	1	1	0	0	0	0	1	1	2	1	2	0	1	0	0	2	2	0	1	1
6	2	2	1	0	0	1	0	1	2	0	0	0	2	0	2	0	0	0	0	1	2	0	0	1
7	2	0	1	0	2	0	0	2	2	0	1	0	2	0	2	0	2	0	0	2	2	0	0	0
8	2	1	2	0	1	0	0	1	2	0	1	1	2	1	2	0	1	0	0	1	2	0	1	1
9	1	2	2	1	1	1	0	2	2	0	1	0	1	1	2	1	1	1	0	2	2	0	1	0
10																								
11																								
12																								
13																								

Group: Antarctic Scientists

Participant	Goal 3												Goal 4											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1	2	1	2	0	1	1	0	0	2	2	1	2	2	1	2	0	1	1	0	0	2	2	1	2
2	2	1	2	0	2	1	0	2	2	1	1	0	2	1	2	0	1	1	0	1	2	0	2	0
3	2	1	2	1	2	1	2	2	2	2	0	2	2	1	2	1	2	1	1	2	2	2	0	2
4	2	2	2	2	2	1	0	1	2	2	0	2	2	2	2	2	2	0	0	1	2	2	2	2
5	2	2	2	0	1	0	0	2	2	0	1	1	2	1	2	0	2	0	0	2	2	0	1	1
6	2	2	2	0	1	1	1	1	1	2	0	0	2	2	2	1	1	1	2	1	2	2	0	0
7	2	0	2	0	2	0	0	2	2	0	0	0	2	1	2	0	2	0	0	2	2	0	2	0
8	2	1	2	0	1	0	0	1	2	0	1	1	2	1	2	0	1	0	0	1	2	0	1	1
9	2	2	2	1	1	1	0	2	2	0	1	0	1	1	2	1	1	1	0	2	2	0	1	0
10																								
11																								
12																								
13																								

Group: Antarctic Scientists

Participant	Goal 5												Goal 6											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1	2	1	2	0	1	1	0	0	2	2	1	2	2	1	2	0	1	1	0	0	2	2	1	2
2	2	1	2	0	1	1	0	1	2	0	2	0	2	2	2	0	2	0	0	1	2	1	1	0
3	2	1	2	1	2	1	1	2	2	2	0	2	2	1	2	1	1	2	1	2	2	1	0	2
4	2	2	2	2	2	0	0	1	2	2	1	2	2	2	2	2	1	0	0	1	2	2	0	2
5	2	2	2	0	1	0	0	2	2	0	1	1	2	1	2	0	2	0	0	2	2	0	1	1
6	2	2	2	1	1	1	2	1	2	1	0	0	2	2	2	0	1	0	1	1	1	1	0	1
7	2	1	2	0	2	0	0	2	2	0	0	0	2	0	2	0	2	0	0	2	2	0	0	0
8	2	2	2	0	1	0	0	1	2	0	1	1	2	2	2	0	1	0	0	1	2	0	1	1
9	1	1	2	1	0	2	1	2	2	0	1	0	1	1	2	0	1	1	0	1	1	0	1	0
10																								
11																								
12																								
13																								

ITEM J4: Worksheet for individual data to record direct from questionnaires

These spreadsheets contains the raw data for Goals 1 and 2 where Definitely beneficial = 2, Possibly beneficial = 1, Not at all beneficial = 0.

Group: Vedic Experts/ Scholars

Parti- cipant	Goal 1												Goal 2											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1	1	2	2	0	0	2	0	1	2	0	0	0	1	2	2	0	0	2	0	1	2	0	0	0
2	2	1	2	0	0	0	0	1	2	0	0	0	2	2	2	0	0	0	0	1	2	0	0	0
3	2	0	2	0	0	2	0	0	2	0	0	0	2	0	2	0	0	2	0	0	2	0	0	0
4	2	1	2	0	0	2	0	0	2	0	0	0	2	2	2	2	0	2	0	0	2	0	0	0
5	2	2	2	0	1	1	0	1	2	0	1	1	2	2	2	0	1	1	0	1	2	0	1	1
6	2	1	2	0	1	2	0	0	2	0	0	0	2	0	2	0	0	2	0	1	2	0	0	0
7	2	2	2	0	0	1	0	0	2	0	0	0	2	2	2	0	0	1	0	0	2	0	0	0
8	2	2	2	0	2	0	0	2	2	0	1	1	2	2	2	0	2	0	0	2	2	0	1	1
9	2	1	2	0	0	2	0	1	1	0	1	0	2	2	2	0	0	2	0	1	2	0	2	0
10	2	1	2	0	1	1	0	1	1	0	1	1	2	2	2	0	1	1	0	2	2	0	1	0
11	2	1	2	0	0	1	0	0	2	0	1	0	2	1	2	0	0	1	0	0	2	0	1	0
12	2	1	2	0	0	1	0	0	2	0	1	0	2	1	2	0	0	1	0	0	2	0	1	0
13	2	1	2	0	0	2	0	1	2	0	0	1	2	1	2	0	0	2	0	1	2	0	0	1

Group: Vedic Experts/ Scholars

Participant	Goal 3												Goal 4											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1	1	2	2	0	0	2	0	1	2	0	0	0	1	2	2	0	0	2	0	1	2	0	0	0
2	2	2	2	0	0	0	0	1	2	0	0	0	2	2	2	0	0	2	0	1	2	0	2	0
3	2	0	2	0	0	2	0	0	2	0	0	0	2	0	2	0	0	2	0	0	2	0	0	0
4	2	1	2	0	0	2	0	0	2	0	0	0	2	1	2	0	0	2	0	0	2	0	0	0
5	2	2	2	0	1	1	0	1	2	0	1	1	2	2	2	0	1	1	0	1	2	0	1	1
6	2	0	2	0	1	2	0	2	2	0	0	0	2	2	2	0	1	1	0	1	2	0	1	0
7	2	2	2	0	0	1	0	0	2	0	0	0	2	2	2	0	0	1	0	0	2	0	0	0
8	2	2	2	0	2	0	0	2	2	0	1	1	2	2	2	0	2	0	0	2	2	0	2	2
9	2	2	2	0	2	1	0	1	2	0	1	0	2	1	2	0	1	1	0	2	2	0	1	0
10	2	2	2	0	2	0	0	2	2	0	1	1	2	2	2	0	1	1	0	1	1	0	1	0
11	2	2	2	0	0	2	0	0	2	0	1	0	2	1	2	0	0	1	0	0	2	0	1	0
12	2	1	2	0	0	1	0	0	2	0	1	0	2	1	2	0	0	1	0	0	2	0	1	0
13	2	1	2	0	0	2	0	1	2	0	0	1	2	2	2	0	1	2	0	1	2	0	2	1

Group: Vedic Experts/ Scholars

Participant	Goal 5												Goal 6											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
1	1	2	2	0	0	2	0	1	2	0	0	0	2	2	2	0	0	2	0	1	2	0	0	0
2	2	2	2	0	0	0	0	1	2	0	0	0	2	2	2	0	0	0	0	1	2	0	0	0
3	2	0	2	0	0	2	0	0	2	0	0	0	2	0	2	0	0	2	0	0	2	0	0	0
4	2	2	2	0	0	2	1	0	2	0	0	0	2	2	2	0	0	2	0	0	2	0	0	0
5	2	2	2	0	1	1	0	1	2	0	1	1	2	2	2	0	1	1	0	1	2	0	1	1
6	2	1	2	0	1	1	0	1	2	0	0	0	2	1	2	0	1	0	0	0	2	0	0	0
7	2	2	2	0	0	1	0	0	2	0	0	0	2	2	2	0	0	1	0	0	2	0	0	0
8	2	2	2	0	2	0	0	2	2	0	0	1	2	2	2	0	2	0	0	2	2	0	1	1
9	2	2	2	0	2	0	0	1	2	0	2	0	2	2	2	0	0	2	0	0	1	0	2	0
10	2	2	2	0	0	2	0	1	2	0	2	0	2	2	2	0	0	2	0	1	2	0	1	0
11	2	1	2	0	0	1	0	0	2	0	1	0	2	1	2	0	0	1	0	0	2	0	1	0
12	2	1	2	0	0	1	0	0	2	0	1	0	2	1	2	0	0	1	0	0	2	0	1	0
13	2	1	2	0	0	2	0	1	2	0	0	1	2	1	2	0	0	2	0	1	2	0	0	1

## APPENDIX K: Further Processing of IGSQ Results

### ITEM K1: Environmental Science Goal 1

#### General Linear Model

##### Within-Subjects Factors

Measure: MEASURE\_1

goal1	Dependent Variable
1	s1
2	r1
3	t1

##### Between-Subjects Factors

	Value Label	N
Group 1	Conservation psychologists	11
2	Antarctic scientists	9
3	Vedic scholars	13

##### Tests of Within-Subjects Effects

Measure: MEASURE\_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
goal1	Sphericity Assumed	443.154	2	221.577	145.660	.000
	Greenhouse-Geisser	443.154	1.848	239.807	145.660	.000
	Huynh-Feldt	443.154	2.000	221.577	145.660	.000
	Lower-bound	443.154	1.000	443.154	145.660	.000
goal1 * Group	Sphericity Assumed	28.223	4	7.056	4.638	.002
	Greenhouse-Geisser	28.223	3.696	7.636	4.638	.003
	Huynh-Feldt	28.223	4.000	7.056	4.638	.002
	Lower-bound	28.223	2.000	14.112	4.638	.018
Error(goal1)	Sphericity Assumed	91.272	60	1.521		
	Greenhouse-Geisser	91.272	55.439	1.646		
	Huynh-Feldt	91.272	60.000	1.521		
	Lower-bound	91.272	30.000	3.042		

### Tests of Within-Subjects Contrasts

Measure: MEASURE\_1

Source	goal1	Type III Sum of Squares	df	Mean Square	F	Sig.
goal1	Level 1 vs. Level 2	266.189	1	266.189	83.743	.000
	Level 2 vs. Level 3	179.782	1	179.782	48.319	.000
goal1 * Group	Level 1 vs. Level 2	41.610	2	20.805	6.545	.004
	Level 2 vs. Level 3	.014	2	.007	.002	.998
Error(goal1)	Level 1 vs. Level 2	95.360	30	3.179		
	Level 2 vs. Level 3	111.622	30	3.721		

### Tests of Between-Subjects Effects

Measure: MEASURE\_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	539.260	1	539.260	688.980	.000
Group	11.799	2	5.899	7.537	.002
Error	23.481	30	.783		

### One-way

A One-way ANOVA (Analysis of Variance) tests the congruence of three or more means (average scores). It facilitates the determination of whether or not a single variable is significantly influential within any/ all study-samples available to be tested.

### Descriptives

		N	Mean	Std. Deviation	Minimum	Maximum
s1	Conservation psychologists	11	7.1818	.75076	6.00	8.00
	Antarctic scientists	9	6.1111	1.05409	4.00	7.00
	Vedic scholars	13	7.0769	.75955	6.00	8.00
	Total	33	6.8485	.93946	4.00	8.00
r1	Conservation psychologists	11	4.7273	1.10371	3.00	6.00
	Antarctic scientists	9	4.3333	1.41421	2.00	6.00
	Vedic scholars	13	2.6923	1.79743	.00	7.00
	Total	33	3.8182	1.72218	.00	7.00
t1	Conservation psychologists	11	2.3636	1.62928	.00	6.00
	Antarctic scientists	9	2.0000	2.34521	.00	6.00
	Vedic scholars	13	.3077	.48038	.00	1.00
	Total	33	1.4545	1.78695	.00	6.00

# ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
s1	Between Groups	6.794	2	3.397	4.751	.016
	Within Groups	21.448	30	.715		
	Total	28.242	32			
r1	Between Groups	27.958	2	13.979	6.264	.005
	Within Groups	66.951	30	2.232		
	Total	94.909	32			
t1	Between Groups	28.867	2	14.434	5.906	.007
	Within Groups	73.315	30	2.444		
	Total	102.182	32			

## Post Hoc Tests

### Homogeneous Subsets

“In statistics, after calculating a multiple comparison, a set of groups that have means which are not significantly different from one another” (Colman 2003, 336).

#### s1

##### Ryan-Einot-Gabriel-Welsch Range

Group	N	Subset for alpha = .05	
		1	2
Antarctic scientists	9	6.1111	
Vedic scholars	13		7.0769
Conservation psychologists	11		7.1818
Sig.		1.000	.773

Means for groups in homogeneous subsets are displayed.

#### r1

##### Ryan-Einot-Gabriel-Welsch Range

Group	N	Subset for alpha = .05	
		1	2
Vedic scholars	13	2.6923	
Antarctic scientists	9		4.3333
Conservation psychologists	11		4.7273
Sig.		1.000	.580

Means for groups in homogeneous subsets are displayed.

t1

Ryan-Einot-Gabriel-Welsch Range

Group	N	Subset for alpha = .05	
		1	2
Vedic scholars	13	.3077	
Antarctic scientists	9		2.0000
Conservation psychologists	11		2.3636
Sig.		1.000	.625

Means for groups in homogeneous subsets are displayed.

ITEM K2: Environmental Science Goal 2

General Linear Model

### Within-Subjects Factors

Measure: MEASURE\_1

goal2	Dependent Variable
1	s2
2	r2
3	t2

### Between-Subjects Factors

	Value Label	N
Group 1	Conservation psychologists	11
2	Antarctic scientists	9
3	Vedic scholars	13

### Tests of Within-Subjects Effects

Measure: MEASURE\_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
goal2	Sphericity Assumed	466.249	2	233.125	162.281	.000
	Greenhouse-Geisser	466.249	1.680	277.566	162.281	.000
	Huynh-Feldt	466.249	1.887	247.120	162.281	.000
	Lower-bound	466.249	1.000	466.249	162.281	.000
goal2 * Group	Sphericity Assumed	21.969	4	5.492	3.823	.008
	Greenhouse-Geisser	21.969	3.360	6.539	3.823	.012
	Huynh-Feldt	21.969	3.773	5.822	3.823	.009
	Lower-bound	21.969	2.000	10.984	3.823	.033
Error(goal2)	Sphericity Assumed	86.193	60	1.437		
	Greenhouse-Geisser	86.193	50.393	1.710		
	Huynh-Feldt	86.193	56.602	1.523		
	Lower-bound	86.193	30.000	2.873		

### Tests of Within-Subjects Contrasts

Measure: MEASURE\_1

Source	goal2	Type III Sum of Squares	df	Mean Square	F	Sig.
goal2	Level 1 vs. Level 2	305.721	1	305.721	93.151	.000
	Level 2 vs. Level 3	167.417	1	167.417	45.301	.000
goal2 * Group	Level 1 vs. Level 2	20.449	2	10.225	3.115	.059
	Level 2 vs. Level 3	4.463	2	2.232	.604	.553
Error(goal2)	Level 1 vs. Level 2	98.460	30	3.282		
	Level 2 vs. Level 3	110.870	30	3.696		

### Tests of Between-Subjects Effects

Measure: MEASURE\_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	569.555	1	569.555	838.054	.000
Group	9.416	2	4.708	6.928	.003
Error	20.389	30	.680		

## One-way

### Descriptives

		N	Mean	Std. Deviation	Minimum	Maximum
s2	Conservation psychologists	11	7.3636	.67420	6.00	8.00
	Antarctic scientists	9	6.4444	.52705	6.00	7.00
	Vedic scholars	13	7.2308	.72501	6.00	8.00
	Total	33	7.0606	.74747	6.00	8.00
r2	Conservation psychologists	11	4.7273	1.00905	3.00	7.00
	Antarctic scientists	9	4.0000	1.32288	1.00	5.00
	Vedic scholars	13	3.0769	2.06000	.00	7.00
	Total	33	3.8788	1.69111	.00	7.00
t2	Conservation psychologists	11	2.3636	1.28629	1.00	5.00
	Antarctic scientists	9	2.2222	2.16667	.00	6.00
	Vedic scholars	13	.3846	.65044	.00	2.00
	Total	33	1.5455	1.66002	.00	6.00

### ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
s2	Between Groups	4.803	2	2.402	5.510	.009
	Within Groups	13.075	30	.436		
	Total	17.879	32			
r2	Between Groups	16.410	2	8.205	3.277	.052
	Within Groups	75.105	30	2.503		
	Total	91.515	32			
t2	Between Groups	29.004	2	14.502	7.352	.003
	Within Groups	59.178	30	1.973		
	Total	88.182	32			

## Post Hoc Tests

### Homogeneous Subsets

#### s2

Ryan-Einot-Gabriel-Welsch Range

Group	N	Subset for alpha = .05	
		1	2
Antarctic scientists	9	6.4444	
Vedic scholars	13		7.2308
Conservation psychologists	11		7.3636
Sig.		1.000	.640

Means for groups in homogeneous subsets are displayed.

**r<sup>2</sup>**

Ryan-Einot-Gabriel-Welsch Range

Group	N	Subset for alpha = .05
		1
Vedic scholars	13	3.0769
Antarctic scientists	9	4.0000
Conservation psychologists	11	4.7273
Sig.		.052

Means for groups in homogeneous subsets are displayed.

**t<sup>2</sup>**

Ryan-Einot-Gabriel-Welsch Range

Group	N	Subset for alpha = .05	
		1	2
Vedic scholars	13	.3846	
Antarctic scientists	9		2.2222
Conservation psychologists	11		2.3636
Sig.		1.000	.832

Means for groups in homogeneous subsets are displayed.

ITEM K3: Environmental Science Goal 3

General Linear Model

**Within-Subjects Factors**

Measure: MEASURE\_1

goal3	Dependent Variable
1	s3
2	r3
3	t3

**Between-Subjects Factors**

	Value Label	N
Group 1	Conservation psychologists	11
2	Antarctic scientists	9
3	Vedic scholars	13

### Tests of Within-Subjects Effects

Measure: MEASURE\_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
goal3	Sphericity Assumed	449.120	2	224.560	123.070	.000
	Greenhouse-Geisser	449.120	1.806	248.736	123.070	.000
	Huynh-Feldt	449.120	2.000	224.560	123.070	.000
	Lower-bound	449.120	1.000	449.120	123.070	.000
goal3 * Group	Sphericity Assumed	25.288	4	6.322	3.465	.013
	Greenhouse-Geisser	25.288	3.611	7.003	3.465	.016
	Huynh-Feldt	25.288	4.000	6.322	3.465	.013
	Lower-bound	25.288	2.000	12.644	3.465	.044
Error(goal3)	Sphericity Assumed	109.479	60	1.825		
	Greenhouse-Geisser	109.479	54.168	2.021		
	Huynh-Feldt	109.479	60.000	1.825		
	Lower-bound	109.479	30.000	3.649		

### Tests of Within-Subjects Contrasts

Measure: MEASURE\_1

Source	goal3	Type III Sum of Squares	df	Mean Square	F	Sig.
goal3	Level 1 vs. Level 2	240.076	1	240.076	61.871	.000
	Level 2 vs. Level 3	209.394	1	209.394	46.007	.000
goal3 * Group	Level 1 vs. Level 2	21.834	2	10.917	2.813	.076
	Level 2 vs. Level 3	5.340	2	2.670	.587	.562
Error(goal3)	Level 1 vs. Level 2	116.409	30	3.880		
	Level 2 vs. Level 3	136.539	30	4.551		

### Tests of Between-Subjects Effects

Measure: MEASURE\_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	620.942	1	620.942	951.297	.000
Group	10.970	2	5.485	8.403	.001
Error	19.582	30	.653		

# One-way

## Descriptives

		N	Mean	Std. Deviation	Minimum	Maximum
s3	Conservation psychologists	11	7.4545	.68755	6.00	8.00
	Antarctic scientists	9	6.5556	.52705	6.00	7.00
	Vedic scholars	13	7.1538	.80064	6.00	8.00
	Total	33	7.0909	.76500	6.00	8.00
r3	Conservation psychologists	11	4.8182	1.07872	3.00	7.00
	Antarctic scientists	9	4.7778	1.09291	3.00	6.00
	Vedic scholars	13	3.3846	2.21880	.00	7.00
	Total	33	4.2424	1.73260	.00	7.00
t3	Conservation psychologists	11	2.3636	1.43337	1.00	5.00
	Antarctic scientists	9	2.6667	2.50000	.00	7.00
	Vedic scholars	13	.3077	.48038	.00	1.00
	Total	33	1.6364	1.86779	.00	7.00

## ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
s3	Between Groups	4.085	2	2.043	4.185	.025
	Within Groups	14.642	30	.488		
	Total	18.727	32			
r3	Between Groups	15.792	2	7.896	2.951	.068
	Within Groups	80.269	30	2.676		
	Total	96.061	32			
t3	Between Groups	38.322	2	19.161	7.841	.002
	Within Groups	73.315	30	2.444		
	Total	111.636	32			

Post Hoc Tests  
Homogeneous Subsets

**s3**

Ryan-Einot-Gabriel-Welsch Range

Group	N	Subset for alpha = .05	
		1	2
Antarctic scientists	9	6.5556	
Vedic scholars	13	7.1538	7.1538
Conservation psychologists	11		7.4545
Sig.		.079	.321

Means for groups in homogeneous subsets are displayed.

**r3**

Ryan-Einot-Gabriel-Welsch Range

Group	N	Subset for alpha = .05
		1
Vedic scholars	13	3.3846
Antarctic scientists	9	4.7778
Conservation psychologists	11	4.8182
Sig.		.117

Means for groups in homogeneous subsets are displayed.

**t3**

Ryan-Einot-Gabriel-Welsch Range

Group	N	Subset for alpha = .05	
		1	2
Vedic scholars	13	.3077	
Conservation psychologists	11		2.3636
Antarctic scientists	9		2.6667
Sig.		1.000	.684

Means for groups in homogeneous subsets are displayed.

ITEM K4: Environmental Science Goal 4

General Linear Model

### Within-Subjects Factors

Measure: MEASURE\_1

goal4	Dependent Variable
1	s4
2	r4
3	t4

### Between-Subjects Factors

	Value Label	N
Group 1	Conservation psychologists	11
2	Antarctic scientists	9
3	Vedic scholars	13

### Tests of Within-Subjects Effects

Measure: MEASURE\_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
goal4	Sphericity Assumed	400.175	2	200.087	95.061	.000
	Greenhouse-Geisser	400.175	1.963	203.854	95.061	.000
	Huynh-Feldt	400.175	2.000	200.087	95.061	.000
	Lower-bound	400.175	1.000	400.175	95.061	.000
goal4 * Group	Sphericity Assumed	32.478	4	8.120	3.858	.007
	Greenhouse-Geisser	32.478	3.926	8.272	3.858	.008
	Huynh-Feldt	32.478	4.000	8.120	3.858	.007
	Lower-bound	32.478	2.000	16.239	3.858	.032
Error(goal4)	Sphericity Assumed	126.290	60	2.105		
	Greenhouse-Geisser	126.290	58.891	2.144		
	Huynh-Feldt	126.290	60.000	2.105		
	Lower-bound	126.290	30.000	4.210		

### Tests of Within-Subjects Contrasts

Measure: MEASURE\_1

Source	goal4	Type III Sum of Squares	df	Mean Square	F	Sig.
goal4	Level 1 vs. Level 2	148.922	1	148.922	34.037	.000
	Level 2 vs. Level 3	256.062	1	256.062	55.593	.000
goal4 * Group	Level 1 vs. Level 2	27.287	2	13.643	3.118	.059
	Level 2 vs. Level 3	7.335	2	3.667	.796	.460
Error(goal4)	Level 1 vs. Level 2	131.259	30	4.375		
	Level 2 vs. Level 3	138.180	30	4.606		

### Tests of Between-Subjects Effects

Measure: MEASURE\_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	669.540	1	669.540	764.087	.000
Group	13.072	2	6.536	7.459	.002
Error	26.288	30	.876		

# One-way

## Descriptives

		N	Mean	Std. Deviation	Minimum	Maximum
s4	Conservation psychologists	11	7.1818	.87386	6.00	8.00
	Antarctic scientists	9	6.4444	.52705	6.00	7.00
	Vedic scholars	13	7.1538	.68874	6.00	8.00
	Total	33	6.9697	.76994	6.00	8.00
r4	Conservation psychologists	11	5.4545	1.36848	3.00	8.00
	Antarctic scientists	9	5.1111	1.36423	3.00	7.00
	Vedic scholars	13	3.7692	2.27866	.00	8.00
	Total	33	4.6970	1.89547	.00	8.00
t4	Conservation psychologists	11	2.9091	1.92117	.00	6.00
	Antarctic scientists	9	2.6667	2.54951	.00	6.00
	Vedic scholars	13	.3077	.63043	.00	2.00
	Total	33	1.8182	2.11327	.00	6.00

## ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
s4	Between Groups	3.419	2	1.709	3.298	.051
	Within Groups	15.551	30	.518		
	Total	18.970	32			
r4	Between Groups	19.046	2	9.523	2.978	.066
	Within Groups	95.924	30	3.197		
	Total	114.970	32			
t4	Between Groups	49.231	2	24.615	7.883	.002
	Within Groups	93.678	30	3.123		
	Total	142.909	32			

Post Hoc Tests  
Homogeneous Subsets

**s4**

Ryan-Einot-Gabriel-Welsch Range

Group	N	Subset for alpha = .05
		1
Antarctic scientists	9	6.4444
Vedic scholars	13	7.1538
Conservation psychologists	11	7.1818
Sig.		.092

Means for groups in homogeneous subsets are displayed.

**r4**

Ryan-Einot-Gabriel-Welsch Range

Group	N	Subset for alpha = .05
		1
Vedic scholars	13	3.7692
Antarctic scientists	9	5.1111
Conservation psychologists	11	5.4545
Sig.		.086

Means for groups in homogeneous subsets are displayed.

**t4**

Ryan-Einot-Gabriel-Welsch Range

Group	N	Subset for alpha = .05	
		1	2
Vedic scholars	13	.3077	
Antarctic scientists	9		2.6667
Conservation psychologists	11		2.9091
Sig.		1.000	.773

Means for groups in homogeneous subsets are displayed.

## ITEM K5: Environmental Science Goal 5

### General Linear Model

#### Within-Subjects Factors

Measure: MEASURE\_1

goal5	Dependent Variable
1	s5
2	r5
3	t5

#### Between-Subjects Factors

	Value Label	N
Group 1	Conservation psychologists	11
2	Antarctic scientists	9
3	Vedic scholars	13

#### Tests of Within-Subjects Effects

Measure: MEASURE\_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
goal5	Sphericity Assumed	460.775	2	230.388	132.729	.000
	Greenhouse-Geisser	460.775	1.887	244.123	132.729	.000
	Huynh-Feldt	460.775	2.000	230.388	132.729	.000
	Lower-bound	460.775	1.000	460.775	132.729	.000
goal5 * Group	Sphericity Assumed	23.652	4	5.913	3.407	.014
	Greenhouse-Geisser	23.652	3.775	6.266	3.407	.016
	Huynh-Feldt	23.652	4.000	5.913	3.407	.014
	Lower-bound	23.652	2.000	11.826	3.407	.046
Error(goal5)	Sphericity Assumed	104.146	60	1.736		
	Greenhouse-Geisser	104.146	56.624	1.839		
	Huynh-Feldt	104.146	60.000	1.736		
	Lower-bound	104.146	30.000	3.472		

### Tests of Within-Subjects Contrasts

Measure: MEASURE\_1

Source	goal5	Type III Sum of Squares	df	Mean Square	F	Sig.
goal5	Level 1 vs. Level 2	261.030	1	261.030	71.088	.000
	Level 2 vs. Level 3	201.049	1	201.049	49.221	.000
goal5 * Group	Level 1 vs. Level 2	22.813	2	11.406	3.106	.059
	Level 2 vs. Level 3	3.643	2	1.821	.446	.644
Error(goal5)	Level 1 vs. Level 2	110.157	30	3.672		
	Level 2 vs. Level 3	122.539	30	4.085		

### Tests of Between-Subjects Effects

Measure: MEASURE\_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	588.387	1	588.387	930.592	.000
Group	9.463	2	4.731	7.483	.002
Error	18.968	30	.632		

### Post Hoc Tests

#### Homogeneous Subsets

#### s5

Ryan-Einot-Gabriel-Welsch Range

Group	N	Subset for alpha = .05
		1
Antarctic scientists	9	6.5556
Vedic scholars	13	7.0769
Conservation psychologists	11	7.3636
Sig.		.061

Means for groups in homogeneous subsets are displayed.

#### r5

Ryan-Einot-Gabriel-Welsch Range

Group	N	Subset for alpha = .05
		1
Vedic scholars	13	3.2308
Conservation psychologists	11	4.4545
Antarctic scientists	9	4.7778
Sig.		.105

Means for groups in homogeneous subsets are displayed.

t5

Ryan-Einot-Gabriel-Welsch Range

Group	N	Subset for alpha = .05	
		1	2
Vedic scholars	13	.3077	
Conservation psychologists	11		2.0000
Antarctic scientists	9		2.6667
Sig.		1.000	.371

Means for groups in homogeneous subsets are displayed.

ITEM K6: Environmental Science Goal 6

General Linear Model

### Within-Subjects Factors

Measure: MEASURE\_1

goal6	Dependent Variable
1	s6
2	r6
3	t6

### Between-Subjects Factors

	Value Label	N
Group 1	Conservation psychologists	11
2	Antarctic scientists	9
3	Vedic scholars	13

### Tests of Within-Subjects Effects

Measure: MEASURE\_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
goal6	Sphericity Assumed	427.928	2	213.964	130.559	.000
	Greenhouse-Geisser	427.928	1.812	236.222	130.559	.000
	Huynh-Feldt	427.928	2.000	213.964	130.559	.000
	Lower-bound	427.928	1.000	427.928	130.559	.000
goal6 * Group	Sphericity Assumed	32.983	4	8.246	5.032	.001
	Greenhouse-Geisser	32.983	3.623	9.104	5.032	.002
	Huynh-Feldt	32.983	4.000	8.246	5.032	.001
	Lower-bound	32.983	2.000	16.492	5.032	.013
Error(goal6)	Sphericity Assumed	98.330	60	1.639		
	Greenhouse-Geisser	98.330	54.346	1.809		
	Huynh-Feldt	98.330	60.000	1.639		
	Lower-bound	98.330	30.000	3.278		

### Tests of Within-Subjects Contrasts

Measure: MEASURE\_1

Source	goal6	Type III Sum of Squares	df	Mean Square	F	Sig.
goal6	Level 1 vs. Level 2	255.544	1	255.544	80.669	.000
	Level 2 vs. Level 3	174.923	1	174.923	41.225	.000
goal6 * Group	Level 1 vs. Level 2	37.935	2	18.967	5.987	.006
	Level 2 vs. Level 3	2.342	2	1.171	.276	.761
Error(goal6)	Level 1 vs. Level 2	95.035	30	3.168		
	Level 2 vs. Level 3	127.294	30	4.243		

### Tests of Between-Subjects Effects

Measure: MEASURE\_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	551.122	1	551.122	920.479	.000
Group	9.600	2	4.800	8.017	.002
Error	17.962	30	.599		

### Post Hoc Tests

#### Homogeneous Subsets

**s6**

Ryan-Einot-Gabriel-Welsch Range

Group	N	Subset for alpha = .05	
		1	2
Antarctic scientists	9	6.1111	
Conservation psychologists	11		7.0909
Vedic scholars	13		7.1538
Sig.		1.000	.869

Means for groups in homogeneous subsets are displayed.

**r6**

Ryan-Einot-Gabriel-Welsch Range

Group	N	Subset for alpha = .05	
		1	2
Vedic scholars	13	2.9231	
Antarctic scientists	9		4.4444
Conservation psychologists	11		4.5455
Sig.		1.000	.882

Means for groups in homogeneous subsets are displayed.

t6

Ryan-Einot-Gabriel-Welsch Range

Group	N	Subset for alpha = .05	
		1	2
Vedic scholars	13	.2308	
Antarctic scientists	9		2.3333
Conservation psychologists	11		2.3636
Sig.		1.000	.966

Means for groups in homogeneous subsets are displayed.

## APPENDIX L: Guna Representation of Individual IGSQ Goals, Analysed against IGSQ Results

IGSQ Goal 1: To maintain the Antarctic Treaty System and enhance Australia's influence within the System

This goal is situated within both sattva and rajas gunas. As it aims to *maintain* the Antarctic Treaty System it is affiliated with sattva guna. Relevant sattvic characteristics include action that *maintains/sustains/preserves*. As this legislation is designed to promote Australia's influence within the system, however, it is affiliated with rajas guna. Relevant rajasic characteristics include *nationalism; proprietorship; and the propensity to manipulate and control material nature/lord it over material nature* (Bhaktivedanta 1987-8, 2:10:41).

IGSQ Goal 2: To protect the Antarctic environment

Goal Two is situated within sattva guna due to its sole focus of protecting the environment. It is affiliated with the sattvic characteristics of *appreciation of others' wellbeing; the distaste of harming other living beings (or seeing them harmed); morality; responsibility; compassion; and the desire to maintain/sustain/preserve*. IGSQ results promoting sattva guna as the ideal guna to achieve this goal are thus congruous with its inherent orientation.

IGSQ Goal 3: To understand the role of Antarctica in the global climate system

Again, this goal is situated within sattva guna due to its sole aim of understanding natural phenomena. Whilst gathering knowledge through the empirical method is situated within rajas guna, the want to learn the truth, on its own, without inferring any specific learning method, is characteristic of the mode of goodness. The goal reflects the sattvic characteristics of *the pursuit of greater and real knowledge*. As with Goal Two, Goal Three is supported by IGSQ results in terms of the congruity between the goal's own inherent guna (sattva guna) and IGSQ scores.

IGSQ Goal 4: To undertake scientific work of practical, economic and national significance

Goal Four predominates within rajas guna, with a weak representation of sattva guna. This is due to its main focus being on scientific work aimed at materially orientated objectives of *economics and nationalism*, both rajasic characteristics. Pragmatism is affiliated with the sattvic characteristics of *cleanliness; being self-regulated and self-controlled*. As with Goal One, IGSQ results suggest that scientists should situate themselves higher (sattva guna) within the triguna than the situatedness of the goal itself (rajas guna) in order to successfully reach it.

IGSQ Goal 5: To ensure that emerging environmental problems of wide international significance receive appropriate and adequate considerations by Governments.

This goal predominates within sattva guna due to its affiliation with the sattvic characteristics of *responsibility*, in this case towards the natural environment. It is also

affiliated with the characteristic of *alertness/wakefulness* and *awareness* of the needs of others. IGSQ results thus support the goal's own situatedness, meaning that participants in the IGSQ saw the relevance of sattvic characteristics for the purpose of achieving this sattvic goal.

IGSQ Goal 6: To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature

Goal Six is also situated within sattva guna. It is affiliated with the sattvic characteristics of *responsibility; sustainability; morality; and knowledge by which one undivided spiritual nature is seen in all living entities, though they are divided into innumerable forms*. As with the other environmental science goals represented by sattva guna, the aim of Goal Six is supported by IGSQ results in that scientists' ideal situatedness within the triguna has been designated by all professional groups as being similar, if not identical with the premises of the goal itself.

As IGSQ results for all six goals, showed that all three professional groups chose sattva guna as the ideal guna from which scientists can achieve environmental science goals, rajasic elements in Goals 1 and 4 raise an interesting point. Even though these goals contained elements of rajas guna within them, scientists and other professional groups were still of the opinion that the goals would be more easily reached from sattva guna.

This seemingly bizarre result actually supports the premises of VCS, namely that even though an individual may be endeavouring to achieve rajasic goals, situatedness within sattva guna still affords the individual a better understanding of how to achieve those very goals, than what rajas guna itself does. The same applies to the achievement of tamasic goals, although the likelihood of an individual predominating within sattva guna, wanting to pursue rajasic and/or tamasic goals, is not very great. Typically, the individual will sooner or later streamline his/her goals to match his/her overall predominance within the triguna.

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## APPENDIX M: Full Interview Transcripts

- Interviews are listed according to alphabetical order of interviewee's surnames.
- The name *Elli* appearing within interview transcripts represents the interviewer/researcher.

### 1. ADAMS, Neil (BOM)

#### Start of tape:

**Elli:** This is Interview No 17 with Dr Neil Adams and would you like to start by just explaining a little bit about your research within the Antarctic context and what your position is within the Bureau of Meteorology.

**Neil:** Okay, well I'm a Meteorologist with the Bureau. I actually manage the Antarctic Meteorological Section and my research is into Antarctic atmospheric processes with an emphasis on numerical weather prediction, forecasting the weather, short term, zero out to ninety-six hours is where my research lies. So my background is as a physicist-mathematician and computer science.

**Elli:** Okay, so how long have you been doing that?

**Neil:** I started in the old Antarctic CRC in March 1992 so that's how long I've been doing Antarctic research. Prior to that I was doing my masters at Monash, which had a little bit of Antarctic research in it, but prior to that I was a practising forecaster which I must add I've been doing right throughout my PhD as well. I spent nearly three and a half years in Antarctica as a forecaster and a researcher.

**Elli:** Okay thank you very much. Are you ready to start the questions.

**Neil:** Yes.

**Elli:** Question No 1: What inspires or excites you the most about being an Antarctic scientist?

**Neil:** I guess in the initial instance it was actually going to Antarctica. It was actually just one of those dreams I've had all my life to go and experience what Antarctica is like. I don't know whether that's really because it's the last frontier or whether it was just because it was uninhabited if you like, but the excitement was actually being in the Antarctic environment and the science was a way of getting there in the first instance. Having said that I've really enjoyed the research that I've been doing. It's been quite challenging and the Antarctic atmosphere is little understood, so it's been really quite exciting to be on the forefront of that sort of research for the last twelve years.

**Elli:** Okay, so initially the environment was certainly a factor ?

**Neil:** Yes.

**Elli:** Okay. Question No 2: Can you tell me about your original motivations for becoming an Antarctic scientist?

**Neil:** The same answer. I guess the science was a means of getting to Antarctica. I mean I've always been interested in science. I did my undergraduate in maths and physics. I've always had an interest in that and I sort of fell into meteorology. I applied for jobs at the end of my degree and took up the meteorology. I was one of these people who never knew what they wanted to be when they grew up and just sort of fell into meteorology and it's been a good career. I actually quite enjoyed it and when the Antarctic CRC started they just put out an advert. for a Meteorologist to join the CRC as a researcher and forecaster, more with research, leading to a masters or a PhD. I had a masters so I enrolled in a PhD and that got me in the door to Antarctica.

**Elli:** Okay. They are quite similar those questions. Now for something different. Can you tell me anything about your own consciousness during your working day. In other words what usually goes through your mind during an ordinary working day?

**Neil:** Now is that a working day here, or a working day in Antarctica.

**Elli:** If you want to give me both, like an ordinary working day here and then your ordinary working day in Antarctica.

**Neil:** I guess, they're not too different. It depends on what I'm doing. If I've got my research hat on, because my job's half and half – half management, half research – but with my research hat on, the

questions I'm trying answer or the systems I'm trying to develop, are to assist forecasting and better understand our Antarctic atmosphere so a typical day is actually looking at Antarctica from a remote sensing point of view. I will have current satellite images lined up on the computer and I'll be looking at the Antarctic atmosphere from the vantage point of a satellite, or be analysing all the surface data we get back to Australia in real time and I will be also looking at the output from the models that I've been running and the global models and trying to just immerse myself in the Antarctic atmosphere in a remote sense, which is not as easy here as it is when you are in Antarctica and you're outside and have a look. That's still a distinct advantage as a Meteorologist, being able to stick your head out the window.

**Elli:** So it's an advantage.

**Neil:** An advantage to be able to stick your head out the window and have a look. To experience the atmosphere as well as remotely look at it. So as I'm doing research I will be keeping an eye on what's actually happening and then looking at the modelling work that I'm doing and the systems I'm designing to see what they're telling me – trying to match up to get some sort of feel of what's really going on and an understanding of the processes that drive the atmosphere.

**Elli:** Okay. So it's mainly task orientated.

**Neil:** I am a very task orientated person.

**Elli:** Okay. While we're on this topic, to you think that a consciousness of a scientist could influence the results of his or her work.

**Neil:** Yes, absolutely. It's a mental activity so you're bent on the worldview, or your view if you like, or your consciousness there's how you look at things and how you judge things. You might be looking logically at hard data but it's your perspective on that data, that's what information and knowledge flows from and it has a consciousness bent to it.

**Elli:** Do you think that that could be, I'm not saying that it necessarily is a lot of the time, but do you think that could be relevant to all parts of the scientific process?

**Neil:** Interesting. I'm not sure because even though you're consciousness will shape how you think and feel about things and that will influence you on how you write up your results or how you perceive what's going on, but as soon as you write those thoughts down, that is a scientifically rigorous process. With the international peer review you're going to have someone else look at that and they're going to judge that on scientific merit. Whether there's a sort of qualitative feel that has a part to play? I don't think so. Not once you put it out into peer review. I think ...

**Elli:** Because other scientists look at it as well.

**Neil:** Yes, and they're going to judge it on its merits, as a piece of scientific work which probably doesn't have a great deal of your thought processes in it, and the way you arrived at conclusions I think is a very personal path. No-one else knows what's going on in your mind but the end results are fairly clinical the way you present them.

**Elli:** What if, hypothetically, all of the scientists who do the peer reviewing are the author of a paper, or even taking it further, what if the whole scientific community is of a particular consciousness?

**Neil:** Well they probably are to a certain extent. Science has a process, a sort of fairly rigorous structure I guess. I think the thought processes that scientists go through could be highly creative and highly qualitative in the way people come to their conclusions, but that needs to fit the perceptions of what you're seeing. The perceptions say in the case of atmospheric physics is the measurements of the atmosphere, which need to be very rigorous. Ultimately I think you're probably constrained within that scientific process, to the end results of the theory that you're either trying to prove or disprove or trying to work out what's going on. The thought process however, is highly creative.

**Elli:** Yes, so ?...? qualitative or ...

**Neil:** Yes. I mean you can sit down and punch through numbers and run models and look at things and think you just process numbers but sometimes you have a leap of faith as to what's going on. I can explain this through this process. I think this is what's happening. If another scientist sat down and said, no I don't agree with that. How can you argue with that data and make that conclusion. But you can look at that conclusion and then work backwards through the data and verify it as being viable. There are some things that I think are quite highly creative in the process. The same with system design. If you're designing, from a computing point of view, you're highly creative in the way you deal with the problems, but the end result, the scientific paper or the theory, has to stand up to rigour

scientific scrutiny. That's a constraining process. I think all scientists will probably have a look at that in a very similar, critical manner. What goes on in your brain and what you're perceiving in the world out there is highly non-linear and non-rigorous. You look at a lot of the great scientists there's a leap of faith in what they did but the process of verifying it and proving it is rigorous.

**Elli:** Yes it has to be to be able to ?...?

**Neil:** Quantitative if you like...

**Elli:** Yes, that's the scientific process. Something has to be able to be replicated to accept it as being correct.

**Neil:** Yes.

**Elli:** Okay, so you're saying that in the interpretation of data sometimes there can be creativity, qualitative ?

**Neil:** In your perception of what the world is really doing. What you're saying is there can be some highly creative processes involved in trying to describe it.

**Elli:** There's another aspect of what we're talking about. What about understanding the significance or the ramifications of what a scientist finds in his or her data. What about interpreting, or perceiving or understanding the significance of that in the bigger picture of what they are working with. Say if a meteorologist, whether that scientist is working specifically looking at issues such as global warming, which is a huge conservation issue, even if he or she wasn't working within that, if they found some data that could be interpreted as being significant for an important conservation issue, or it could just be neglected, so this is what I'm wondering how you think of this. You've already told me that you think that the creative process, or the scientific process, it may well and it probably does vary for most scientists, so what I'm asking you is do you also think that the part of science that says 'this is significant' or 'this is not significant', do you think that that varies a lot?

**Neil:** Sure. There's all sorts of cultural things there too. If you come from a background where conservation is a strong belief in your community and you come up with some result that suggests – for example, what we're doing in Antarctica is highly damaging and adding to global warming, as an Australian scientist you would probably publish quite quickly. But if you were from some other cultural that wasn't so concerned about those issues and economic issues were far more important, say a third world countries need for resources, then you may be more inclined not to see those results as being significant I suspect. Although I must admit I haven't come across any research that's been held back because it doesn't agree with what's out there but I don't know of anyone who would just not present results if they were significant in any manner, even if they were detrimental with what we're doing down in Antarctica or not.

**Elli:** I think sometimes ?...? results may not be acknowledged by scientists. If they're thinking within a particular framework.

**Neil:** True.

**Elli:** ?...? hypothetically a biotechnologist or a technologist who might be looking for the economic uses of micro organisms may stumble across something significant as far as the growth of some ?cellular organism? ?...? because he's thinking economics he may not necessarily discuss it with ?...?

**Neil:** That's true. Although certainly within research organizations like this now we're being made far more aware of commercial benefits, and also multi-disciplinary uses of research in this particular CRC ranges from people like yourself to biologists, oceanographers, meteorologists, sea ice scientists. I guess we're probably an organization where that sort of thing is less likely to happen. If I give a seminar on a piece of research that I've been doing and the results of this is what I've found hugely exciting in the context of Antarctic meteorology there may very well be someone else there who says 'well hang on a minute that has quite serious ramifications for the oceanography or the glaciology'. Meteorology is probably not such a great field to make those sorts of comments on, it's very dry. I suspect those sorts of things like in the bio-tech area, I think they're probably less likely to happen because certainly Australian science has matured a fair bit in the last few years and we're being drummed into 'commercialisation and 'cross-disciplinary' work.

**Elli:** That was just an example. Different results can mean different things within different frameworks

**Neil:** For sure. I'm sure there's a lot of stuff that's gone by the wayside because people haven't realised the significance. I mean Chaos theory's a classical example. That was a bit of work done by

Lorenz who was a meteorologist, so it was published in the meteorology paper and at that stage the rest of meteorology wasn't particularly interested in Chaos, and didn't really consider it to be important. There were a lot of physicists out there who were incredibly taken by this paper and I think they only stumbled on it fortuitously because it wasn't published in a normal physics journal. That sort of stuff does happen.

**Elli:** Interesting, that was quite a lengthy one. Now ?we've probably? ?...? into question No 4. In your opinion what role, if any, does qualitative science play in Antarctic science? We've kind of already discussed that. Is there any other aspect of qualitative ...

**Neil:** I don't know how other scientists work but I'm sort of a fairly 'seat of the pants' sort of a person. I like to experience something and not be too analytical of it to start with. From a meteorology and research point of view I quite enjoy being a forecaster and just trying to forecast the weather. I find I learn a lot more about that environment by experiencing it, and that's purely qualitative. Then you'll get feelings or you'll get ideas about how things may or may not work. I'm not a classical scientist in that respect. I'm not completely analytical but once I've got a few ideas then I'll go away and approach it a little bit more analytically.

**Elli:** Do you ever report on the weather from your own experiences, just without doing the quantitative part as well. Do you ever write reports or articles based on your experiences or is it all ?...?

**Neil:** No. All of the writing I do is peer review journal stuff so that's the end result after the analysis. You won't get published otherwise unless you're writing an article for a newspaper. I haven't done any of that. I've done a lot of talks. I talk to primary schools and high schools and organizations and that's more talking about my experiences in the Antarctic first hand. Along with facts and figures and what not.

**Elli:** I suppose it depends on who you're reporting to and who ?...? publishing.

**Neil:** Yes.

**Elli:** Okay. Question No 5: Do you have any thoughts on the idea that spiritual insight and wisdom should play, or does already play an active role in contemporary scientific research such as physics and biology?

**Neil:** Is that spiritual *and* spiritual wisdom? Or is it spiritual wisdom *and* wisdom?

**Elli:** I've had that ?pointed out? I think four times now. ?...? the other way. ?...? not necessarily ?...? ?...? just on its own.

**Neil:** See wisdom is an interesting word isn't it. I mean I'm not sure how you define that. Wisdom to me is sort of accumulated knowledge put to use I guess. To a certain extent by the time you come to publish something you hope you've reached that point in wisdom in it. You've analysed it and you've been through and you've thought about it for a long, long time. The spiritual side of things good question.

**Elli:** Spiritual insight.

**Neil:** Spiritual insight for me doesn't play a part in the physics. I'm not a biologist and I'm not dealing with animals in Antarctica, other than purely as a tourist. I appreciate the animals in Antarctica when I go and see them. I wasn't there in any sort of scientific capacity. Certainly in the physics as a forecaster and a researcher I didn't dwell too much on the whys and wherefores at a spiritual level. You could always argue backwards that the laws of physics and where they come from.

**Elli:** ?...?

**Neil:** Yes ?...? Certainly in the work I do, no it's not a spiritual thing. There's a certain amount of spiritual feelings being in Antarctica. It's one of those places that actually does make you sit and think, but that's a personal thing not a scientific thing.

**Elli:** Not ?...?

**Neil:** Not science

**Elli:** I've heard a few people say that. That they've experienced something extraordinary when they've been down there.

**Neil:** Yes, there's a lot of things in Antarctica that making you sit and think. For a start you're quite insignificant. You just have to jump on your skis and ski three or four kilometres off stations and sit on the cliffs and watch the Minke whale and the orcas cruising around in the bay feeding. All you can hear is the occasional penguin squawk and you look around and nature is quite overbearing, not overbearing, overpowering if you like. You'd be dead pretty quick if you were left isolated there. It's

quite remarkably beautiful, and it's incredibly quiet. There's no human noise around at all a few kilometres away from the diesel generators, it's very quiet. If you're up on the plateau away from the coast and you just turn around it's just the same in all directions and the most perfect and deathly quiet. All you hear is blood running through your ears, it's fairly sobering.

**Elli:** Yes I suppose it gets people away from the everyday things that we do here surrounded by ?...?

**Neil:** quite spiritual. I grew up in a fairly religious family but have mixed views on the whole thing and different points of view.

**Elli:** So you ?...?

**Neil:** I did grow up in a religious family and I'm not a complete atheist although I don't think too much about religion other than I think most fundamentalist religious people that had a half-way decent education in physics see that the universe is a far more exciting place and wonderous, than the six days of creation at the hand of God. In physics and maths there are concepts that are far more intrinsically beautiful than Genesis. I reckon if there was a God he would be on our side. I think it's far more beautiful and intrinsically "right" to see God laying down the basic laws of physics and watching the complexities of life unfold over billions of years.

**Elli:** *[indecipherable]*

**Neil:** I occasionally have those sorts of thoughts but it doesn't really impinge on my day to day work of what I'm doing as a scientist. I don't see religion and science as being mutually exclusive. I see Genesis and science as being moderately exclusive but I don't see spirituality as being mutually exclusive in science.

**Elli:** ?...? exclusive ?...?

**Neil:** You have one or the other. I don't see science has a place in religion at all. When I look at fluid dynamics or cosmology, quantum mechanics, relativity the beauty in those sorts of theories is far more impressive than anything theologians come up with and if there was a God? that's where you'd find it. It would be in those equations.

**Elli:** Yes well Albert Einstein was a very interesting person. He often switched from scientific discussions to religious discussions.

**Neil:** God does not play with dice. That's where I find that sort of fundamental religious stuff quite disconcerting because they're short-changing themselves really, or short-changing God.

**Elli:** Who are short-changing.

**Neil:** The religious nutters. People who force Genesis down your throat, that's the way it was, the world's six thousand years old and blah, blah, blah and God put the dinosaur bones there. Those sorts of people are doing religious a disservice, or doing God a disservice.

**Elli:** Yes I understand what you're saying. Okay question 6. What do you think the goals and values are that are most prominent in your work culture – so this will probably be let's say within ACRC Bureau of Meteorology perhaps, but call it Antarctic science ?...? *[indecipherable]*

**Neil:** It's not values is it?

**Elli:** Yes, well it's the goals and values that are most prominent. So this question is asking not necessarily what are the mission statement goals that are written up but more what actually goes on. What's the thing that's experienced when you associate with other scientists.

**Neil:** With other scientists. I think it's a really strong desire to understand, just to figure out what the processes are that are going on that are driving what we're seeing. I do a little bit of work with the upper atmospheric physicists and the cosmic ray physicists and do a bit of work with the oceanographers and the glaciologists and it is just to understand the processes because it's highly non-linear processes - the whole earth environment. We're reaching that point where we're trying to put together a complete earth simulation so it's understanding the process of this. The goals and values I see is a striving of that understanding. Trying to piece that jigsaw together.

**Elli:** Do you feel that there is a distinction, within that striving trying to understand, do you feel there is a distinction between scientists trying to understand for their own wanting to understand and trying to understand for the purpose of contributing to everyone's understanding, or do you think that they're linked.

**Neil:** They're probably linked. I'll be honest, I'm not doing this for anybody else. My research has always been an intrinsic desire to know why, and is personally driven. The science I do has always

been a personal pursuit. I've done that fitting in under the umbrella of what the Antarctic CRC and the Bureau of Meteorology and the other scientific organizations have wanted to know. I've steered myself in a direction that will achieve some of their goals, but the values for me is in understanding. I could get the data, analyse the data and push out papers but if I don't really understand what's going on then I need to keep working at it. It's an understanding, so that's personal. I'll bet most of your career scientists who are driven, who are best in their field, I suspect you'll find it's a personal thing. I can't speak for them but I suspect that would be where most of the good scientists would be coming from. They'll be driven in a sort of a direction that meets government goals but I think you'll find most of the government goals have actually been written by scientists, which are probably personal goals. That's what I'd do if I was in charge. What these scientists think is important is important and the government does take direction from them, but for most of these guys it would be personal. If you've picked up a piece of research and you're going to do a PhD for instance, which you're probably quite aware of, it is not something that, well I certainly would never recommend anyone undertake it because at the end of the day they get a piece of paper and they might get a job. The wrong reason to do a PhD. It's a long, lonely journey and you've got to get some intrinsic value out of it. For me if I never use my PhD again, that's no drama. It was a personal journey for me to take something to its logical conclusion. That's personal, but the goals were designed by somebody else.

**Elli:** Okay, interesting. No 7: do you have any thoughts on the process of peer review as a means by which to ensure rigour in Antarctic scientific research?

**Neil:** Yes, I think it's necessary. I certainly don't think anything should just be published because it was written. I'd rather know that it had gone under some sort of scrutiny.

**Elli:** Okay. So you think that it actually achieves maintaining rigour?

**Neil:** Look I don't know. I've only been publishing if you like for ten or twelve years and as sole author papers there's probably only eight or nine papers that I've written and they've all gone through peer review and they've all benefited from going through peer review.

**Elli:** Benefited in what way?

**Neil:** In just being a little bit more rigorous I guess. Like I said before, I tend to be a bit of a 'seat of the pants' person so I will write a little the way I feel about it to a certain extent but that needs to be pulled back in to say well here's the evidence. I appreciate the peer review. There's been a few comments I've had on some papers that you think well maybe they're not quite sure where you're coming from, but that's probably my problem in the way I've written it. Ninety-nine per cent of the time the comments have been quite valuable. I wouldn't want to have my name on a paper published that there were flaws in so from that point of view I'm more than – I mean it's always nerve-wracking to put a paper out to review. When it comes back and they say this is a load of rubbish, but I'd far rather go through that process and not publish it and have people tell you that it's a load of rubbish afterwards. So I appreciate the peer review process. How rigorous it is I don't know. They find two people, someone else to read it and say yes it was good or not. I certainly haven't found any of the process that would have lead me to believe that it was flawed.

**Elli:** Okay. Question No 8:

[END SIDE A]

**Elli:** Have you ever considered giving up your professional position as a scientist for a simpler life and a simpler life here means renouncing material life for a life of austerity and spiritual self-realisation?

**Neil:** I always used to joke that when I'd finished my PhD I'd open a coffee shop somewhere. Somewhere where you wouldn't get too many customers and I could ride my motorbike when I wanted to and put a 'closed' sign up. I think at some stage after two or three years doing a PhD certainly you feel like 'Oh, I could do without all this'. The stimulation you get from it far outweighs the grind. Certainly it would be nice some days to wake up and think it would just be nice to have a simpler life. I'm not sure about the austere part of it. I still want to put petrol in my motorbike so I can go for a ride somewhere and I guess that's materialistic. No, I quite enjoy researching and quite enjoy working and I don't think being a research scientist is necessarily materialistic. There's not much money in science. I don't think we're the richest people in the world, or the poorest. Intellectually it is something that is necessary I think and this is one field that you get that in bucket loads.

**Elli:** ?...? You feel that that's necessary for you?

**Neil:** For me, yes.

**Elli:** Okay, last question. As a scientist are you at all interested in whether or not species of Antarctic fauna and flora have, or are, a spiritual soul. The emphasis there is on *interested in*.

**Neil:** Interested in.

**Elli:** Yes. If you are interested in whether or not they would have, or are, a spiritual soul.

**Neil:** Well, I've never had any other belief other than the fact that every living, well fauna anyway, as having a soul. Yes, they all do. I don't see any difference between myself and any other animal - although it depends if you're getting down to single cell organisms I suppose. Certainly in the higher vertebrates in Antarctica. I mean why wouldn't they. It's a fairly arrogant comment or view to have that we're the only ones with a soul. If we have one ourselves?. Plants - I haven't given that a great deal of thought.

**Elli:** Okay. Do you think that it's something that perhaps should be or could be incorporated into Antarctic biological research?

**Neil:** From an ethical point of view?

**Elli:** No, really from the practical point of view. Even just moving on from the Antarctic context, let's say?...? Antarctic specific context, biological studies in general today. We are investing time and resources into looking at the many other aspects of animals. We look at the biological, physiological structure of organisms, we look at how they exist within their environment, we look at how they interact, we look at how they eat, how they reproduce and the list goes on and on. So do you think that it would be a good idea to implement a scientific program that would set out to discover if, well let's take the higher order vertebrates, if they actually have a spiritual non-material?...?

**Neil:** The answer would have to be no, on the grounds that the whole scientific process of putting forward an hypothesis and then setting about designing experiments that would prove or disprove that, when you start talking about a spiritual side of things you need to go and get a theologian to discuss those. It's not something that I believe is open to scientific pursuit. You need to ask yourself, what question are you asking, 'not the question?' you'll answer. I think in science what we can do is we can - well what I hope we're aiming to do in science, from physical sciences, biological sciences and even the field you're in is looking at the earth, looking at our environment in totality as a system and trying to figure out how it functions. As soon as you start asking *spiritual* questions, you're putting yourself - well, I believe?...? - in a position where I don't believe you're ever going to be able to apply a scientific process to it and come up with anything meaningful. There's a place for theology and there's a place for those sorts of questions but I don't think they mesh with science. I'm not disparaging of theology or science, I just think they're two different ways of looking at a system and I don't know that you can take a scientific process and apply it to a theological question. Mainly because, how do you go about proving or disproving. You can make the hypothesis there is a God. I don't think you can design a scientific experiment, maybe design a theological one or a thought experiment, but I don't think it's open to scientific scrutiny. I think if you talk to scientists who are religious I think they're quite happy to keep those two processes separate. I don't think there's anything that's contradictory. I just don't know that really talking about the spiritual soul of animals really is going to be under any sort of scientific scrutiny and nor should it necessarily do so. As a scientist I don't think you should be unaware, I mean of the other processes, such as theology or spirituality or whatever. As a scientist I don't know that we can apply a scientific process to that question.

**Elli:** Yes, certainly not within the context of the science we are experiencing at the moment.

**Neil:** Yes, well theology is theology and science is science. I don't know what new fields will come up in the next years, decades.

**Elli:** If we look back a hundred years ago, or if we look back five hundred years ago and if you were to tell somebody then that in five hundred year's time you could do science [*indecipherable*], we're going to all this amazing things, they wouldn't believe you. They'd say it can't be done, you can't do it. They would probably?...?....?

**Neil:** Well they probably would have, yes. That's true. You never say never I guess. Science is a reasonably mature field and it has been around for many years ...

**Elli:** [*indecipherable*]

**Neil:** Well, it's tenuous isn't it. I'm in the business of making forecasts but in a very rigorous short-term process but those sort of questions - it's very hard to answer isn't it.

**Elli:** Sure, yes.

**Neil:** I mean politics is another field that can totally screw the whole lot up. We're a very secular society and religion and politics are quite clearly delineated, in western society anyway. If we were to move back to a religious fundamental sort of regime, science would probably be very suppressed and we could find ourselves in five hundred years back in the dark ages. We could find ourselves in another dark age in ten year's time if you wanted to be very pessimistic about the world. Sure, during the Cold War that was a highly likely outcome that we would be pushed back into another dark age. I don't know. I can't answer the question. That's an Nostradamus type question isn't it – knowing what you're going to be doing in five hundred year's time.

**Elli:** You mean you don't have a crystal ball ?...?

**Neil:** Oh we do. No I don't think science has necessarily peaked, just as religious study may not have peaked. I'd say science has been doing the advancing over the last couple of hundred years. I don't know where theology's been going. ?They? seem to be having the same old tired arguments.

**Elli:** It was the year of the Middle Ages ?...? ?...? was really in power [*indecipherable*] whereas now it's pretty much the scientific community certainly as far as governments ?...? but yes you're right it could swing back the other way.

**Neil:** And who knows where science may go. I mean, you asked the question about whether spiritual ?or theological spiritism? could be part of science. Maybe it will be. Maybe there will be some obvious connections made. Maybe we are just the sum of our parts and eventually we drop dead and that's it. That would be the logical scientific conclusion but you're not going to know are you. I doubt if there is any way of really knowing – at this stage I can't see any techniques on the horizon that are going to be able to test that. Until we can get someone to ring us up from the other side - a telephone that works in the after-life, we're really not going to know.

**Elli:** Interesting. That's the last question. Is there anything else that you [*indecipherable*]

**Neil:** I was interested because the questions that you asked there are really similar to what was on the questionnaire. What are you trying to achieve? What are you trying to study – what's your premise?

**Elli:** Well I'm working with the premise that the consciousness of – first of all the outlook and behaviour of other scientists is directly connected to consciousness and what – the specific methodology that I'm using discusses consciousness as being within different modes. You can have different modes of consciousness. For example, with the questionnaire, all of those questions in there are derived from this structure, which discusses different modes of consciousness. These questions in the interview, all of them except the question on peer review – I put that one in there because I'm doing specific study on the process of peer review ?...? – but all of the other questions here are also derived from this structure that discusses the different modes of consciousness. There are some factors which are, well according to this system there are some characteristics of consciousness which are ?...? more ?...? for conservation. It's a very intricate framework.

**Neil:** So how many scientists do you hope to interview ?

**Elli:** Well, okay I think you are number sixteen or seventeen. I think I have another four or five to go - like scientists within the different science programs and then next year I'm going to be interviewing people who are in key positions within science, such as ?Tony Press, Michael ....? Perhaps [*indecipherable*] . I'm also hoping to get an interview with the Australian Science Minister and also perhaps some of the members of ?...? ?...? just to try and understand where science itself is situated. I can look at that through doing a study within consciousness, or most specifically, ?...? methodology ?...? ?...? conservation psychology, which is kind of an offshoot of environmental psychology. So I can look at science coming in through conservation psychology and that's really what my thesis is about.

**Neil:** Okay. So any ideas coming into that.

**Elli:** Well, I've been pleasantly surprised speaking with scientists so far. I can't discuss any ?...? with you.

**Neil:** No, I don't need to know.

[END OF TAPE]

## 2. ALLISON, Ian (ACE CRC/ AAD)

### Start of tape:

**Elli:** This is I think Interview No 13 or 14 with Ian Allison, Program Leader of Glaciology. Ian can you first of all just explain a little bit about your position within the Glaciology Program and how it fits within the ?...? ?...?

**Ian:** Okay. I have been Program Leader of Glaciology - I'll get onto that ?...? in the past - which involved both being responsible for the coordination of all the glaciological research that's done in the Antarctic but I also have a direct line management role for the people who are employed in the Glaciology Program by the Antarctic Division. Now with the recent new strategic directions I'm still responsible for my management of people in the Glaciology Program, but my leadership role has been expanded to include everything from ....atmospheres and climate.

Comment [AAD1]: ??

**Elli:** Okay, so how do you fit within ?ACE? CRC?

**Ian:** People employed in the Antarctic Division Glaciology Program are all contributed staff to the Cooperative Research Centre, so the work they do fits within the CRC objectives ?...? different people work on different projects there.

**Elli:** So which specific program within the ACE CRC would most of the work that your people are involved in?

**Ian:** They're probably involved in several of them, mostly in the climate variability and change program and also the sea level rise, although there is the requirement to provide some of the physical sciences background to the Antarctic marine ecosystem program also.

**Elli:** Alright, thank you for that. Okay, shall we move onto the questions?

**Ian:** Yes, sure.

**Elli:** Okay. Question No 1: What inspires or excites you the most about being an Antarctic scientist?

**Ian:** I guess the place itself – the size and the unspoilt nature of a lot of it. I never get sick of being in the Antarctic. I never get bored by new surprises, new things you see there. Mostly just the scale of it and the immense power you see in nature in the raw.

**Elli:** Do you spend a lot of time down there?

**Ian:** Not as much as I used to. I'd probably do a trip every two or three years for maybe two or three months.

**Elli:** Okay. Question No 2: Can you tell me about your original motivations for becoming an Antarctic scientist?

**Ian:** I was doing physics at Melbourne University and I was going to move on and do an honours. It probably would've been high energy physics somewhere working in a basement full of particle accelerators. I used to wander around the university grounds and outside the staff club there was often this vehicle parked. It said "Department of Glaciology" on one door and "Department of Meteorology" on the other door and it always had skis on the roof. So I went to the Department and asked them what the opportunities were for postgraduate work and I changed my direction then, and that was a group in Melbourne that had largely started the Antarctic Glaciology Program in Australia and was still supervising it from the university. Being there and seeing people go and come got me motivated.

**Elli:** So you come from a physics background.

**Ian:** Yes.

**Elli:** Alright, so it was the science.

**Ian:** It was the science and also science that was exciting. Science that involved some environmental, work involved work other than in a laboratory.

**Elli:** Yes.

**Ian:** It was also the attraction of the place itself and doing something other people weren't able to do.

**Elli:** Okay, so a few things. Now this next one's a bit different. Can you tell me anything about your own consciousness during your working day. In other words what usually goes through your mind during an ordinary working day?

*[interruption by phone]*

**Ian:** So what goes through my consciousness.

**Elli:** In an ordinary working day.

**Ian:** At the moment I guess I'm mostly making mental lists of what I've got to complete in the time I've got. A lot of my work now is administrative and management and I very seldom have a chance to pause and think about some of the bigger science issues. I do occasionally, mostly when I'm talking with other people. It's mostly just making mental lists and working out if I'm going to get 'my next task done...' tomorrow.

**Elli:** Okay. So would you say time constraints or time scheduling issues like trying to fit things in.

**Ian:** Yes, a lot of that. I don't think much about Antarctica in the office.

**Elli:** So you used to do more science than what you're doing now. Now you do more administrative?

**Ian:** Yes mostly administrative and management. I have 'responsibilities' for an overview of the science but I don't tend to do a lot of nuts and bolts. I'll sit together with groups of people and talk about what they're doing and throw in ideas. Most of the science I do is when I've got to review papers and things that other people in the group are working on.

**Elli:** Okay. One of the things I've discussed with some other interviewees, because they've also brought up time constraints and not just within administrative tasks but also '...?' science. One of the questions I've asked them is - in their opinion do they think that the consciousness of researchers might impact on the results of the science - and I've had a variety of responses so I was wondering if you had an opinion on that.

**Ian:** Can you elaborate a bit more.

**Elli:** Yes. For example, say if we had two different scientists and one scientist is purely focussing on his work and is very purposeful in what he's doing and he is very careful that his work fits within the bigger picture of things, and the other scientist might be thinking, 'well, I've really got to get this work done. I've got plans to go out tonight', or he might be thinking, 'as soon as I get this done I'll get my pay rise' or something. So given those two scenarios you could say that the consciousness of those two scientists is different, so within that rough example could you say it would be so that you might end up getting a different quality of results of work of those two scientists.

**Ian:** I don't think it's as obvious '...?' example you gave. I think most people do care about the quality of their work. Some people have better ability than others to see directions. A lot of the work we do is done in groups so you spend a lot of time talking to each other '...?' people can drive the research. People don't tend to be rigid. They'll change their minds, they can be persuaded. Some people will go all out to finish something because they're driven by that, but that doesn't mean they want to get something in for a pay rise. It means they *don't* go out for dinner, they continue working at night, whereas others are much more structured in the way they work. It's the same in any group. They'll very rigidly from nine to five and they're probably more productive because they manage their time better within that.

**Elli:** So would you say that there's a variety of personality types.

**Ian:** There certainly are, yes. I could name you names if you want, but I'm not allowed to.

**Elli:** That's okay.

**Ian:** I think that's to the good. You see this when you're doing performance appraisals of people. Some people are very ordered and structured and they can very carefully lay out what they've done. Others you'll observe put a lot of effort in but the results aren't nearly as obvious.

**Elli:** So as far as consciousness goes, do you think that consciousness plays a role '...?'

**Ian:** Only in that their consciousness is determined by the type of personality that they are.

**Elli:** Well that makes sense. Okay. Question No 4: In your opinion what role, if any, does qualitative science play in Antarctic science?

**Ian:** I think it plays quite a considerable role. I think many of the ideas people have first are qualitative ones. They see a mechanism as a thought model for something that happens. One guy has

been here, I won't name him, but his ability was to see the big picture and synthesise things and pull them together. In the sort of science we do, that's not the final answer. You need people with that vision and that 'qualitative' vision but then you've got to follow that up with a lot of quantitative measurements to show if that concept is true or not. It's having those ideas and seeing links between systems and processes that really drives the science, much more so than making the results. The whole science method is to have some theory that you're testing, some concept, and if you don't have that concept in the first then it's usually qualitative.

**Elli:** So just on what you've said, do you think that qualitative input is something that is lacking within Antarctic research, or that qualitative way of thinking should be enhanced or encouraged?

**Ian:** It's rarer than the very careful measurement process and you'll always find there are fewer people like that and there are other ones that can 'pull up...' the detail. They tend to be the people that lead.

**Elli:** Okay interesting. Do you think that that situation has contributed to the shape of Antarctic scientific research - that ratio where you have a small number of people who can perhaps see the big picture and a bigger portion of the Antarctic community who don't really have that ...

**Ian:** I wouldn't say they don't have it. They don't have the highly developed ... No the ratios about right. The quantitative stuff has to be done. You have to get the measurements to show that the concepts are right and that's a lot more work and involves a lot more money than just perhaps sitting down and having a big idea, but you need people with both and you need more of the others.

**Elli:** So you think that that ratio is quite good.

**Ian:** I think it's about right yes. I guess the other thing that comes in is that sometimes the big concepts don't come out of your own group, they come from other people.

**Elli:** Yes, from other places. One other thing very quickly to do with qualitative science. There have been today a number of publications on something called researcher influence. Some people will say that even if the scientist 'is working with' very black and white methodology, he or she will always bring some hidden values or biases to the scientific process that is another area qualitative issues, one could say, or qualitative science. It's the actual variables, although they might be very subtle, that the researcher imposes on his or her research. Do you have any thoughts on that?

**Ian:** I think that's true and there are certainly ideologists in science and there are people who passionately believe in what they're doing and the problem they're studying and if they were having a hard time changing direction if all the evidence showed that what they passionately believed in was incorrect and the opposite applied.

**Elli:** Meaning that they're attached to their theories.

**Ian:** They're attached to their theories, or it may be '...?' that they have a very strong environmental ideals.

**Elli:** Alright.

**Ian:** I mean we try and iron that out in the review process but science is not always correct – seldom correct probably. It's very, very hard for people in science who go against the common flow to get published, to get their ideas accepted.

**Elli:** Yes and that brings us into peer review, which is '...?' and I don't know why. You brought up a few interesting things there. People who may have ideas or insights into science that are different from the mainstream kind of way of thinking. How does that work for a scientist who might be employed by a government supported organization. How does the scientist survive in an organization like that.

**Ian:** Probably with some difficulty. I don't think anyone stops them doing their work but it's hard to make progress in their work, because if you've got an idea, a big picture concept, this qualitative idea that goes against the grain of everyone else, it's very hard to get the resources to follow it up with other people doing quantitative work to show that you could be right.

**Elli:** So there's two things that would stop them or would put the limits on them and one would be the government goals, or the government agenda...

**Ian:** Yes, certainly.

**Elli:** ...and also this thing, peer review. I mean it's through peer review that keeps everyone agreeing.

**Ian:** It's as much peer review of the research proposals as it is papers. It's often hard for people to get papers published when they go against the grain too, but I think that's probably easier than to get the funding to do the work in the first place. The government objectives, we have them there and then the 'catch or? ...?' of do anything else you like – practical or economic value or national importance. There's lots of small projects there. It's hard to get big projects up and the classic example is astronomy. The astronomers want to do work in Antarctica and their difficulty is that they need an awful lot of money to do what they want to do. For them to get a large program means redirecting funds.

**Elli:** Is that the main thing that's been hindering the astronomy program because I heard something that they were struggling to get it going.

**Ian:** The astronomy community in Australia is very well organised.

**Elli:** Is very well organised?

**Ian:** Yes, and it serves as a very effective lobby. They tend to have a lot of their disputes in-house and settle them first. Antarctic astronomy has not been the top of the astronomers own list of things that '...?' on large scale '...?' In the funding of the community '... In the Antarctic ...the money available through the Antarctic grant scheme is trivial. They give other astronomy projects as top priority rather than infra-red astronomy in Antarctica.

**Elli:** Okay. I would have thought that Antarctica would offer an astronomer many good opportunities because of the ...

**Ian:** Well it's basically what they call the '...?' of the atmosphere – the coldness of the atmosphere, lack of background light – all those things.

**Elli:** Yes [*indecipherable*]

**Ian:** There are opportunities there but it's expensive and it's expensive not only in the tools they need to do the job but the infrastructure required to put it in Antarctica.

**Elli:** Yes I understand. Okay Question No 5: Do you have any thoughts on the idea that spiritual insight and wisdom should play, or does already play, an active role in contemporary scientific research such as physics and biology?

**Ian:** Can you try that again.

**Elli:** Okay. Do you have any thoughts on the idea that spiritual insight and wisdom should play, or does already play, an active role in contemporary scientific research such as physics and biology?

**Ian:** Well wisdom has to have '...?' Insight also, but I'm not sure what level of spiritual insight. Again it's getting onto the qualitative science idea. People have to be able to think of abstract concepts – have insight into those to really advance things. I personally wouldn't '...?' spiritual '...?'

**Elli:** Okay. Next one, number 6: What do you think the goals and values are that are most prominent in your work culture at the Australian Antarctic Division. I suppose in your case it's also in ACE CRC, unless you find there's a big difference in the work culture.

**Ian:** No it's the same. I guess it's the commitment to the objectives you're trying to deliver on. It's self-motivation and a certain amount of dedication and also along with that a self-criticism – checking and being careful of the work you do.

**Elli:** That's interesting. I haven't heard that mentioned – the self-criticism.

**Ian:** In that you have to be your own hardest critic I think, on a lot of the stuff you do.

**Elli:** Do you think that's fairly prevalent?

**Ian:** It varies as it does with people. I can think of some people who never even bother reading a second time what they write, or checking it, and churn it out and yet there are other people who are so self-critical that they never get anything out because there's always something that they've got to go back and correct.

**Elli:** So you've got both.

**Ian:** Yes we've got both.

**Elli:** If you were to say that the Australian Antarctic Scientific community – where would you place them on that scale of self-analysis or self-criticism.

**Ian:** Well in the physical sciences I think it's more on the side of having a little bit, or a bit too much of the self-criticism. The people who have less of that often have an impact on the short time scale. I think the legacy they lead is not always a sound one. That's in extreme cases. What's really

nice is a mix of different sorts of people in a group and to get them to come to a common agreement about just what's enough of being careful and checking and convincing yourself.

**Elli:** Just on this note, have you have had the opportunity to spend time amongst Antarctic scientists who are not Australian, like in the New Zealand Antarctic program.

**Ian:** I haven't worked extensively – I mean a lot of meetings and short exchanges of one or two weeks. We've had a lot of involvement with the Chinese program and we've had a lot of Chinese in the early days come here and train with us and basically work almost as students.

**Elli:** So they became part of the Australian team.

**Ian:** Yes. Then they went off on their own.

**Elli:** Okay. Well I was going to ask you whether you had witnessed another Antarctic culture in another country as ?...?

**Ian:** I guess what we were doing was inducting them into our culture.

**Elli:** Okay. Question No 7: Do you have any thoughts on the process of peer review as a means by which to ensure rigour in Antarctic scientific research?

**Ian:** I think it's a necessary process. It's often flawed.

**Elli:** What does that mean?

**Ian:** That you can send out a paper for three different reviewers and get three completely opposing opinions back. I don't see an alternative to the process and I think for it to work properly you need to have a good editor – someone who's managing that process and making decisions and directing both the reviewers and the authors to deliver on something that really 'fits'.

**Elli:** Okay. As far as the rigour goes, you say it's not perfect ?...?

**Ian:** No it's not perfect.

**Elli:** It's not perfect.

**Ian:** No.

**Elli:** So if it's not perfect then it may not guarantee rigour but do you feel that ...

**Ian:** Certainly. It's not perfect in two ways. You can get reviewers that are completely wrong and reject a paper because they don't understand it and if the editor also doesn't understand where they're coming from you can reject a good paper. But you can also get reviewers who don't take enough care and something slips through that's probably faulty. The process certainly does help and you can see that. Most journals now will publish lists of reviewers who have really contributed to not just checking the process but improving the paper offering positive ideas to the authors.

**Elli:** Within science papers is it mostly anonymous or is it mostly not anonymous?

**Ian:** It depends on the individual. ... Some people always say that they're happy to have their name released. I tend to say that.

**Elli:** So it's really up to the individual.

**Ian:** Yes, some journals won't release them under any circumstances but all journals will keep the reviewers name confidential. If you want it some will let you and say 'here you are'.

**Elli:** Okay. What's the general trend, do most ?...?

**Ian:** I would say it's about fifty-fifty. People tend to be quite happy to release their name if they feel they're making a positive contribution to the paper. They're saying to the author not that this is a "load of crap" but this is a good idea, however have you thought of doing this much extra. Often you will see the acknowledgement that says acknowledgement to a reviewer by name.

**Elli:** Right, Question No 8: Have you ever considered giving up your professional position as a scientist for a simpler life, and a simpler life here means renouncing material life for a life of austerity and spiritual self-realisation and can you explain your answer?

**Ian:** I haven't thought of giving it up but I can be austere though if I'm a scientist. I haven't thought about giving up my work, no.

**Elli:** How could you be austere as a scientist?

**Ian:** I'm not quite sure what you mean by the simple life being austere. There seem to be two different questions. One - giving up your work and; two – putting on the sackcloth.

**Elli:** Okay.

Comment [AAD2]: ??

**Ian:** I can go home and wear a sackcloth every night.

**Elli:** I think what I was meaning with it was, for example, if a scientist who was employed full time was to give up work well, one – they would stop having an income, which means that their lifestyle would change dramatically. They couldn't have the comforts that they normally have, so as far as a simple life goes it would be a more restricted life materially speaking. I suppose that's where austerity comes in. That person who walked away from his job he may even have to sell his car so how he's on foot. The whole lifestyle becomes more austere.

**Ian:** Yes but that's only ?...? linking the salary to the lifestyle. There are people in our program who lead very simple lives – don't own houses, don't own cars, don't have a licence. They still work as scientists and they have a salary. I don't know what they do with their money, whether they give it all away to charities or they just stuff it under the mattress.

**Elli:** Well, it's that kind of thing ?...? removed from a comfortable material life to a simple life and perhaps the scientists that do live like that see themselves as living austere or not, or maybe they see themselves as living – there's an expression called ?...? simplicity ...

**Ian:** Well I was going to say uncomplicated lives rather than austere.

**Elli:** So, yes it's true that one can live very simply and not live austere but then really I suppose it comes down to definition – what you classify as austere. Generally I think I just meant giving up material comforts ?...? having a good career position and living materially very simply and perhaps focussing on spiritual self-realisation. In other words focussing on non-material values as opposed to material values.

**Ian:** I think the word used there was spiritual again.

**Elli:** Yes. In my ?...? I've replaced 'spiritual' with 'non-material'.

**Ian:** I think they're quite different.

**Elli:** Spiritual and non-material.

**Ian:** Yes. I don't think you'd need to lead an austere life to lead a spiritual life. Look at these Monks up the road here, the big Mercedes they drive around in, and they would I'm sure argue, and probably correctly, that they lead a spiritual life.

**Elli:** I think also just on that note I'm very sure, not 100 per cent sure, but I'm very sure that they also refrain from any sort of intoxication. They never go out at night, they don't allow themselves ?...?

**Ian:** Yes and the ?...? the material things they have are probably communal ?...? individuals.

**Elli:** Yes, so there is perhaps restriction on their behalf ?...? involve themselves ?...?

**Ian:** I'm not answering your question. I guess I have not considered giving up science and taking on spirituality.

**Elli:** ?...?

[END SIDE A]

**Elli:** Okay, the last question. As a scientist are you at all interested in whether or not species of Antarctic fauna and flora have, or are, a spiritual soul and can you explain your answer.

**Ian:** I guess I'm not interested in it because I haven't really thought about it. I have trouble with the whole issue of spirituality. That's probably because of the way I am. I'm not even sure what it means in people. They can be thinking about high level issues, largely abstract, and there's a role in that. I don't see a lot of difference between theology and some cosmology.

**Elli:** ?...? ... fundamental questions within cosmology that are the same, if not similar, to religion. Also I think some of those questions could possibly have been for science.

**Ian:** Certainly.

**Elli:** Extremely normal physics.

**Ian:** And mathematics, very strongly.

**Elli:** Yes. Alright, that was the last question but I wanted to go back to one.

**Ian:** Right.

**Elli:** I was thinking as we were talking – it was actually the second question – what are your motivations for becoming an Antarctic scientist – because you were telling me the story ?...? .... you

saw the car with the “Bureau of Meteorology” and “Department of Glaciology” and then you decided to look into that ?...? and then you went on a little bit to say that you were inspired by the Antarctic environment ...

**Ian:** Well I had an interest in ?...? or environmental issues and seeing that made me realise that there were paths I could take in science that allowed me to work in that sort of area, so getting into that department opened up opportunities that I really wanted to take anyway. That particular car or something opened doors to me – let me realise that there other ?...? When I did science as an undergraduate there were small departments around but the mainstream you did physics, you did chemistry, you did mathematics and sometimes you might do geology.

**Elli:** So you could say there was the opportunity to do the science that you wanted to do within a ?...?

**Ian:** Well it allowed me to work in an area that I found fascinating and interesting in itself.

**Elli:** That’s the main ?...?

**Ian:** Yes.

**Elli:** Okay, thank you very much. Is there anything else that you can think of that you might want to add to any other question.

**Ian:** Not at this stage, no.

**Elli:** Alright, thank you very much Ian, I appreciate your time.

**Ian:** ?...? So some people get interviewed, and some people do the questionnaire.

**Elli:** I’m being a bit greedy. I’ve had a couple of scientists ask me, ‘I did the interview so do you still want me to do the questionnaire’.

**Ian:** And you said yes.

**Elli:** Yes, if you want to. *[informal conversation between Elli and Ian regarding questionnaire]*

[END OF TAPE]

### 3. Barmuta, Leon (UTAS)

Start of tape:

**Elli:** This is interview number fourteen with Leon Barmuta. Leon to begin with would you like to explain a little bit about your own research that is connected to Antarctic research.

**Leon:** Certainly. I’m a fresh water ecologist who mostly specialists in things that live on the beds of lakes, rivers, streams and so forth. My connection with Antarctic research is through a project that I’m co-supervising with Dr Kerrie Swadling and Dr John Gibson and the research student involved is somebody called Louise Cromer. We’re looking at the biogeography and the recent palaeohistory of a number of Antarctic lakes. Some of them are saline, some of them are fresh and some are in between and so our interest is firstly in biogeography of these exciting animals, which are mostly invertebrates, zooplankton, but we’re also interested in seeing whether the patterns that we can see over time in sediment cores taken from those lakes agree with current thinking about recent climate change in the area.

**Elli:** Okay, so your research involves both the geosciences and biology in one sense, it’s a mixture.

**Leon:** Yes indeed. I think formally our grant is administered by the geosciences program because ?...? cores of long dead material and dating techniques and things like that.

**Elli:** I hope you don’t mind me asking – you’re working for the Antarctic Division ?...? working within ACRC.

**Leon:** ?...? ?...? part of TAFI the Tasmanian Agriculture and Fish Institute and Kerrie Swadling who’s a ?...? research fellow approached me to see whether I’d be interested in helping supervise ?...? So that’s the connection there. So outside the Antarctic CRC thing I’m the best freshwater researcher ...

**Elli:** The reason I ask is because there are so many programs, the 'web' of different Antarctic organizations and also non-Antarctic organizations that *[indecipherable]*

**Leon:** Yes. I think John Gibson who's also part of the '...' team has a more formal connection with the Antarctic CRC.

**Elli:** Okay. So are you ready to start the questions?

**Leon:** Indeed.

**Elli:** Question No 1: What inspires or excites you the most about being an Antarctic scientist?

**Leon:** Right. Having never been to Antarctica, my virtual interest in Antarctica is that it's a place that has very special recent geological history and so the questions that we're doing '...' some researching can only be done in Antarctica. Climate change and using invertebrates to '...' '...' about climate change is perhaps best addressed in some of these Antarctic lakes. That's the main reason for doing that research. If we could do it somewhere else that's better we'd do that.

**Elli:** So it's the opportunity – scientific '...'?

**Leon:** Yes.

**Elli:** Now. Question No 2: Can you tell me about your original motivations for becoming an Antarctic scientist, or perhaps in your case, for getting involved in Antarctic science?

**Leon:** I've always been more than vaguely interested in Antarctica, well not so much Antarctica but also some Antarctic islands from a '...' stand-point. I guess this particular project was a good opportunity. I felt comfortable that we were doing meaningful science that could only be done there and for me that's always been a big part of becoming involved in that type of research. You don't want to just to research down there because it's difficult. It's very, very expensive. I'd find that difficult to justify if I just went down to do a survey for example. So this particular project had a nice combination of practical things and also the excitement of '...' visiting some lakes that nobody's sampled before. '...' fill in some substantial gaps as well '...' analogy of freshwater fauna of Antarctica.

**Elli:** I suppose it's similar to your response to question number one, that's the opportunity to do special scientific '...'?

**Leon:** Yes, and also a big part of it is feeling that I'm not wasting the taxpayers money – it's not junket science. That's always been a very strong opinion that I have is that if you go to somewhere that's difficult logistically to work in then you need to have good reason for going there.

**Elli:** So you feel that the science that you do, or can do down there, whether it's actually travelling there or not, is important.

**Leon:** Yes, certainly.

**Elli:** Just on that note. How would you define 'important'. In what context would you say it's important.

**Leon:** The climate change aspect of the research is the thing that has practical importance. To make '...' about climate change you need to gather evidence from a number of independent lines so you can't just rely on carbon dioxide in ice cores, or just rely on chemical changes in sediments and so forth. Somebody once said that truth is an intersection of independent lies - truth is the intersection of independent lies *[laughter]*. So if the patterns we see out of the zooplankton in the cores are consistent with the patterns that people have got out of other independent lines of evidence then we've got a stronger, or a clearer picture, of what the recent climate changes have been in Antarctica and therefore in the southern end of the world. I think there's an emerging consensus that we can't rely on a bunch of ice cores from Greenland to understand what's been happening in the Southern Hemisphere. There's been a bit of that, so it's of practical importance. There's also a sort of a biogeographic/freshwater ecological importance, which is perhaps a little more 'Archean?', or maybe it's not that 'Archean?'. Increasingly Antarctic has been visited a lot more and one minor motivation in this particular project is that one reviewer of zooplankton maintained that a particular species was introduced there accidentally by researchers or whatever. We've actually been able to discount that quite substantially.

**Elli:** You mean eradicate it?

**Leon:** Well not eradicate it but we've found '...' evidence that this thing in layers of 'mud cores' are many tens of thousands of years old so it's been there forever. It's a puzzle how these things manage to hang on there given the last Ice Age and all that sort of stuff. So we've been able, very earlier on in the piece, lay that particular 'ferfie' to rest '...' '...' But, yes I guess the time is right to

get a handle on the freshwater fauna before there are too many more, or too many accidental introductions or interferences with both lakes.

**Elli:** So you did a fair bit of palaeo, or a fair chunk of your research down there is connected to palaeo research.

**Leon:** Yes.

**Elli:** The idea I suppose of studying palaeo ... the future.

**Leon:** Yes indeed. I guess in climate change research the bit that always seems to be missing, we seem to be quite good at ... complicated computer models which can simulate what happened in the last hundred years, and we're quite good at getting the hundreds and thousands of years timescale right, but it's the stuff in between – the things that ... like to be facing in the next five hundred to two thousand years, which we need to better understand as climate changes, or does change. How variable the thing's going to be – if we're going through a greenhouse phase or we're going to – it's not just the average rise in temperature, it's how much fluctuation there is, or the ... is about to change into a new Ice Age. Again it's the variability of that climate signal which is likely to cause lots of strife for humans and extinctions for animals and plants.

**Elli:** Is there in fact any part of palaeo research that you're aware of ... Antarctic research that is not done for the purpose of predicting ... for the future. Is there any palaeo research that is done just purely as an interest.

**Leon:** I'm certainly aware of earlier research where people were purely interested in actual fossils in rocks and things like that and published work on dinosaur bones [*indecipherable*] ... Antarctica ... all part of the 'Gwandana' story. I don't know whether that stuff is still continuing. I'd be surprised if it wasn't. ... people tend to go for the last couple of thousand years ... resolution.

**Elli:** Alright, now Question No 3 - it's a little bit different. Can you tell me anything about your own consciousness during your working day. In other words what usually goes through your mind during an ordinary working day?

**Leon:** What usually goes through my mind is how much administration there is to do and how's it going to fit. Yes, it's mostly stuff to do with trying to juggle the huge administrative load - ... graduate teaching, post-graduate supervision, administering grant things, and I must confess that working in the Antarctic Division there is even more forms and things to deal with so it's ... plus ... fourteen month old baby making sure that 'works stops' ... go and rescue from childcare. I'd like to say that there is some higher mental processes involved there.

**Elli:** I appreciate your honesty. So time constraints is a big one for you – you're conscious ...

**Leon:** Yes.

**Elli:** Just on that, would you say that things such as time constraints or other influences on one's consciousness, that that could contribute to the results of one's work as a scientist?

**Leon:** Contribute towards?

**Elli:** Well, it could influence. For example, say if you had two scientists and one of them had plenty of time – not many time constraints. I don't think I've spoken ... hypothetically, and then you had another one who was perhaps – let's say something else. Let's say that he wasn't pushed for time but let's say he spent his day thinking about how he really wanted to get the work done ... because he had plans to go out for the evening and he was going to have a wow of a time with his mates, so he's holding that in his mind, whereas the other scientist might be really focussed on his work. Do you think that the actual results of scientific research within those two examples, do you think that could contribute to variables within the outcomes of scientific research?

**Leon:** I think, given those two ... I think if they both were given the same project, they'll probably both achieve similar results in terms of the raw data that comes out and things like that. But the one that was more interested in thinking about their science would probably be able to do more with those results and generate more ideas than the one who was treating their science more like a technical job. In terms of time pressure the things I miss the most is having time to think. I really only get time to think when I'm writing ... on my bicycle. Yes, from the perspective of generating new ideas and being an innovative scientist, then finding space within the working day, or during your life, to actually sit back and take some stock of things and stare out the window and just let your mind rove across all the results that you've been getting is really important. There's much more of a creative process more akin to painting or drawing involved in moving the ideas forward. Many

people tend to think science is a bit like welding or whatever, you just put another brick in the wall and then write another paper or whatever and that's all there is to it.

**Elli:** Perhaps putting one's science into the bigger context, the bigger picture of things, ?...? ?...? Okay, that's interesting. So you would say that there could be some ... well, if we can say that time constraints or pressures can influence our consciousness, then you do agree that in some cases the consciousness of scientists could influence the productivity or creativity?

**Leon:** Oh, easily yes.

**Elli:** But you don't think necessarily when there's just a number to punch in ?...? that that science would be influenced ?...?

**Leon:** Provided you've got enough sleep and so forth and not making mistakes on your computer then the business of – not particularly in our area where you're sorting little bits of long dead invertebrates out of from sediments and so forth. You're brain tends to go in neutral and you're just sort of picking the bugs out of muck and I'm now beginning to think that ?...? ?...? I almost missed that. As a PhD student then sorting samples is a major chore which occupied most of the day, but at least you've got the opportunity to think about things while you're doing it and actually seeing the data, feeling the data if you like as that's happening. It can be a big part – enjoying your science and also ?coming up? ?...?

**Elli:** So as far as imposing on your natural space, would you say that the administrative things ?...? are the first thing ?...? ?...?

**Leon:** Yes. Also teaching is part of my job and the administration of students. I find the actual contact hours involved in running a practical or a tutorial session or a lecture or so forth, that stuff can be quite enjoyable and I enjoy those sorts of things. But the things which really take a lot of head-space and really emotionally draining are students who cause problems by not turning up, by enrolling late, by not reading the instructions and also the ?...? formal brought against you. The tedium of having to document meetings you've had with students it's just really annoying.

**Elli:** Okay. Question No 4: In your opinion what role, if any, does qualitative science play in Antarctic science?

**Leon:** Qualitative science. By qualitative science you mean...

**Elli:** Okay, well. Two areas in particular that come to mind when I say qualitative science. I'm a social scientist so we use the word qualitative science quite a lot but I'm thinking that within Antarctic science, one example is a biologist who might be studying the behaviour of seals or penguins and recording their observations of how the different animals behave, or how they respond to different stimuli, because these days, as far as I know, most of that sort of research that has been done in Antarctica has been monitoring of heart rates, which is more quantitative.

**Leon:** The illusion of measurement. *[laughter]*

**Elli:** Then another very strong area of qualitative science – you've probably come across these days – there are a number of publications on what we call researcher influence. In other words, every scientist no matter how black and white their science is, the scientist will always come to the scientific process with a number of hidden biases and values ?...? onto the scientific process. Some people argue that you can never really get the ?...? value ?...? science because of that, so that to me is an area where there are qualitative influences in the quantitative ?...? Do you have any thoughts on that?

**Leon:** Basically I agree. When I had the time I used to read quite a bit of the philosophy of science and being a ?child in Sydney? in the early 1980s it was ?...? doing some things like philosophy and we were very keen to buck any idea that there's any ?...? objectivity. As a child of those times I ?...? *[indcipherable]* ..published a few years ago about how people can even be aware of their own personal philosophies or the cultural ?...? within which they're working but it would be very difficult for anyone to actually do anything about that. I think that qualitative issues do effect the way people do science. Whether those qualitative issues effect what we're doing in Antarctica – I had to think about that a fair bit. Yes, just articulated pieces of invertebrates in mud. *[laughter]*

**Elli:** In mud.

**Leon:** Yes, mud cores. *[laughter]* What ?...? ?...? am I bringing ?...? Well, I guess qualitative things come into why we would choose to study things like climate change using that particular tool. It's really big picture sort of stuff. I guess fundamentally I think that it's always a good idea to be sceptical, even if things on which there is a consensus like global warming, so there's a little part of me that secretly hopes that the zooplankton will tell us a very different story from what people have got out

of CO<sub>2</sub> concentrations or whatever. That's when things get really exciting. It's always very appealing to ?lapse into denial? when thinking about climate change. There's a bit of me that would like to ?...? people around a bit and say, well think hard about whether this ?stuff's? really happening because there's big money and big commitments and resources and people are being put into the climate change bucket. To be honest, the standard of proof of climate change is possibly a little more relaxed than we had ?...? ?...? trying to demonstrate competition between competing species on a rocky ?...? shore or something like that, simply we don't ?...? giant experiments on planet earth ?...? ?...? a dozen different ?...? You can't replicate the planet. It's interesting isn't it because you often hear ?...? scientists having a go at social scientists for trying to do research on whether an intervention like increased ?...? results in ?...? and all that sort of stuff. You also manage to dig out the physicist [indecipherable]. ... When it comes to big physics like climate change type stuff, they're in the same ball park. They're only able to deal with descriptive data as they've got it – you can't do an experiment. All you can do is really construct some sort of miracle model and ?...? some notes.

**Elli:** Yes. Well some people think that if we're to discuss the researcher influence factor, some people will say that is something that occurs on a macro scale ?...? micro scale. In other words if one was to look for research influence on the scientific process then they should go to the bigger picture. In other words, what actually ?...? the whole scientific process ?...? involved with and then you ?will find? that there is ?foundation? that is actually quantitative. But that's getting ?...? philosophical [indecipherable]

**Leon:** Yes.

**Elli:** Alright. No 5: Do you have any thoughts on the idea that spiritual insight and wisdom should play, or does already play, an active role in contemporary scientific research such as physics and biology?

**Leon:** Spiritual insight. Yes, when I read that question I was thinking well what do you actually mean by that.

**Elli:** Okay, I kind of deliberately left it open for interpretation.

**Leon:** Right, okay.

**Elli:** I think the dictionary meaning of the word *spiritual* is something perhaps metaphysical. Sometimes they give the meaning of religious and other times it's metaphysical – something that is beyond us, our physical realm. So it's really up for interpretation.

**Leon:** Yes. ... I ?categorise? myself as ?...? spiritual person. I certainly don't have any religious slant these days. One level doesn't really come into the science that I do, but then there's another bit of me that says, well I'll look at the things that I'd like to work on, or try to get funding to work on. It's not ?pollution? ecology or things like that. I did score some funding to look at both those sorts of issues but it doesn't fire me up as much as the opportunity of going to wild place or a river or lake or whatever which has been in better condition or less affected by human beings. I guess there's a dimension there which – an emotional pull towards ?...? pristine but wilderness in the true sense of the wilderness type systems. I think they have an opportunity to tell us how the rest of the world works. ?...? articulate that. ?...? ?sense? it's difficult. I've had a long-term ambition to just do some basic ecology of something as untouched as the Denison River in south-west Tasmania. Hugely expensive but I really articulate to a funding agency why I would think that would be worth doing. Often interesting stuff comes out of that sort of pure curiosity driven research. If just pure curiosity is an aspect to spirituality, then yes. I mean it's being enthused and curious about something that's a very important ingredient of doing some science and certainly as a researcher I'm not that enthusiastic or enthused about it. It's a real chore to do and a real chore to write it up.

**Elli:** [indecipherable]

**Leon:** I would imagine so, yes. To be honest I can't think of a lot of scientists I've met that I would call 'wise'. Again it's difficult to define but there's a couple of people like – well he's still alive – a famous river ecologist Noel Heinz who, when I finally met him after I'd done my PhD and things like that, struck me as being very wise and able to think very broadly and bring a lot of life experience to a particular problem or a topic. A very ?inclusive? sort of person to deal with - quite the answer to the goal driven, managerial sort of ideal of what a scientist should be these days. Definitely somebody who would sit on the back verandah or drink and think about things.

**Elli:** Think about the broader picture.

**Leon:** Yes.

**Elli:** Would you go as far as saying that such a person would have a more holistic view of science?

**Leon:** Yes, that word holism is a ?...? Somebody once said *[indcipherable]* ... There was another person, Bob Newberry, who I also regarded as being a wise scientist. What appeals to me in their approach is that they're able to see linkages between things. I don't think it's holistic things, but they're able to see where the gaps are and know the limitations of what they know or what other people know, how say they know about things. They're able to see the big picture – they're better able to see where the big picture is ?wanting?. It's the ability to identify gaps – opportunity is not quite the word I'm looking for but if you're going to make a big advance then you do this bit and you think, 'Oh, of course yes. Why didn't I think about that sort of thing'.

**Elli:** Okay. Question No 6: What do you think the goals and values are that are most prominent in your work culture, and this reads in the Australian Antarctic Division, but should we say amongst the other Antarctic scientists that you work with?

**Leon:** Other Antarctic scientists I work with. I also know and have kept with a number of the people in the Antarctic Division like ?Steve Candy? and Andrew Constable – there's a variety of things. I think that for Kerrie and John whom I'm working with, and Louise, we're genuinely interested in and driven by a fascination for fauna in this particular neck of the woods. Nobody's going to eat it but it's got an interesting story to tell, which is ...

**[END SIDE A]**

**Leon:** ... not very charismatic. Freshwater stuff isn't as well funded or supported as marine research but how these animals can actually hang in over the last few Ice Ages in a really difficult environment, and they are fresh water things – they don't like salt water – it's just a really interesting question and happily it's also going to tell us something about climate change. So I think in that marriage of palaeo, recent palaeo, and biogeography is particularly attractive and it's a nice non-diverse, simple, tractable fauna, ?where I can go to? my local stream and there's three hundred species there. Another bunch of people who I have something to do with in the Antarctic Division are quite passionate about doing good public, good science. Andrew's very motivated about doing good fisheries, or getting ?researcher supports?, good fisheries decisions and things like that. The other people I know are involved in ?...? side of things and are very passionate about gathering data which actually makes a difference. You can gather data until the cows come home but if it's not collected in the right way it's got no information content and that's one of the other ?...? ?my own research? ?...? very passionate and keen about the distinction between mere data and information.

**Elli:** So it's something that's prominent amongst the people ?you work with?

**Leon:** Amongst people I work with. I know it's not a passion held by some other researchers in the Antarctic Division. *[laughter]* *[indcipherable]* So, yes not everything that gets branded for science is scientific. For example, all the aerial photos of penguin colonies may not yield very much information at all but some people seem to think that once it digitised and stuck on the website somewhere then it's somehow useable.

**Elli:** Okay. So for you that's not really science in itself.

**Leon:** No.

**Elli:** No. Science is knowing what to do with it.

**Leon:** Yes, and knowing what you want to collect in the first place, or collecting data so that you can decide between alternative hypotheses or have a clear idea of what sort of patterns you want to generate. There's some fairly infamous examples from the Antarctic Division of, 'Oh, we've got the gear let's collect the data', and nobody really thinks very much about what they want to do with it.

**Elli:** Yes, I must admit I questioned a couple of PhD students on scientific research and what they were going to use their data for, what purposes, ?...? ?...? and what they're doing it for, which to me was quite surprising.

**Leon:** Yes, very sad isn't it.

**Elli:** Okay, Question No 7: Do you have any thoughts on the process of peer review as a means by which to ensure rigour in Antarctic scientific research?

**Leon:** That famous classic Churchill said – "Democracy is really cracky but it's the best got" sort of thing. I think that's probably my opinion on peer review. It's fraught with all sorts of problems but I think it's the best system that we can use at the moment. Any alternatives are always more or less a disaster. ?...? in Soviet science and things like that we you've had some sort of a god-like person at the top who dictates what's good and bad science. Peer review at it's worst can be subject to a lot of nepotism and petty infighting. I know from a colleague's experience from New Zealand ?in Victoria?

trying to get support to try to go down and survey fresh water systems on Macquarie Island. Because he wasn't part of the in-crowd some referee's comments were just ridiculous. Things like 'Oh, if we let this person down there, they will contaminate the different streams with their nets because people from New Zealand and Victoria don't know how to 'wash' nets between sample stations'. Where does this come from...?has? this person actually been out with my colleague. Eventually he was able to get some support and go down there and do the work. When you see those sorts of things you think, well what is going on.

**Elli:** That scenario, was that like a personal vendetta?

**Leon:** Not so far as we know because generally Richard hadn't had anything to do with the Antarctic Division before, or anyone in there as far as he knew. It was back in the late 1980s ?...? ?...? general calls for scientific research and he had ?...? done some work on the lakes and nothing had been done on the streams at all. Nobody had done any work on the macro invertebrates side of things. He put together a fairly cheap proposal to go down and take some samples and bring them back. Then again, the best peer review can work really well. Actually my best experience with peer review was with this particular project in applying for support and the panel got back to us. We had a couple of good referee supports from ?...? one referee's report which was from left field and the panel said, 'well it seems like ?...? referee which isn't particularly helpful or constructive, can you nominate three other people who we might be able to pick one of those and see what they say as well. So we did that. We actually got positive, beneficial feedback to improve the proposals ?of? that process.

**Elli:** So there can be a lot of variations in ?...?

**Leon:** Yes.

**Elli:** [*indecipherable*] scientists ?...? projects and research.

**Leon:** Yes.

**Elli:** Any particular problems to do with peer review that you can think of as far as publications go?

**Leon:** Publications. I haven't tried publishing any Antarctic stuff yet because we're still working that out.

**Elli:** Just in general.

**Leon:** Just in general, again it's probably as good as we'll be able to get but there's a huge variation in the quality of reviewers and sometimes a little knowledge can be a dangerous thing in the hands of some reviewers. You just have to lump it really. I've had to give up on getting papers into what I would consider the appropriate journal because ?...? ?...? or what I consider to be an unfair peer review opinion and have to submit it somewhere else I suppose, which is the usual pattern.

**Elli:** ?...? ...submit it another name.

**Leon:** Oh, you don't have to go to that extent but there's certainly a couple of papers I've had to submit to another journal instead of my preferred journal. In one of those instances four referees thought it was great research and worth publishing and so forth, but the editor ?...? just a thin slip of paper saying it's not fundamental enough for our journal. That's after eighteen months of reviewing.

**Elli:** So there's quite a number of things that ?...? ?...? It's interesting to me because as we go through our training ?...? We started school and had teachers, then we go to university and we have supervisors and when we get to this level of PhD or masters, that's it we're on our own. So somehow the academic community has decided that at this particular level we don't need supervision any more. Why have we chosen to stop at this particular level, but we have. So it's kind of interesting.

**Leon:** It is, yes.

**Elli:** Okay. Question No 8: Have you ever considered giving up your professional position as a scientist for a simpler life, and a simpler life here means renouncing material life for a life of austerity and spiritual self-realisation and can you explain your answer.

**Leon:** Right. I quite frequently think about giving up being an academic but I'd like to still be a scientist. [*laughter*] But I wouldn't want to take such a substantial cut in pay in order to undergo an austere lifestyle. I came from a middle working class background and I know what being poor is like, so it's not something that I particularly idolise and I had quite a few friends who did that sort of Nimbin thing and all that sort of stuff and went off and lived in communes. If I wanted to have a lifestyle of thinking about whether the goat needed milking or not then I would've chosen that by now. It's just something that doesn't hold a lot of appeal to me. There are only some things that I really values as material possessions and certainly with a young family and another baby due and all that sort

of stuff that money's important – educate them and give them a good start in life. I'm just not that sort of person I don't think. I like having my cake and eating it.

**Elli:** Did you say you've got another baby due?

**Leon:** Yes in mid-December.

**Elli:** Congratulations.

**Leon:** Thank you, I think.

**Elli:** Okay last question. As a scientist are you at all interested in whether or not species of Antarctic fauna and flora have or are a spiritual soul and can you explain your answer?

**Leon:** Do they have a spiritual soul. I don't think so. To me the flora and fauna have a legitimate right to exist and as a scientist interested in biodiversity amongst other things ?...? those species should be allowed to continue to exist and in populations as close to pre-contact levels as possible. My reasons for feeling that way, I just find aesthetically animals and plants really interesting and beautiful to look at and inspiring. My ?...? ?...? aren't necessarily cute or cuddly and that's the academic interest, my scientific interest. I find very stimulating things to think about and once you get your ?...? you get an aesthetic connection with those things as well. There's a lot of copepods out there but they can be beautiful in their own right as well, but I stop short of calling that a spiritual connection or a connection that's as deep as the connection I feel for my wife and my family. So, yes the Antarctic flora and fauna has a right to exist, but more than just exist, it has a right to flourish. I think that's more to do with both an intellectual ?...? and an emotional commitment to a sustainable future.

**Elli:** Okay, well that was the last question. Can you think of anything else to do with any of these questions that you might want to add?

**Leon:** Not really. I actually had quite a lot of difficulty separating out the qualitative and the emotional things from the science when I really think about it, particularly in regard to the question you asked about the sorts of research other Antarctic Division people are involved in and what they care about. ?...? ?...? group of people who really cares about data and how it's collected and what it all means and so forth, and that's a really big part of my motivation for continuing in science – continuing in the job I'm in. I'm very passionate about that issue. It's not just because we're going to get better data if we do it, it's also because I think we owe it to society to come up with research which doesn't just have a practical application but it's also really good research and really advances knowledge. Knowledge perhaps does have a spiritual dimension to it. It's something that characterises us as human beings and makes up different from whales or seals or whatever, or even gorillas. That whole business of not just getting the technical side of things right but also getting the setting and the questions and the mindset right to generate knowledge from data is something I'm quite passionate about.

**Elli:** Is that passion as you call it is that something that you recognise in other ?...? Antarctic scientists.

**Leon:** Yes certainly.

**Elli:** Would you say that ?...? ?...? Antarctic scientists, they are ambitious as far as ambition goes? ?...?

**Leon:** ?...? ambitious ... Antarctic scientists have that quality of being passionate about knowledge. Other ambitious Antarctic scientists I can see are ambitious because of the material reward that that brings. I can think of somebody in a completely unrelated ?...? ?...? ...often wonder why he perseveres. ?...? very as much as though it's a job ?...? a bank almost. I think well why don't I get a job in a bank ?...? a chore to go down and do what you do.

**Elli:** Yes, when we were before discussing different consciousness and different ?...? that could be an example of ?...?

**Leon:** Yes I often wonder how those people can sleep straight in bed at night.

**Elli:** Yes. Okay. Well thank you very much Leon. I very much appreciate you time.

**Leon:** It was really interesting, thank you.

**Elli:** Okay.

#### 4. BINDOFF, Nathan (CSIRO/ UTAS)

##### Start of tape:

\* No introductory conversation preceding questions for Bindoff. This was the first interview, after which it was decided to first ask interviewees to talk about their professional positions, before beginning scheduled interview questions.

**Elli:** This is interview No 1 with Nathan Bindoff. Thank you very much for doing this I really appreciate it.

**Nathan:** A pleasure.

**Elli:** Alright. Question No 1: What inspires or excites you the most about being an Antarctic scientist?

**Nathan:** That's an interesting question because I didn't start out as an Antarctic scientist of course. I'm now an oceanographer and I didn't start out as an oceanographer either. I think the way I'd come to Antarctic science is in fact – I'll give you a long story. It started out as a PhD in geophysics looking at conductivity of upper mantle, lower crust. It's completely unrelated and we had to do that in the Tasman Sea. There was another student at the same time and we divided up the data by subject rather than by data type. I was going to cover oceanography and oceanographic signals that were in that data set and the colleague was going to cover the geophysical side. That's how I got into oceanography and that was very new oceanography because at that time the methods that we were using were not used at all widely by the oceanographic community. At the end of that PhD I decided that actually I was interested in a thing called inverse methods and inverse methods is about modelling of the environment ?but? trying to discover the things that you can't get from direct measurements. So that's the inverted part of it – it's estimating things that you cannot observe, but which are used. I went to MIT to do that and I learnt a lot more classical oceanography so I became much more trained in the traditional oceanography community. Then I came back here and I was at CSIRO and at CSIRO we were doing a lot of climate change and I had some nice papers on climate change, large scale ocean change. So Antarctica wasn't driving my thinking at all at that time – that's back to 1992. Then this position became available and the virtue of this position was not so much necessarily the Antarctic focus – there was no Antarctic focus – but it was actually the capacity to do work in climate change. In the first few years I did quite a bit of work on climate change and have written papers about that and the important connection that goes to those climate changes. The climate change story is that it was Southern Ocean waters that were changing and were being observed at distant locations to have changed. That's actually how I got into Antarctic science. I came indirectly through climate change and trying to understand climate change. I think what happened was then, of course I participated in voyages, that was part of the job, and we then discovered things like Antarctic bottom water formation around Antarctica, we realised there was a new source, we were discovering things about the currents around Antarctica for some of the experiments and also the Antarctic CRC was trying to combine physical oceanography in other work areas. I took on projects which combined these issues and so these are the things that I have done since then – so I've done studies of Antarctic bottom water, the ocean currents in Prince Bay and around Antarctica through various voyages. That takes me up until probably four or five years ago in fact, so that's a six or seven year period. I've always been involved in computing and we have to simulate Antarctic so I've ?driven? resources there and in the new ACRC what has happened is that there are key things that are missing, and that we need, so I've spent quite a lot of time getting resources for that. One of the key things that we need is the capacity to actually simulate Antarctica. So I've been driven partly by the need of the ACRC and also recognising how the Antarctica CRC is different from other institutions in Australia and play to those strengths, if I can think of it that way. So if you want to get back to what inspires and excites me about science – I'm now looking back at the question – the things that have inspired and excited me about Antarctica it's the issues of Antarctica and climate change, so that's one. The issues of water mass formation around Antarctica and there's a question of climate change in those, and there's the issues of the very large scale global circulation, which includes the Southern Ocean.

**Elli:** So when you mention these different areas of natural phenomena, are you going to say that you're looking at those phenomena through the eyes of science that inspires you?

**Nathan:** Yes. I talked about a couple of things which I've implied as being infrastructure but the things that have motivated me is the science perspective, so whilst I've been eager to get hold of resources to address those questions, it is always more or less in the context of this underlying science. How to better measure or estimate or observe bottom water formation, so this is part of the global overturning circulation, so that concept is pushed to get this kind of information. One science program I didn't talk about was the Amery Ice Shelf and the interaction of oceans with ice shelves. What drives my interest there – it's not the Amery Ice Shelf actually, it's much more about what is the global fresh water balance, how much do ice shelves contribute to that, and we've done that small experiment to try and undercover that sort of information. So if you like I've got in the back of my mind a picture of the climate system in which ?...? at aspects of it. It has to always be linked to resources so that's why the resource question comes in.

**Elli:** Okay, just before we move onto the next one. Could you say that the inspiration of wanting ?that information? when you were describing your work history leading to this point, a number of times you implied, or it sounded like you were responding to the needs of certain research programs, so would it be correct to say that you were also inspired to serve, could we say the greater group of trying to find out the truth about how something works for the purposes of say conservation, to try and get the big picture.

**Nathan:** It might be a bit glib to say in the service of mankind, the ?paradigm? of climate change I guess has ?underlined? a lot of what I think about. The paradigm of the global overturning circulation is a big part of the paradigm that I think from, so it hasn't come out of just a lump of simply *the ocean*, it's the relationship of the ocean to climate or earth in the very broadest terms.

**Elli:** Understanding that system ...

**Nathan:** Exactly.

**Elli:** Yes, okay so you want to contribute ?...? ?...? complete understanding of this system.

**Nathan:** Yes.

**Elli:** Okay.

**Nathan:** It's not selfish interest as such.

**Elli:** No, well that was what I was meaning. I perhaps didn't phrase it right when I brought up the word *service*. I mean that is a very big word – it's perhaps too broad but as a scientist you are contributing knowledge ...

**Nathan:** Yes, so service is a slight distraction because that says that you're responding simply to other people's ideas and that you're not adding anything yourself. So there's a creative aspect to science and the creative aspect is solving this problem in thermohaline circulation or solving this problem in the transport of fresh water by icebergs or how much fresh water comes off the Amery Ice Shelf as a contribution to the global fresh water balance. It's not about 'this is how the Amery Ice Shelf flows', that's a problem in its own self so that would be an inward view of looking at things. The things that excite me is the impact of Antarctica on the rest of the world, the rest of the globe, so my interest in Antarctica is to tease out how it affects the rest of the world, it's not to discover Antarctica by itself or in isolation of anything else. It's not for the sake of Antarctica alone.

**Elli:** Okay, the second question is kind of fitted into the first one in one sense: Can you tell me about your original motivations – you kind of satisfied that –

**Nathan:** I've done it for my career perspectives.

**Elli:** You've covered that – they are actually quite similar, those two questions. Anything else ...

**Nathan:** I will add something to that question. The original motivations if you like were external to Antarctica. My motivations now would be much more embracing of Antarctica in a sense. Even my own thinking has evolved over ten years from my view of Antarctica and my participation and leadership of various experiments around Antarctica and in International programs.

**Elli:** So are there any inspirations that have come along very recently that you haven't already brought up – anything in particular?

**Nathan:** For motivations?

**Elli:** For motivations and for perhaps keeping you in your position.

**Nathan:** Recent motivations. My most recent project is basically on iceberg tracks. The project that I'd most like to be doing at the moment, which is not what I'm doing, is some climate change signals in the Southern Ocean, so it's some of the old things being carried into the future and if you look slightly

further back in the past, and my aspirations, slightly further back in the past is the exciting things that come from high resolution modelling of oceans. So I believe actually that a lot of the 'new'...? models have become far more realistic than they were previously. Only ten years ago they were crummy by comparison and now the realism has gone up in leaps and bounds, so much to the point that you think they can be useful, genuinely useful. My aspirations is that we can do a lot more on the simulation of the sea ice ocean and atmosphere 'system' and we're working towards that. I'm still motivated to do that, plus observations. You can't simulate anything in the absence of observations. You only learn something in the presence of observations.

**Elli:** Okay, we're up to Question 3: Can you tell me anything about your own consciousness during your working day. In other words, what usually goes through your mind during an ordinary working day?

**Nathan:** So, if you're speaking about my entire working day, I would say fifty per cent of what goes through my mind is about the tasks at hand and that fifty per cent would be a kind of an administrative activity, unfortunately - science administration if you like. I negotiate contracts at various times so there's some legal work in there - these aren't quite the answers you might expect but it's motivating other staff and students to deliver in their chosen areas, it's delivering on ACE and TPAC goals, partly of which are all inter-related and made that way. So a fair bit of my time is spent that way and then the work I do with students is science, because they all do scientific projects, so that's pretty much as close as I get to science. I do it by proxy in effect. Then the TPAC staff are building ocean models and atmosphere models and sea ice models so their building 'coupled' systems - that's a big undertaking in itself so I spend a fair bit of my time thinking about how to do that, and I don't mean in the technical sense, I mean to actually achieving the actual goals that couple sea ice to ocean. Those staff think much more about the technical details of the model itself.

**Elli:** So it's pretty much work orientated tasks, administrative duties that you have.

**Nathan:** Right. Then I have international committees which I'm on, so up until recently I was on the world ocean circulation experiment, I was co-chairman of their data products committee. I'm now a coordinating lead author in the IPCC process so I now have to write my other lead authors, which is about ten of them but there would be fifteen people involved - Chapter 5 in the science working group analysis so that will occupy a lot of my time. I have a project with 'Hydro' Tasmania, which is to do with down scaling climate change to Tasmania, that occupies my mind. I haven't mentioned Antarctica too often here.

**Elli:** No, Antarctic science to me is not necessarily being on the Continent it's anything that's related to what happens down there.

**Nathan:** Well, the problem really is to achieve Antarctic science you have to do a lot of other things and those lot of other things are what I'm really talking about to edge towards these goals that we're talking about. ACE goals plus Antarctic Division goals. I reckon about seventy per cent of my day is spent thinking about a bunch of tasks, '...' absolutely right.

**Elli:** Lots of tasks and they're all science related by the sounds of it, in some way.

**Nathan:** Yes, they're driven by science.

**Elli:** '...' circulating '...' '...' perception. Okay No 4: In your opinion what role, if any, does qualitative science play in Antarctic science?

**Nathan:** Well that's kind of a curious question isn't it - qualitative science plays. It's everything actually.

**Elli:** Oh, yes.

**Nathan:** Yes. You're in disbelief now.

**Elli:** Well, I'm interested to hear that response.

**Nathan:** Well of course because science is highly quantitative, and I can assure you our models are highly quantitative, and absolutely fascinating responses and those quantitative things can be impressive when compared with observations and quantitative science. The decisions you make about what experiments to do, or the absence or presence of the experiment, the comparisons you make, the choices of subject area is entirely qualitative. You could argue it's political so you could employ somebody else for instance and instead of looking at the over-...' circulation, which is the paradigm that drives a lot of my thinking in air sea exchange and the fluxes of heat and fresh water - the transport of water to the hydrological cycle - all those things are qualitative decisions to some extent, based on maybe informed, but they're based - and then you make projects that wrap around them. If

you employed somebody else for instance then you might use a different paradigm that might be the sea ice fuelled alone and the internal pressure field in sea ice and it has no global perspective, or very little global perspective. So I think the decisions you make about where to study, what to focus on and what you're going to pursue as questions is qualitative science in my mind.

**Elli:** That's very interesting that you should say that. So by saying that those sorts of decisions are qualitative, are you meaning that they're qualitative because decisions come from people who are not machines. We use our judgement and we value things and weigh things up, are you saying that that is why those decisions are in fact qualitative, or are you referring to something else?

**Nathan:** No, it's not the way I would have put it's a reasonable slAntarctic They are political to some extent – decisions, that's true. By qualitative I mean they're driven perhaps a little bit by policy at some level. Climate change is of national interest so you focus on those and the questions are related to those issues and to answer them you have to think globally in some ways. So they're qualitative decisions in a sense that they're not optimised, we're not maximising any – it's subjective is really why it's qualitative. We've arrived at decisions that are based on discussions and human elements and exterior things like policy 'sheddings' and national interest and so on. We haven't optimised it and decided that a fresh water story is the *best problem to look at* in a quantitative way, but when we do a problem we like to do it 'quantitatively?'. So there's a break-point there, this is not descriptive science once you start a problem. It ceases to be descriptive once you start a problem or a project.

**Elli:** Just one more question on this particular point before we move ahead. If you don't think that the decision-making process at that level, before you actually get to the implementation level, if you think that that is qualitative in nature how much influence do you think that individual scientists carry in that decision-making process?

**Nathan:** Are we discussing the leaders of programs?

**Elli:** Yes, such as ...?

**Nathan:** CEOs, Program Leaders, people who wrote original proposals .../

**Elli:** Yes, people in those sorts of situations ...

**Nathan:** So the answer is yes. It will depend fairly strongly on some of their slAntarctic There's two reasons for that. One is that strong individuals tend to have strong projects and are good at articulating the value of their program or activity. So a successful program leader will have an articulate way of presenting their program, and it's that articulateness that will win the day, and they decide partly on their own, their own preference, plus often a lot of discussion. What it does mean is that if you have lots of good, strong, articulate people leading your programs you'll have good programs. Strong leaders also follow the bigger picture very often and so they have a good sense of that. That means obviously that often the programs have good relationships to external things – international programs – they're not done in isolation.

**Elli:** Is it that relationships, you mean contacts with other bodies ...

**Nathan:** Scientific communities and international programs, scientific body if you like – good participation and also international programs.

**Elli:** Okay thank you.

**Nathan:** That's political in some ways too.

**Elli:** Yes. As we all know the government has certain goals and they really steer the whole ...

**Nathan:** Yes. They influence how you get assessed when it comes down to selection criteria, that's what these proposals have.

**Elli:** It's a two-way thing isn't it. The scientists inform the government and then the government responds to the scientists and that's how programs move ahead so they're in conjunction with each other.

**Nathan:** Except that they can be different groups. You could argue that a lot of scientists are jockeying for positions to move the government in certain directions and the government has certain views, so that's two-way. How it spreads out to the rest of the community 'gets mixed' obviously.

**Elli:** Okay. The next one's an interesting one. Do you have any thoughts on the idea that spiritual insight and wisdom should play, or does already play, an active role in contemporary scientific research such as physics and biology?

**Nathan:** I'm thinking. It's kind of an interesting question, yes. Spiritual insight and wisdom. I would say wisdom already plays – I'll tackle it in reverse order. Wisdom is of course – well I'm going to

mean it to mean – a common experience in accumulated overtime, so wisdom plays quite a big role in a lot of programming and push of Antarctic science. It's the sense of where people think things ought to be that are of interest about Antarctica and the rest of the world. I've talked about fresh water and transport of heat and key components like sea ice and climate change and the impact on sea level and all of that is based on wisdom. We know that there are impacts and usually they're 'unfield' things so you know they're impacts, but you don't know how big an impact it is or what fully are the consequences, or what are the emerging areas. You only know about emerging areas usually through prior experience of some kind to know where it's going to be different. You don't know in advance where the real surprises are, but you do usually know where it's changing and evolving towards. The other thing that happens through wisdom is that usually you know about the improved capability to deliver in certain areas – new instruments, new satellites, new observation platforms, 'which mean that we should be' able to deliver in new areas. That's kind of a wisdom side – it's a cultural appreciation if you like.

**Elli:** '...? wisdom, can I just add a little clause here. In regard to the spending of resources, funding, if we '...? the way that the funds that are allocated towards Antarctic research the way that they are allocated today, do you think that that is wise, if we are to look at wisdom, do you think that that is a wise way to allocate the funds that are given to the Antarctic program?

**Nathan:** I didn't tell you that I sat on the panel that does that.

**Elli:** Oh, well you're the right person to ask.

**Nathan:** It's actually quite similar in many ways to the ARC approach of assessing proposals and giving money. Unfortunately it's exceedingly competitive and we have too little money – it's a pretty significant fraction, you'd like it to be higher in some ways. All of the projects typically have merit. A lot of the projects tend to be – so I think in a wisdom sense the decision-making process is quite reasonable and because there's no sense of having to integrate all the experiments and they're only funded on the individual basis, I think the process is just fine and more or less the right projects get funded.

[END SIDE A]

**Nathan:** I don't think there's any injustice. You might look at it differently and say, well is the sum of all these little projects greater than the whole. Then you get into a problem because some of the projects can't be degraded into a hole, but the projects by themselves have merit.

**Elli:** That's interesting.

**Nathan:** So the spiritual insight – let's not avoid the spiritual insight question. Actually that's kind of a personal question.

**Elli:** It could be.

**Nathan:** I don't think there's a spiritual view that comes out of any of the programs that we've talked about – the ACRC doesn't have a spiritual view on Antarctica, the program leaders don't express it ever that way, so I don't hear that 'as a term'. Spiritual insight to me would simply mean, in my perspective, having a love of problems in climate and the climate system and in my thinking now in Antarctica and its impact on the climate system and liking, or being curious about them and looking for the story. I used to compare it to being a sleuth. You have data and you have observations and if they agree perfectly you're disappointed, well you might be very excited that the problem is solved, but usually they don't agree and so therefore your intention between what the observations are telling you and what the models or what the conceptional models are telling you. When you have tension like that you do learn something.

**Elli:** So as far as spiritual insight goes, that learning process, do you see that as being somehow having some extra insight – some other dimension of insight.

**Nathan:** That's the creative part isn't it, to close the 'eclipse' between the data and the observations so that you feel like you're solving a problem. It's a problem about earth if you like, in my case. That's the creative – and so if that's spiritual, then that's the connection I'd make – teasing out a problem – solving it and contributing to a bigger picture, so that's the global system.

**Elli:** I think that connects to my first question when I was trying to say serving the bigger 'group'. It's looking at the bigger picture and trying to contribute towards something that is good, or it's working towards a better world in some way – contributing in some way.

**Nathan:** Yes, in that sense, in service of science. I'll go with the service concept there.

**Elli:** Yes. In service to science.

**Nathan:** In service of earth systems, or in service of the climate system. That's probably the level that I work at rather than in service of science. But that's also related to humans as well, the impact of humans.

**Elli:** Okay, number 6. Now you're not actually employed through the Antarctic Division, or maybe you are, but you can just replace that with the CRC if you like: What do you think the goals and values are that are most prominent in your work culture at the Antarctic CRC?

**Nathan:** For the record, I'm employed by CSIRO Marine Research, the University of Tasmania and that's all, but for the record I have four or five different bosses. The goals and values - and I think I should actually talk about the Antarctic CRC rather than the ACRC. The ACRC is still very young. I think the things that were exciting about the Antarctic CRC was that - maybe arrogant thought - that we could do new things for and about Antarctica and it was that optimism, and naïve belief maybe, that we could have an impact on the global community in Southern Ocean and Antarctica. That was the chief goal I would say from the Antarctic CRC's point of view. So we were pretty excited about the possibilities of the various voyages. We were, over that time, going to probably treble the number of observations of the Southern Ocean over the period of the CRC and that therefore means there's going to be new scientific results. We did have those new scientific discoveries actually. So in terms of our work culture I think there was that kind of naiveness on the one hand. The Antarctic CRC had a very little paper culture so it was free of any burgeoning managerialism, if I can put it that way, and the focus was really on new scientific goals. In some ways the Antarctic CRC didn't believe it was going to do commercial work in a way, so in many ways we had a lot of freedom, as long as we were working towards those Antarctic milestones, to pretty much as we pleased in those areas. Perhaps a little different from now, there is also very good access to resources, rather than just reasonable access, say. We've still got very good access to resources.

**Elli:** You mean ...?

**Nathan:** Ship time ...

**Elli:** Logistics.

**Nathan:** Logistics, so experiments can happen and then through collaboration with CSIRO equipment, so we've got a lot of equipment to put out in the oceans and become the basis of projects.

**Elli:** What years are you talking about.

**Nathan:** I'm talking 1992 through to 2002 inclusive. The new ACRC - the work culture - it hasn't quite got up to steam yet, the new appointments haven't arrived, which is the fresh, enthusiastic blood that we require to some extent. There's a slightly different emphasis, there's a strategic focus on commercial gain so there's new words like 'IP' and 'secrecy' and 'intellectual property' that has to be preserved and the ways to achieve that and so on, and a greater emphasis on paper trails. So collectively those things have blurred a little bit the scientific questions that we're also meant to be addressing.

**Elli:** Yes, interesting. Okay No 7: Do you have any thoughts on the process of peer review as a means by which to ensure rigour in Antarctic scientific research?

**Nathan:** I have the view that if you don't publish you don't actually have anything to say. Whilst it's all very well go to meetings and to talk verbally and to present results, it's not a replacement to actual scientific publications. The value of scientific publications is that they are in the literature, they do get read and people do comment on them and do request things, and I can tell you that you quite quickly forget the results - your own results. I think there is an imperative to actually publish your science. That's a must in my view, having a profile. That's not sufficient communication by a long shot. It's important that it's peer review because quality is actually important. Peer review means that it's been criticised, checked over and analysed by your peers and those checks, whilst they may not always be adequate and so on, they do put the pressure on you to be current in your field, they do put the pressure on you to do good work, and they do put the pressure on you to achieve some novelty and creativity in your work. So I think this is an essential part of being a scientist, not just simply Antarctic scientific research. I think it's important to communicate as well so you have to be dynamic and that means you do have to communicate through conferences, so peer review isn't as essential there, but it is a review process actually when you talk to your colleagues. It's also important to communicate more widely, so yes.

**Elli:** Okay. I just thought when you were talking, some people say that when one consults with somebody who is at the same level as themselves - level of knowledge or understanding that sort of

thing – then you can end up with this what they call ‘the blind leading the blind’, because you don’t have an authoritative view on it. How does that concept sit with you in terms of ...

**Nathan:** No, no, I don’t care about that. The point is that publications should be right as they stand at the moment so if for instance your peers agree that it’s a good publication, and it’s only a couple of peers by the way when you review. What they’re really saying is that this paper has some interesting ideas in it and it’s an interesting piece of work and it’s relevant, okay. It could be completely wrong or fallacious or it could be, not deliberately so, misguided, but it’s all possible. Peer review doesn’t protect you from that, so if there was a scientific revolution going on that’s fine. Sure enough three or four years down the track your piece of work will be discarded or forgotten as time goes by, by the following pieces of work in the evolution. Peers are there to ensure quality, and they hold up the science maybe because they control the quality a little bit but, boy, it wants to at least come up to the scratch of your peers. So you don’t want sub-standard ideas. I think that’s what’s important about peer review. Grey literature can be of exceedingly variable quality and it isn’t credible. Peer review’s about credibility, so peer review’s important

**Elli:** Okay, No 8: Have you ever considered giving up your professional position as a scientist for a simpler life, and a simpler life here means renouncing material life for a life of austerity and spiritual self-realisation, and then also can you explain your answer?

**Nathan:** [laughter]

**Elli:** Have you ever had the urge to go to the Himalayas?

**Nathan:** Never to the Himalayas. I’ve thought about buying a block of land on the beach at Research Bay at Cockle Creek or something and kicking up my feet there, and I have those thoughts. I’m not sure that I’d quite renounce the material life because I can’t resist gadgets and things like that, but it would certainly be a life of austerity, and would it be spiritual self-realisation? No, I think it would be a spiritual death to be honest.

**Elli:** That’s a very interesting answer. So you actually feel that you’re more ?...? ?guess here? so you have to correct me. That you might be more spiritually connected when you’re actually doing your duty here as a scientist, or working as a scientist?

**Nathan:** So if we missed out the word ‘self’ and probably said spiritual realisation, yes I think so. If you contemplate unemployment, which is kind of what we’re talking about, and I was living in Cockle Creek, then I would be leading a very simple life that’s for sure, and I’m sure that I would not be stimulated by everything that was going on around me. It would take me a long time to adjust to the absence of activities and if I can’t be creating things and making things then I reckon that would be a death basically. I’ve loved my job for twelve years or thereabouts and I would say that the things I’ve loved about it is the realisation of solving or tackling, tackling probably more than solving them, a variety of problems. I have thought about giving it up and I usually think about giving up for a simpler life when a load of administration bears down on me. So administration can be a kind of spiritual death, it’s just exhausting and fatiguing. Whereas being a scientist – you can’t be a scientist in isolation though, so I enjoy more actually science interacting and simply being a pure scientist who’s isolated by their science.

**Elli:** Yes. So is it correct to say that you enjoy, or you ?mean?, being mental stimulation from your work and being association with other scientists – other people who are doing the same thing?

**Nathan:** Or related, so there can be interaction.

**Elli:** ?Similar?

**Nathan:** Exactly, so there’s interaction. Interaction is stimulating but you’ve got to have done some work too.

**Elli:** Interaction’s stimulating. On that point of stimulation, do you think that your actual work is stimulating for your mind as well, that’s kind of what you were saying I think. Problem solving.

**Nathan:** Problem solving in a way in the climate system.

**Elli:** You can use your intelligence and your mind.

**Nathan:** Yes, and you think you’re solving a problem that’s the nice thing. The appeal is to be able to do something. That’s creative, you ?said? a problem, solving it, then you’ve got to do the hard work. The hard work is good, so that’s a little bit like the austerity thing. Austerity is perhaps the wrong idea in a way. Hard work, which is ecclesiastical-like very often, the rigour of work. Maybe that’s a Protestant ethic I’ve just expressed, but the rigour of work and the discipline of work, plus interaction, is what’s stimulating. You can’t do it in isolation. I can’t anyway. So while I’ve considered it I’ve

always rejected it basically and the truth is that – except for the ‘ministry fraction’ became too high, I would remain a scientist for as long as I can.

**Elli:** Okay, alright thank you. So we have the last question – I’ve got about another ten minutes on the thing before the tape runs out. As a scientist, are you at all interested in whether or not species of Antarctic fauna and flora have, or are, a spiritual soul, and can you explain your answer?

**Nathan:** I’m not a biologist, I’m a physical oceanographer, so in a way I would have said that I didn’t care, as a scientist. As a scientist I don’t care. I guess at a personal level I might be more interested in ‘some plants’. If you were to ask me a slightly different question, which is to say whether Antarctic fauna were self-regulating in some way, whether they are at some kind of balance with themselves ...

**Elli:** ...? dependent on the environment?

**Nathan:** No in balance with their environment so the ...? ...? and their interaction with that and the interaction with the climate system of course, then I would say I have an interest in that. I don’t know about there being a spiritual soul, whether they’re regulated in some sense, responding in balance with it or whether they’re disturbed and out of balance, out of equilibrium, and going to be impacted by man, then I would say yes, I’m definitely interested in those sorts of questions. I may not be able to address them in my work, but that’s an interest. So the carbon cycle’s an interesting one. It’s related to the bio-geochemical cycles and what we breathe and breathe out and so on, and we’re interested in the impact to that and how it’s changing and the physical mechanism affects that kind of thing. So that’s a regulation but I don’t know if I’d think of it as a soul or spiritual.

**Elli:** So the ecosystem thing all works together.

**Nathan:** Yes, that’s right.

**Elli:** Okay. Thank you very much. Thank you that’s good, that ran for an hour and I think these tapes are about seventy minutes.

**Nathan:** The tricky part for you, just thinking about – I haven’t thought about these question in advance right. I think the answer you’ve got is just fine from me.

**Elli:** Yes, I’m happy with them.

**Nathan:** Yes, the Antarctic fauna and flora of course that’s a very biological question and I’m a physical oceanographer. The regulation thing is of course kind of related to the Geyer hypothesis ...? and so that’s another way to come at this question, whether I see things as being able to re-establish equilibrium. That’s a very interesting question – can we re-establish equilibrium – will the environment do that naturally. That’s kind of an interesting question – it’s not a question about soul as such.

**Elli:** But it has that ...

**Nathan:** ‘Cheques?’ and balances ...

**Elli:** Yes, and of course some people who discuss Geyer in ...? have a very spiritual understanding of it but I know the concept of Geyer as being one big organism in one sense, that extends to both spiritual and material realms depending on who you’re talking to.

**Nathan:** Yes, and for the record of course, I’m an atheist.

**Elli:** That’s okay, I didn’t ask you that but ...

**Nathan:** So that affects the way I think about spiritualism, insight and wisdom and things like that as well.

**Elli:** When I was preparing this one choice that I had was to go right into people’s personal beliefs and try and estimate how that would impact on their professional lives, but we decided to not go too far into that because it’s ... it’s like opening a ‘Pandora’s box’ – it becomes so big – the research area becomes so enormous so we had to somehow try and focus it on the work scene, but you are very right that whatever hold within your personal self does have an impact on you. It does ...?

**Nathan:** Exactly. It’s certainly true there would be many Christians out there and many highly spiritual people who are scientists as well and work with the nexus that exists between the two ...? can and do work happily with it. Often there is no conflict of course, but sometimes there can be.

**Elli:** Yes, there can be. Some people claim that the whole western society has a Christian theological basis, including things like the science that we do, so in that sense it’s not ‘value free’? It’s actually based on the values of Christianity. Then you’ll have Christians who are saying, no that’s wrong we don’t support science’. You really get your arguments both to and against.

**Nathan:** Society of course is a rational activity and the success of science ?has made it? so rational. ?...? but the failure of science in some ways, and one of the difficulties of some science is actually because it isn't collective, it's ?reductionist?

**Elli:** Holistic.

**Nathan:** No, opposite of holistic, it's reductionist – reduce it to a single piece, a simplified experiment, whereas usually the environment and natural systems aren't. They interact and so the relationships aren't especially obvious and they can be difficult to tee out.

**Elli:** So they are actually holistic.

**Nathan:** More holistic.

**Elli:** This is actually reflected in – I mean some of the science that the Antarctic scientists are doing now, like your own work, where you are looking at the bigger picture and you are saying, 'this system over here is actually connected with what's happening over here, they have a significant impact on each other'. That, to me, is adding to the holistic appreciation of earth even though specific science is very reductionistic, you're getting – by looking at the earth as a whole organism – you're actually applying a type of holistic thinking.

**Nathan:** I use the word 'integration' of course, which is the summation of the little bits and holistic is to see the whole big picture. Yes, you're right, we're trying to be holistic.

**Elli:** Yes, but perhaps that word isn't used very often because I think sometimes people use it in a way that it's not very scientific ?...? ?...?

**Nathan:** You're right, that's the way to put it. Anyway, it's kind of curious those questions. Thank you very much for that.

**Elli:** Thank you very much, I really appreciate your time ?...?

[END OF TAPE]

## 5. BOWMAN, John (UTAS)

Start of tape:

**Elli:** For the tape, this is Dr John Bowman and he's working on Antarctic Microbiology. So first of all John can you tell me a little bit about your research in relation to the Antarctic program that you're currently working in.

**John:** Okay, the current research that I'm doing directly in Antarctica is in the field of microbiology. I have two projects. One is associated with the Australian Antarctic Division Human Impacts program, and the other one is effectively within the Biology program. Both are projects, conducted by PhD students that I supervise directly. One student, Shane Powell, has recently completed but Shane is continuing her work as a research assist Antarctic She is investigating the impacts of hydrocarbon and heavy metal contamination in nearshore sediments in the Casey Station area. The research is part of the a larger Human Impacts program project,. also involving the examination of the impacts on fauna and measuring degradation rates of hydrocarbon pollutants. We also worked together on hydrocarbon contaminated soil, collected around the Casey area. Basically, we were interested in looking at the microbiology associated with hydrocarbon and heavy metal pollution, and subsequently bioremediation.

The second project is investigating exopolysaccharides, (which are the polymers of sugars) produced by bacteria in the Southern Ocean. At the moment the research has taken an ecological point of view. The research is being conducted by PhD student Carol Manuso Nichols. The research is supported by Antarctic Science Grants as well as and other granting bodies. Beyond Antarctic microbiology I am involved in research covering other aspects of microbiology including food microbiology and microbial ecology

**Elli:** That's Okay. So you're actually working for the Australian Antarctic Division as well as the University of Tasmania?

**John:** Currently I'm employed as a research scientist with the Australian Food Safety Centre of Excellence. In this position I coordinate molecular biology research including the supervision of several students. However, for a variety of projects I still collaborate with various people, including colleagues at the Australian Antarctic Division. I still submit Antarctic Science grants regularly, indeed I've been doing that for nine and a half years, effectively. Originally I worked with the Antarctic CRC before it changed to ACE. My strictly Antarctic oriented research has declined in recent years, but I like to maintain it to some level because it's worth doing. Basically, it's an area I have done a lot of research on and it's certainly worthwhile continuing rather than simply dropping it because I have gotten involved in other areas of research. Sometimes it's hard to manage everything, however I have always tried and keep something going.

**Elli:** Alright. Thank you very much for that. Okay, so we might move onto the actual questions.

**John:** Okay

**Elli:** Okay. So Question No 1: What inspires or excites you the most about being an Antarctic scientist?

**John:** Okay. I think when I first saw the advertisement for the position I first obtained in Tasmania, I was immediately interested in it. I thought 'Oh, it's Antarctica, that's interesting'. It would be something new to do from what I'd been doing before, so it would represent new experiences and, new opportunities. So that's really what I saw and felt. Subsequently I became more quite excited as I realised Antarctic science was such an open area, particularly from a microbiology point of view. Much biological research had been performed on animals, such as penguins and seals but bacteria were really unstudied. I thought scientifically this would be interesting, but also it was just the fact that it was so open to research – to discovery. I suppose that's really what excited me was the potential for discovery, and it wasn't necessarily discovery from a commercial point of view it was the discovery in itself – pure and simple. You know, curiosity, what will be uncovered, what were the nature of the organisms etc. So that's what really drove me for the position I think.

**Elli:** So the science interests you

**John:** Yes, the science was interesting, but I think it was also the sense of discovery as well. I mean the science can be very, very specific and very directed and applied, but you need a broader feeling of curiosity I think to appreciate it.

**Elli:** When you used the word discovery, you're talking about scientific discovery or ...?

**John:** Fundamentally. Fundamentally it's scientific because in order to be able to show what you have discovered involves doing science, but I suppose it's the feeling that you've actually uncovered things that no-one else has actually found before and you're actually describing new organisms that do new things, and these sorts of things. In other words it's more than just doing the science, it's the sort of feeling you get when you're actually revealing something new, doing something new, doing something that's interesting. I mean for me to do good science requires motivation. I took the job because it interested me, and in the end you have to like what you're doing to feel fulfilled.

**Elli:** And just on that note, that's actually the second question. The second question asks, can you tell me about your original motivation.

**John:** I think those two questions to me are very closely related because I mean in the case of Antarctica science I didn't want to just go down there and see all the icebergs and penguins, it was more that I saw the opportunities.

**Elli:** (*indecipherable*) scientific discovery or discovery of things that 'had not been done'?

**John:** Yes, scientific discovery and sense of achievement that would come from the research effort

**Elli:** Personal achievement?

**John:** Personal achievement as well as – yes, personal achievement primarily. I mean obviously you need to have something to show for yourself in your life. It's where my life is heading and I was not totally happy with what I'd been doing before, essentially completely applied science to the point it was almost not science. Indeed, it was exceedingly applied and I wanted to do something a bit more interesting.

**Elli:** Okay. Question No 3: Can you tell me anything about your own consciousness during your working day. In other words what usually goes through your mind during an ordinary working day.

**John:** Okay. I'll try and be honest. I mean it depends in the past it's probably different to what it is now, but generally speaking I sort of focus on a number of things I need to get done. So I concentrate on doing these set activities. Of course some things are interesting to do and some things less so – more

routine. And of course then I am always thinking about the things that need to be done. There always seem to be lots of things that need to be done and 'Oh, I can't do them today. I haven't got the time.. That's probably the primary concerns I have on a day-to-day basis. I don't mind it and It's not discomforting, It's just a reality I have these things to do and I'm getting more and more things piled up! But it's not like it's the things are really unpleasant to do or anything. They're interesting individually, it's just trying to put it all together. Sometimes you're going from one thing to the other. And often they're quite unrelated.

**Elli:** OK. Would you say there are time constraints, that ?might be something?...?

**John:** Occasionally some things do fall by the wayside permanently, well almost permanently, but I think for most things I get them done eventually.

**Elli:** Do you feel you're working against time?

**John:** Sometimes, yes quite frequently, because I have a lot of things to do. I'm on the editorial board of various journals and tasks associated with that are continuous. I mean they just regularly pop up. Then there's the students, and then there's the research and then you've got the expectations of people for that. The responsibility and so forth. And then people are constantly asking me to do things for them.

**Elli:** ?Participating in collaborations?

**John:** I don't mind variety. I mean in most cases I can manage it. Occasionally some things do tend to fall by the wayside and I feel a little bit guilty, but my rationalisation is that it's just impossible and I just can't do anything about it so I don't let it worry me. It's just one of these things.

**Elli:** Just one question in relation to that question. Do you have any opinion on the proposition that the consciousness of scientists may impact on the results of their work?

**John:** Consciousness?

**Elli:** Yes.

**John:** The objectivity, or subjectivity? Is that you mean?

**Elli:** Well, perhaps more the subjectivity. In other words what one .....

**John:** It depends on what you're doing I suppose. If you have made a hypothesis and the experiment for whatever reason wasn't working, you know some experiment that had a lot of variability or something like that, then yes there is potential that you might be selective on how you interpret it. I suspect that's very common. Sure I've probably come across that myself sometimes. Fortunately I think try and design the experiments in such a way to eliminate that as much as possible. You try and make them give you a concrete answer, otherwise you can't really – I mean if you can't get something that's reproducible, then the experiment really isn't designed properly, so you have to go back to the drawing board and try something else. That's what I normally do, go through a series of iterations to finally I find something that works reliably and then obviously if you have a hypothesis answered, yes or no, you just have to take what results are generated. I had a hypothesis, for example, when I was investigating microbes, living in marine sediment and I thought the ones in Antarctica were all the same and were different to the ones in Tasmania, but as I discovered that isn't quite true, because it's more complicated than that.

**Elli:** So you think that sometimes perhaps the interpretation of data or the understanding of the implications may be affected or influenced by the consciousness of scientists?

**John:** I think to some extent. I mean again it depends very much on how you're going about your experiments. How clear-cut and reproducible. Some experiments just give you results and the results are indisputable, because they are just black and white. Other times if you're looking at things which prove to be more qualitative, then it definitely becomes a case of interpretation. I guess sometimes if you feel you have experience in the area then you can give an educated and reasonable interpretation, I think that's fine within reason. But you don't rely on those too much and if you're publishing stuff in papers people like to have some sort of fairly concrete answers and statistics. I mean I think to the world statistics is almost designed to try and tease out information. Sometimes things are not very clear because they're so complicated and they're sort of part of something greater – you're looking at shades of grey I guess, only a part of the picture.

**Elli:** Yes, and that kind of leads into the next question which is, in your opinion what role, if any, does qualitative science play in Antarctic science? And I think you might (*indecipherable*)

**John:** Yes, it has a role in a sense that it's part of the experiments that you do that if you have a complex situation, sometimes you're looking at differences which may not necessarily be easy to

measure. So sometimes you have to make an interpretation based on an opinion. But you have to keep that to a minimum I think. This is the case in the biology areas particularly, and any of the hardcore

**Elli:** So ...? Question 4: Would you say that it is a goal of Antarctic science to minimise the role of qualitative ...?

**John:** I think so. It's only because often the science is reviewed scientifically and so a view that you has to be supported by concrete data or some sort statistically verified data that you feel confident about. I guess that comes down to competence. It all depends on the field of science. In some areas researchers probably have to rely more on qualitative data than others. Microbiology is one that mostly relies on quantitative data.

**Elli:** I would guess that most Antarctic sciences ...? perhaps with the exception of *(indecipherable)*

**John:** That's right, yes exactly.

**Elli:** *(indecipherable)*

**John:** Because sometimes it requires more intuition, something you can't measure very easily. *(interruption)*. People constantly knocking on my door– that's one good thing that happens to me, I hopefully dispense useful advice, It's what I did to my PhD supervisor... *(indecipherable informal chat)*

**Elli:** That's part of your normal day.

**John:** Well, it happens all the time, yes- Basically acting as a mentor, one of my major roles I have here. So, you're up to question No 5?

**Elli:** Do you have any thoughts on the idea that spiritual insight and wisdom should play, or does already play, an active role in contemporary scientific research, such as physics and biology?

**John:** I haven't really thought about this. No, I can't really give an opinion. and I haven't really read anything to do with it either. I've seen books, which are about this area but I've always passed them by. It's not really my thing, I've got so many things to do than to get into this. I'm not a religious person My spirituality whatever that is, is minimal I have to admit. I'm too pragmatic, which I think is typical my family in general .

**Elli:** OK, so there's nothing that you *(indecipherable)*

**John:** No not really. No, the interactions I have had have been scientifically based and I haven't had any large interactions with people doing commercial stuff, To be honest. I I've often talked to others about things like commercialisation in relationship to the Antarctic treaty, biodiversity and bioprospecting These sorts of issues people have many different opinions on, because they place different values on these sorts of things. I have my own set of opinions because I believe that we can compromise. But that's not really spirituality.

**Elli:** *(indecipherable)*

**John:** I mean I guess that's values I regards to the Antarctic treaty that's what the major reason it's there for is to preserve the value of Antarctica, the quality of the environment, protect it from exploitation and prevent it being modified and reduced...fundamentally, kept at a pristine state as much as possible. I mean that's something that I think is very important This relates to the AAD Human Impacts program, I think that's the whole point it's there really, isn't it. I mean, I suppose when approaching that project I mentioned previously where we investigate human impacts, it was out of curiosity to see if in fact this was a significant problem, but it was also from a more general point of view that could we see them in the first place. How resilient the Antarctic environment was. My general conclusions are that is quite resilient to small impacts. So I think when it comes to preserving the values I mean that's something that's important for Antarctic research to have a role in.

**Elli:** OK. Question No 6: What do you think the goals and values are that are most prominent in your work culture at the Australian Antarctic Division, or shall I say in your case the ...? scientists that you associate with. I'll just specify that we're not looking at the goals and values, but the official goals and values. More of the work that goes on amongst .....

**John:** The little groups ....

**Elli:** Yes, like one *(indecipherable)*

**John:** Right, so it's not an official capacity. OK. For the biology project which is focussed on studying exopolysaccharides, I believe it represents science that involves both ecology and biotechnology? So in other words there was this idea that we could work on this area with the

possibility of obtaining at some point a commercial product but without any impact on the Antarctic or contravening the Antarctic Treaty. This is because we isolate the bacteria and everything else is conducted in a laboratory in Australia. And I think that was taken as a given by many people. I think that we do have to do it this way. We have to take the opportunities. For me it was always the case, I was more interested in the scientific aspects, and I get the distinct impression most people are like that as well. Within the pure scientist groups there's not this feeling that we're there to get things to commercialise and make money from it. It's more a curiosity factor as well as the discovery factor. In previous projects I've also related to that area too. We had a contract, for example, with a pharmaceutical company in Melbourne. It was called Cerylid Pty. Ltd. It had a number of name changes over a number of years. The work comprised a bioprospecting type project where we isolated bacteria and then they were screened for pharmaceutical compounds. I sort of felt that the reasons we were doing it were different to that of the pharmaceutical company, which was only interested in an end goal to make money. It's just a different philosophy I think. In the end we developed a resource (what we isolated) and I think that's where the true scientific curiosity and interest can be developed from. We still have that resource, so I feel most of the scientists I work with tend to have value orientated goals that appreciate the value of Antarctica for its uniqueness and its specialness, rather than for something to exploit – They're the people I tend to work with. I mean I haven't come across that many people who have the counterview, in fact very few. I think people who are in that game tend not to be scientists. They tend to leave the field and get into business fairly early. It's a totally different philosophy. I do not know many people like that. They're found in universities very often. It's like a complete change of language and it's something more associated with the business world, which is foreign to me.

**Elli:** That's interesting.

**John:** So that's what ?...?

**Elli:** That's quite interesting ?...? philosophy is ?...?

**John:** Yes, it's quite a strong difference I think. I'm sure there's some people sort of in between but often it's one way or the other.

**Elli:** Yes. Well, I think I have spoken to people who are scientists, biotechnologists and (*indcipherable*) just a couple ?...? I suppose it comes (*indcipherable*)

**John:** Depends how conditioned you are. What you think is important

**Elli:** OK. Question No 7: Do you have any thoughts on the process of peer review as a means by which to ensure rigor in Antarctic scientific research?

**John:** I think peer review for me is so engrained as a scientist. It is needed. There has to be some sort of evaluation at some level to screen out the nonsense from the things that are worth seeing. I mean, sure there's always going to be some compromises like some things might be excluded because of priorities or some sort of political stuff. And of course, if you're a scientist peer review is par for the course. It's something you have to live with, particularly if you don't like it.

**Elli:** (*indcipherable*) quote that there's a saying that ?...? I was thinking about that because I was thinking, in the education system ?...? from when we start at school all the way through college and university we have somebody supervising us ?...? we get to this level where we get out doctorate and that's it. There's no-one any more to supervise what we do so it's kind of assumed that once we reach that level then that's the furthest that we can take our knowledge. That's kind of, we've made it – once we're there we've made it so it's kind of an interesting thing that all of a sudden when we reach that level then instead of looking out we're looking at ?? being ?...? we're saying how do you see this ?...? our peers. So from one perspective it's kind of interesting to me, the process of peer review, whether it's foolproof.

**John:** Oh, it's never foolproof. Peer review is tripped up by so many different things. I mean things get through the system and others never get through, but other things get excluded because other people's rivalries or whatever. So it's never perfect but usually I think in the end it works for the most part. It's just people attach a hierarchy to it which is not so good, particularly the journals now everything's got a score as you've probably seen in citation index and it's all numbers now

**Elli:** Which is all based on peer review as well isn't it.

**John:** More or less. It's all based upon, I suppose there's an elite aspect to it. For example if you're working as a scientist in Bangladesh, it's not likely, you'll get a paper in a journal like Nature.

[END SIDE A) ....

**Elli:** So do you think there's a culture thing for us there as well? You were saying '...? if a scientist from Bangladesh publishes something or makes ?? he or she may not '...? publication because he comes from a country that is considered less technologically advanced.

**John:** It depends on the nature of that discovery. I mean it's possible that the discovery is within the technological capacity. It could be still very major and still could get a good journal as a result, but the probability is not very high because for sciences these days it's become a lot more technological, particularly in biology and physics, it's all driven by new technology and that costs money.

**Elli:** I suppose it's very competitive as well.

**John:** Oh yes. Competition it is – it depends on the fields very much, what you're doing. I mean, when I went to Antarctic there was no-one really doing anything at all in Antarctic Microbiology, only some people pottering around here and there, but I felt that I had no competition, and I didn't. Since then more people are doing similar things. I think there's still lots of room. It just depends on what you're doing. I think certainly certain areas have a lot of competition, but I that's something not worried about.

**Elli:** No. I was thinking though it may actually play a very important role in deciding which papers get published, because if you get ten papers submitted that have all looked at the one specific thing, as compared to only two or three, then the people who are in the group of ten are going to be less likely to get a publication.

**John:** You can't assume things haven't been done or there was already knowledge out there. That's another one of these things that seem to be a phenomenon of the times. Since everything is data-based and people forget about the old material. This is something, the old lady that tried to come and talk to me, June Olley, has mentioned because she actually sees this happening – she has read a lot of stuff over many years and she has noticed that some people are rediscovering things because they're not looking at the literature. I think that could become more common? perhaps, But of course with the more sophisticated science it's possible, I mean there's more details obtained but maybe the fundamental truth is the same as what's been previously seen, but by less technological means. But you just have to go through that obstacle course. I think scientists do need to have a bit of imagination to really try to do something new. It's not like there's new ideas popping out in people's heads all the time. You've got to have imagination that's got to be doable. So it's a bit of a balancing act. So somehow most people manage eventually. I think some of the best scientists tend to be very good at that. Lateral thinking and all that sort of thing.

**Elli:** Would you say that the desire to discover something new is the motivation in '...? I mean, I can imagine that there would be different motivations why scientists want to discover something new. One motivation might be to make a name for themselves for example. Another motivation might be that they are aware that there is a need to learn about something in particular in a particular field.

**John:** Or you could have both.

**Elli:** Or you could have a combination of both.

**John:** I think you can be proud about some of the things you do, especially if people cite you, then you know that people are taking notice of your work. To me that's probably the best feeling of success, that people actually read your work and are interested in it. That's what really I think motivates most scientists. I mean obviously some of it goes to some people's heads a bit more than others and they might get a chip on their shoulder, but I think that's a fairly rare thing generally speaking. I mean most people are realistic enough not to act like that.

**Elli:** Right. Second last question. Have you ever considered giving up your professional position as a scientist for a simpler life, and here a simple life here means renouncing material life for a life of austerity and spiritual self-realisation and can you explain your answer.

**John:** Goodness. I have to say no to that one. I haven't really ever for a moment considered being a Buddhist monk or something like that. It's only because I like what I'm doing in the here and now. I mean that's basically it. It's not like I'm interested in material goods and I'm not an overly ambitious person, I just want to be able to keep on discovering things that's all. I mean it doesn't cost that much money but obviously you've got to keep in mind that you're doing should be reasonably useful and not too self-indulgent, and I think I'm hopefully managing that. At least at this stage in my life, maybe when I retire I'll want to have a more spiritual existence and get away from the over-intellectualisation of things.

**Elli:** Alright, the last one. As a scientist are you at all interested in whether or not species of Antarctic fauna and flora have, or are, a spiritual soul and can you explain your answer.

**John:** OK, it's similar to the previous one. I haven't really thought about animals having a spiritual soul

**Elli:** Yes, but the question is actually asking .....

**John:** Interested...

**Elli:** Yes

**John:** I suppose, yes I would say I am interested in the sense that is there something more than just their nuts and bolts and how they behave. I mean is there something more, that would be interesting. I would find it interesting at least just for general knowledge or for just pure interest and curiosity, but how do you measure that or how do you study that maybe we might discover something that might be able to tap into this I've had some interest in the Gaia Hypothesis. The fellow who thought of this? I can't remember his surname..

**Elli:** Lovelock

**John:** Lovelock, yes that's right. It's an interesting thing because I only have worked with fundamental organisms, I suppose you could call them You know they might have their own super-consciousness maybe, you never know. I mean when you're doing science you tend to deconstruct things, try to take them apart in little pieces so maybe eventually we will know so much that we should try and turn around to look at the bigger picture in the future.

**Elli:** Just one last little thing added on to that question. Do you think that they're something that Antarctic biologists, or even human impact scientists should be trying to research, whether Antarctic fauna and flora have a spiritual dimension to them?

**John:** Probably not at this stage. I suppose the key goal for the human impacts is trying to develop management schemes to minimise human impacts so perhaps when that's perfected and we know that Antarctica was fully protected, maybe we'd be able to refocus attention to things which were perhaps less pragmatic, but I would have to say that, depending on how old school reviewers were I don't think it would be too popular with some people. Then again it might broaden people's interests as well. I mean, I would have to sit on the fence with that one, sorry.

**Elli:** No ?

**John:** It would be interesting. I think you would have to be a bit careful from a political point of view on how it might be interpreted by people. People might think it's – some people are very, very cynical, so they might say it's silly I'm sure that once we've worked out everything about the biology and we know exactly how things worked. People always want to find things out so it would be something for the future I would think. Hopefully it's still there with a little bit of luck.

**Elli:** OK. Alright well thank you very much.

**John:** That's perfectly fine, I happy to be involved.

**Elli:** I very much appreciate your time.

**John:** That's alright

**Elli:** How long did we go for? Forty-five is it?

**John:** Forty-one minutes, forty-two minutes, that's alright.

END OF TAPE

## 6. BURNS, Gary (AAD)

**Elli:** This is interview with Gary Burns from the Australian Antarctic Division. Gary, would you like to first of all explain a little bit about your position within the Antarctic science program.

**Gary:** I'm a principal research scientist within the space and atmospheric science group. I'm a principal investigator for two projects, one on hydroxyl air glow monitoring the temperatures of

mesopause region in the atmosphere at about 87kms, and another one looking at the earth's geo-electric circuit. Both projects fit within the government goal of looking for the influence of Antarctica on climate change. The mesopause region is the coldest region in the atmosphere and meant to be a region that should be indicative of climate change and the electric field, global electric circuit which links thunderstorm activity and solar variability via cosmic rays as a means of having solar variability influencing weather. So those are the two projects I look after.

**Elli:** Alright, thank you very much. Are you ready to start the questions?

**Gary:** Yes.

**Elli:** Question No 1: What inspires or excites you the most about being an Antarctic scientist?

**Gary:** Well, now that would be the science and the ability to do my science down there. The Antarctic division is probably the best place at the moment to be a scientist. The universities are under a lot of pressure to swap from what their original task was to being more a teaching institution and the CSIRO is under pressure to raise money outside and to make itself very industry related. I like the opportunities that Antarctica presents to let me do some scientific research in areas that interest me.

**Elli:** Do you get the opportunity to travel down there very much?

**Gary:** I did when I was younger. I stopped when I got married and that's a long time ago now, 1987 was the last time I was down there, but I have applied to go down again this year now that my family is a little bit older and it might be possible. Certainly when I was younger the fact that it was the excitement of going to the Antarctic that motivated me, and it was a little bit funny there, it wasn't so much the Antarctic as Macquarie Island that was my greatest interest and then it was also the opportunity to have the adventure related to the science and then, and then it even turned into an opportunity to improve my academic things because they let me do some research that we were able to use elsewhere. But it swapped around, the excitement of going to the Antarctic is not there so much now, and it's the fact that science is even more interesting.

**Elli:** Did you end up going to Macquarie Island?

**Gary:** I went there and actually did my PhD on the data that I collected there day that I ?...? there so it worked out really well.

**Elli:** OK, Question No 2: Can you tell me about your original motivations for becoming an Antarctic scientist?

**Gary:** I actually joined the Department of Supply as a cadet in my second year university and it was because there was an advertisement for cadets for that and it mentioned the cosmic ray and upper atmosphere physics research in Antarctica and I applied for that because I'd remembered we had a visit when I was in ? Grade 10 and I always had in the back of my mind that was interesting and I knew a bit about Macquarie Island, so it was that that motivated me to join that and then I just had to fight within the Public Service as everything swapped and changed and I got flopped out of the department I was trying to hang for and I eventually got back across.

**Elli:** So again it was the science.

**Gary:** The adventure in a job and the fact that it was within my area, but more adventure in those days motivates you.

**Elli:** Question No 3: Can you tell me anything about your own consciousness during your working day. In other words what usually goes through your mind during an ordinary working day.

**Gary:** Hard question. Well, it's more trying to get things done. We generally have a list, you never run out of things to do as a scientist. You are always thinking of something else and that's probably true of almost every job in its own way, particularly if you're motivated to work in it, and sometimes it's the frustration of something that just has to be done ?...? right to enable you to achieve something else. But I think more than most jobs it does have enough time in there to actually think about your research and to progress ?...? issues that you know you've got to step along to get towards the aim of what you want to understand.

**Elli:** Are you saying, or are you not saying that time constraints impact on your work sometimes, or not really – perhaps on the quality of work?

**Gary:** Yes. Everything can be done better. If we were organised better and there was less things that had to be done go get things lined up to do the research, then we could produce more. But because I have been here so long I can look back and say 'well, we've got more resources now than we've ever had over any year and we are able to do more'. Like, what I've got coming up this year potentially with the new planes I hope to go in and take equipment up onto the Antarctic plateau to work with

Russians at Vostok. I've got someone that's there, but to start a new one with the French and Italians at Concordia, the logistics is available for the first time ever. So, while there is 'Oh, I wish we could do this better', and 'could we save money here so we could put it into the science', certainly when you look at the long-term trends over the time, we have a better chance now than we've had before.

**Elli:** Due to technological advances and logistics.

**Gary:** And finance that is available. The Antarctica division, when I first joined it, had a budget of six million dollars. I mean, it's hard to equate the same budgets because different things are put in the cost these days, but it's up around \$100 million now, so that's a massive change even though it's twenty-five years and few government departments have expanded like that, and I've looked around and there's a lot more scientists. Now I would have liked to have seen more of that. I would think it would've more appropriate if more of that money had come into my particular area, but every scientist will say that, but I feel that way so I say it that way. I also think there are other things where we can do linking with places like the university where we haven't yet been as successful as I would like us to be because I still think there's a great opportunity there that Tasmania, with CSIRO, the glaciology group and the CRCs, the new one and the old one, and the physics department potentially we ?? cover a lot of very interesting fields of physics yet we attract people from interstate but we haven't set up our maths and physics department to give the students in Tasmania the sort of opportunities. So there's not only can we improve with Antarctic division, but we can also improve our linkages to other universities. We do better linking to universities outside of Tasmania than we do to linking through into Tasmania. And a little bit of that ???the reason I would regard would have been the reluctance of the Physics Department here to change out of the area (expand out of the research areas they were in), so it was interesting. The focus where it's got some local interaction. Now I think that's finally changing but the Physics Department was squeezed down so much. It's expanding out again now and we are tapping in there and trying to see if we can provide people with the opportunity. You don't want to attract people that don't want to be there but you want them to know there's the opportunity.

**Elli:** With my ??? understanding of physics, the nature of physics itself has evolved so much ??? physics research over the last few decades. [Interruption by third party]. Would you say that that's correct, that the nature of physics research has evolved a lot over the last few decades, perhaps more so than other scientific areas, or not?

**Gary:** I actually think it's gone back to even earlier than that in a way. ?They (Scientists ...or we) can't be over as many fields perhaps as earlier people could and I still like its old name, which was ~~an~~ ~~actual~~ natural philosophy. That was the early name for physics was natural philosophy. How can you philosophise about what the universe is if you don't understand what it is to a deep level, so I like philosophy, and you can still see that in the people like Paul Davies. You can see that you can take high level understanding of the universe and you can philosophise a bit more about knowing the way things seem to interact and what that implies, so I like the whole concept of natural philosophy. But we've got a bit more. I think there's been pressure from society, mainly from governments to be more focussed. You focus your research on a more predictable outcome. I think there's different areas where that should be. Australia actually set it up beautifully but it's ??? changed? big science a little bit in the way it approaches. If you think about the universities were meant to be training and researching subjects. We've ~~swooped~~ swapped it more around to being training into a job rather than training to thinking. I thought that was a good lot where essentially you were saying 'you're picking your best minds', I'm saying 'well look we want you to do some research and train some people which sort of fits in with our thing of M.Sc.s and PhDs and training people up that way. So that was a good concept. I think the scientists in there also corrupted by abusing the system a bit so it needed a bit more rigor over it, but I think it's gone so far now that the time for research is just really limited for those people. CSIRO was a good concept that you want some science to back up your industry and the government trained it to latch ? support? research in areas that can build up the country's industry, so I like the concept of that, but now that's been perhaps made a little bit harder to do by forcing them to get 30% of their money out of industry. The way we talk about that is they're spending 60% of their time getting 30% of their money, so it doesn't leave as much for the research, and the government stuff is my philosophy so ?? in here where, if you look at in a very broad picture, the reason the government should be interested in doing research in Antarctica is that it keeps that region – it's close to Australia on the southern side, even during the Cold War, we've managed to keep it peaceful and co-operative by emphasising ~~the site?~~ the 'science'. So it's a cheap way of doing the defence budget to the ~~the~~ South. So I like the whole concept of Antarctica and co-operative international science and that that being the way we manage an environment that we could easily muck up or fight over resources. It's the concept I like, but I think governments over time have forced them all to be more 'what's the output direct, the

measurable output for the government', for the people and I think we've lost that separation and why we do it.

**Elli:** That's very interesting. I just want to go back to a couple of points. One thing you said was that the CSIRO was originally established to support industry. So it wasn't a research ?

**Gary:** It was a research - they put in specific institutes that were designed to support our wool industries and to support our technology. That's always been their focus. It's an industrial research organisation, isn't it. CSIRO - Commonwealth Scientific *Industrial* Research Organisation.

**Elli:** One other thing that you said was that, I don't know when, but you said that science changed somewhere along the line and the government wanted this shift from when physics was classified as a philosophical nature..

**Gary:** Yes, Department of Natural Philosophy is the head over one of the old physics departments at Melbourne Uni.

**Elli:** Okay, so when it changed somewhere over the last few decades, you were saying that the government wanted and I suppose they were instructing that science organisations supported by them were to produce science that was more predictable or more defined.

**Gary:** Yes, more goal focussed. It's been over a longer period than that. It's been a very gradual change. I've actually enjoyed parts of that. I mean, I've swapped my original research area and my PhD and things with ?...? aurora? and understanding the magnetosphere between the two hemispheres linked. I still think that's important and part of the things is I think we are only able to explain to the general public, and it's very hard to do, or people get a ?thing and? think that from outside I think I'll direct this this way. So we were told to take an emphasis off that. I think other nations have maintained that emphasis in Antarctica because Antarctica's where those magnetosphere lines come down and where the solar wind interaction happens. Now, I've enjoyed swapping over into the two areas I've gone into. The low? in the atmosphere I've learnt a lot more about that group in the atmosphere and I can see that it has more of an immediate link, when you think about we're told to look at. So I don't mind the goal-focussed thing. I think where perhaps we get into trouble is we spend all out time trying to think about are we goal-focussed instead of going on and doing the stuff. So perhaps there's a little there but it's better directed than it ever was before.

**Elli:** OK, because one thought I had was that will the rigor of science suffer at all if there are demands like if you move away from a purely research orientated program to a program that is still research based but it has demands on it to produce results. Even whereas the original focus may not produce some many results, at least not so many predictable results. So I'm wondering if the rigor of science would be compromised at all by having the pressure to produce specific results.

**Gary:** I don't think there is a pressure to produce specific results. I haven't felt it here that I have to get an answer that says one way or the other, so that wouldn't ?...? with a ?...? of science. I think it's more interesting to your area as well. You've got to think about what the comments mean and try to put them more into a focus. It's harder than measuring a fixed fact about something. There is interpretation to go with it. I don't think that's a lessening, that's more of a fact that ?...? imposed on you. You have to think clearly about what your data are showing and be able to put that into more of a context, so I think we've been asked to think a bit broader, but you still have to have the rigor. We're always trying to focus back on, have we got the measurements to say this and you will find a scientist will often ?...?talk? on what the probabilities are, or my thoughts at the moment, or based on what I've seen at this stage. We are always trying to couch ourselves a bit that way and I'm certain people like politicians know what the other side and what the evidence against is, but there it's always 'this is the way', 'this is right', 'we'll do it like this', despite the fact that they know that there's a chance of the other thing, but that's where they've decided they're going to go and then it becomes 100% focussed. Scientists can still be 'I'm looking at it', 'it's like this', 'it's tending that way', 'I've got to watch out there could be something else influencing these measurements that I have to check'. So I don't find that we've been forced unduly to do things. There's been a lot more, and I think it's happened right across society that jobs have been more focussed to outcomes. I think you can see that change to society over at least 30 years, that there's not 'Oh, I've just got to punch this button', or 'I've just got to do this' and they don't care what else they do outside that time. People in Australia are now more productive and I think that comes through focussing on the outcomes, which has been something that's happened in science as well as every other field in Australia.

**Elli:** Well, it is focussing on specific goals. It's more goal-orientated, not in the sense that a specific result is wanted but the research, as you say, it's channelled.

**Gary:** I think it can be broadly interpreted in many ways. One of the first goals is to maintain the Antarctic treaty, and that was number one. That was the one that came out of 'Cabinet' that way. Other people try and interpret that anything we do – we don't need any science to maintain the Antarctic treaty. I think there's always discussions about what's meant by that. I think if you take it away from the science base of the treaty, then you essentially could be working towards undermining the treaty. If that's not your focus of you maintaining the treaty then people might eventually say well you're not really down there for doing science, why should we be pushing the science barrow, we'll go and do something else, we'll exploit the resources. So I think it can still be interpreted very broadly. There's people trying to use the focus on the goals to put forward their arguments that 'Oh, your science is not goal-focussed', but there's always the argument back the other way that yes we are. I feel quite happy justifying the ?. In fact I can't understand why there wasn't a rush to us when they said they wanted to be ? atmospheric physics, when we were told to be environmentally (you know) given emphasis to the environment and climate change, because what's the one change that everyone agrees has happened is the ozone hole. Where does that occur – ground level? In the ice? On the ocean? - In the atmosphere. It's obvious the atmosphere responds faster than any of the other systems to manmade changes and perhaps we, as a group, haven't latched onto it, or you could say it turned around on me and say I haven't been able to convince the management that it's here to give me the higher level priority that would bring more resources into my area. I'm happy that I've got more resources than I've had before but if I'd been a bit more successful at that, or if we'd been a bit more successful at that, would we have got more resources. I think there's more to come out in that area.

**Elli:** Just very quickly before we get onto the next one. Would you say that, over the last few decades, how long have you been working within Antarctic science?

**Gary:** Since 1975. That's thirty years.

**Elli:** Okay, thirty years. Would you say that time constraints, or your schedule, there's more in it now than thirty years ago so far as work load goes?

**Gary:** No. The reason being when I'm younger and single, the science and the adventure intrigued me and I put in a lot of hours. Now I have a commitment to a family, and in fact I took three years – three years part time – when my kids were young to look after them in their first few years of school and while one was at home to allow my wife to go back and work full-time to bring her skills up a little, and I enjoyed that. So I've been able to do those sort of things. I think I'm at the stage where I'm interested in science but I have extra commitments outside here that I didn't have in those days. Then the question is – it was probably easier in those days to be slack if you wanted to be. There's probably less scope to be slack these days, but on an individual level I would say perhaps that's disappointing from my management, but I'm not putting in the hours that I did when I was a younger person, and I don't think I should have to, but I can fit within those other structures.

**Elli:** Okay, we spent a bit of time on that question.

**Gary:** Sorry, I'm always expansive.

**Elli:** No, you've got absolutely interesting things there and I'm still thinking about them in my head. Anyway, we'll move forward. No. 4: In your opinion what role, if any, does qualitative science play in Antarctic science?

**Gary:** Yes, I remember seeing some of these questions and wondering how to think about them. Qualitative science. It's hard to get a handle on what you mean by – you're talking more about 'Oh, I think it goes this way', or 'If we do this, it's going to move things this way but we haven't got a feeling on by how much it's going to move'. I think that's reasonable as a starting point. When you're going into a new area and looking about, I think that's the way we've always been in science. If I start working in a new area, or one that I don't know much about, you will start looking at what the literature says and as you're building up you might say, 'Oh, I think it will go this way, I wonder if there's any more evidence to support that'. I think qualitative science is the starting point for making quantitative science. So I don't mind people doing that. In fact I think it's the way to go and then you might ask yourself the questions 'how much do we need to know about this', 'how important is this', and 'how would I go about quantifying the qualitative nature of the understanding we have at the moment'. Some of those things are extremely difficult to get an overall picture on the system without ?...?quantification?. There's a lot of effort that has to go into thinking about how you do your research from that, but qualitative thinking and justifying it against what research has been done at the moment is a very important starting point.

**Elli:** So you feel that as one gets more experienced in an area, then variables – that qualitative thinking, as you might say – they decrease.

**Gary:** You are able to put limits on them, yes. I would think that's the way you develop in any scientific area.

**Elli:** These days there are publications in something called researcher influence on science, what every?...? researcher is doing, which suggests that the researcher always brings hidden biases and influences into the scientific process. Do you ?...?

**Gary:** Yes, I think it's bad science if you're approaching it that way. Maybe there is some pressures within the system to do it that way. We see our politicians working that way. We see the people in society working that way to push their own barrow. I would hope, maybe after 30 years I'm getting old fashioned. No, that's not science. I feel there is some scope of that when reviews are going on, that people are interpreting things the way they want to, to push their science and I really wish I didn't get those sort of feeling about that if that's happening. But, still within the scope of what I'm trying to do, that's something that I would be fighting my hardest to avoid.

**Elli:** Do you think that it is possible for a scientist to reach that point where they are totally biased neutral or value free in working and processing data for example?

**Gary:** Hope not. I don't think you get to that stage to say that you're not concerned about what the implications of what you're doing are, but I think if you're focused correctly on why you're trying to do something and then you're trying to find an answer to something then science will be better if you're focused on what is actually going on here, rather than 'do I want something to happen'. I mean that's opposite to what you think you're doing as a scientist. That's where you're not doing science, you're doing spins – it ~~jumps~~ comes out of a different department, not out of a science department. In the whole thirty years I have never felt the pressure to have a particular result. Perhaps I'm not in an area that's been focussed on, but if you think about it the government would prefer there not to be environmental problems with the atmosphere, I guess our present government. But that's the sort of outcome they would like. If you're picking – I've never felt any pressure to ?...?

**Elli:** ?To do something?

**Gary:** No.

[END TAPE SIDE A]

**Gary:** ?...? ...to go the way I want You know, to look at the sort of focus on the bits that I put forward, that someone else reviews to say that's a good idea and then to get in there and with what resources I've got I'm certainly encouraged to get the best result I can with the resources they can give me.

**Elli:** Okay. Question No 5: Do you have any thoughts on the idea that spiritual insight and wisdom should play, or does already play, an active role in contemporary scientific research, such as physics and biology?

**Gary:** Well I think that's where people like Paul Davies come in. I mean, do you know Paul Davies?

**Elli:** I don't know him.

**Gary:** Okay. He's one of the people that looks right into things like universe creation and black holes, so he is a physicist that can discuss those sort of things on that sort of level, and yet he's funded at the moment by a big religious grAntarctic So there is that link across between that and ?cosmology?

**Elli:** Cosmology?

**Gary:** Cosmology, yes. He's doing cosmology but he is funded by a massive religious grant because he's looking at that sort of level. How is the universe structured and does this give us any inclination to a spiritual being or anything like that. So, yes if you can get to that sort of level it's important Can you hit me with the question again because I find it a bit awkward.

**Elli:** Okay. Do you have any thoughts on the idea that spiritual insight and wisdom should play, or does already play, an active role in contemporary scientific research?

**Gary:** Yes. Spiritual is a bit harder. I'm not religious therefore perhaps I don't think on that level. Wisdom I think has always been very important because that's what guides your qualitative thinking as to where the opportunities for further understanding what you're studying are. So I sort of think that those things are there, and certainly in earlier, well I guess for a religious person, perhaps the wisdom and the concept of the universe would sort of help them. You know – it might be part of the structure that says I want to work as a scientist and study this, but ultimately when it comes down to what is

there and what isn't there, I think that's just helping to provide the foundation for your motivation, rather than actually doing your science. I think certainly wisdom is very important

**Elli:** Do you think it's active ?Do you think it's part of?

**Gary:** Yes. Well I don't delve into – I'm more interested I guess in my own direct air. I certainly see scientific motivation in all my colleagues around the small – it's a relatively small group – that I see here. We've got John Humble who's retired from up at the uni but he still likes his science, so you can see the burning desire that's still there to understand things. And even the ones younger than me, their certainly idealistically motivated in terms of wanting to understand and perhaps not having the longer link to how we've progressed, perhaps aren't as comfortable with saying, you know are more aggressive to 'Oh, we can do this better' – and more have got that in them. I don't see it as anything that's negative there in drifting them off away from a reasonable approach to science. I don't see that that's changed. The strongest motivated scientist which I saw in my ? university days? inspired me in my younger years. I can still see examples of them around. I still see them there. I see the young ones coming up that I think 'Yeah, they're the same way'.

**Elli:** Okay. Question No 6: What do you think the goals and values are that are most prominent in your work culture at the Australian Antarctic Division, and before you answer that I just want to emphasise that in this question the goals and values is not referring to...

**Gary:** ?A government goal?

**Elli:** Yes. The official goals and values that are on the website or in the paperwork as such, it's more in the working environment.

**Gary:** Yes, I see more motivation these days because we have less of the people that were trying to you know, it was a job. Go home to the family. There's less opportunity now because the positions are so valued. It's a great job. A lot of scientists would love the opportunities that we've got and if we make our staff selections correct, we should have a great opportunity to pick really good people. So I think the goals are the way that I expressed it for myself. I mean I see people that aren't actually doing science and wouldn't say they want to do science. I see people like Lloyd Simmonds who's the engineer. He puts tremendous effort in trying to get these boffins organised so we've actually got a system that's going to produce more outcomes for the boffins, and we all admire him for his efforts there. And the guy, the other engineer that came in to talk to ?him? there I mean he's struggling with being directed in lots of different ways and pressured for time for making things for ships and things like that. But he's keen. I see the keenness.

**Elli:** So you would say that there's a real dedication.

**Gary:** Yes. I think there's more dedication today. I can still point out, there might be a few people within the division that perhaps aren't that way motivated. The system has got them down and it's just become a job. But if you put how many there are you know are like that, to how many there were like that a while ago, or percentage-wise, it's improved. And I'd say that would be the same all the way through society related to the change in productivity that we've got. No jobs are like that any more.

**Elli:** Would you describe that type of motivation as being ambition.

**Gary:** There certainly – I mean ambition – it motivates people more I think in the ? There are people who I would think have strong ambition motives. I think I'm a little past that and I think there – yes, it plays a part but I would be quite happy, like I competed for the Project Manager position here and I was manager of this back in the '80s and early '90s, but I stepped sideways to do my research because I thought the management function was not as enjoyable, or as generating ?...? fulfilling? I thought we could do better as a group if I had someone else handling the management side of things, and I went back into the research. I thought that if I did that swap then we could do better. Then I thought there was another opportunity to make better use of that and I didn't get it – get the position. But I acted in it for about three or four months and that's all I needed to remind me that I'm very grateful to the person whose got that position and is doing the job and seems to enjoy that. Now, I think there's a degree of ambition in those positions and probably ?...? of flicker in me that said OK, you might as well apply for it. But not in an bad sense. I think you want to be ambitious to a way, but you've just got to make sure it doesn't overwhelm you. I mean if you're looking for the thing of am I willing to backstab and fight, I mean it just really doesn't work or it makes the whole job – I think it would make the job difficult to sustain the efforts you want So I don't see it as being to a bad level.

**Elli:** An excessive level.

**Gary:** Yes. I think there's a right level. The people I see ?...? around me as scientists have a good balance between home motivations and job motivations.

**Elli:** And when you said job motivations –

**Gary:** That's to try and achieve the common goal that we have of getting research out. I mean there's reasonably good working together within our group. It's a relatively small group and I can see it even beyond that in the division that there are plenty of people here that are motivated to try and help us. So I don't see the ambition under them to affect any outcomes that they're trying to deliver, and I see them interested in our field and seeing that we can get some research out.

**Elli:** OK. Question No 7: Do you have any thoughts on the process of peer review as a means by which to ensure rigor in Antarctic scientific research?

**Gary:** Yes. The concept of peer review is great and it's a pretty good system but the bit that I'd never get accepted by my colleagues – I've actually thought long and hard about that. Perhaps I'll demonstrate ? by what I say. I like the concept of elevating the peers, the reviewers in a process of having a paper accepted. I reckon that if you're selected to review a paper, you should have access to more ~~that~~ than is in the paper, it should be your responsibility to see if you agree with the approach, and you should almost have published with every paper a page comment of what extra things the reviewer's looked at, what he thought might have been done a bit better but why he has approved the paper for publication. So I would like to see the review process have more of you know the referee who has done it should be able to say something about the paper. Then I also think we've got to get out of this habit of wanting to put out a paper for a paper's sake, and we've got to take the pressure off us that says you've got to produce so many papers a year. I think we ought to form a union or do something that says 'we're only going to be lead author on at most two papers a year, which means - I'm not asking any of my colleagues to spend time reading my distilled thoughts unless I've put six months of my thinking time into writing that, so that we cut down the amount of literature that we've got out there and we've put more of an effort into distilling our wisdom into a way that saves the people who have to read it the time of assimilating it. I would like to see both those things but I can never see them happening. The same way as democracy is the best system we've got for politics at the moment, I think the peer review system is the best we've got at the moment.

**Elli:** At the moment. So do you feel that there pressure on scientists to produce more than two papers a year?

**Gary:** I've managed – yes there's pressure too.

**Elli:** Or is it expected.

**Gary:** Yes, it's expected. And I think it's reasonable to expect a certain level. I mean, I'm relatively high up in the pay and academic scale within Antarctic division and in my performance of appraisal I have listed that I am meant to put out one lead author paper a year and one as a co-author, and I think that's a reasonable expectation. I might be able to do a little more, but that's a level that I'm comfortable with and that's been an agreement. And I think there's a general thing in society that that's about the level that we want to aim at. But over-emphasising that is just not the way to go. I like my Prof. who was my PhD supervisor. He said, you know we've got all these little ways that people like to try – it's amazing – everyone wants to assess scientists, and I want to take this into the other area later on so I'll blab a bit. But he said, you know the best way to assess a scientist is actually how many free meals he gets shouted by his colleagues. You know, how many conferences he gets invited to because people want to hear him talk and expand on the subject he's doing. That sort of does the complete picture and I don't want people to start counting ?those things? But in a way it's other scientist's view of scientists, your colleagues view that in a way helps you or makes you feel good but you generally should be self-motivated as well. Look, on that side of things there's a lot more review and assessment of scientists. I think that rather than refine how you deal with scientists, take what is a good scheme and apply it elsewhere. Apply it to the administrative side. Like, we had the Antarctic Science Advisory Committee – I keep blabbing that I want the Antarctic Administrative Advisory Committee and I want to chair it. I want the administrators to go through a similar sort of rigor with the way when they change the process that they should have to put out what they're trying to do, what outcomes they expect, how they're going to judge whether it's successful. They put it out to some other people that are, you know sort of peers, to look if they think that's a good idea and then lets assess it, so that we can look at the process. I mean, I think there's more to be gained through outcomes by applying that sort of process that we've got at the moment within the science across to other areas than there is by trying to refine the science where it is at the moment. I think the scientific approach to that is close, even maybe a little over the top in places, but there's more to be gained I think going that way than trying to refine the scientific one at present.

**Elli:** Okay. So in particular when you're meaning to apply that system ....

**Gary:** Of review and assessment.

**Elli:** Yes to other areas, you're specifically speaking about other organizations, or other areas of society that are somehow connected with science ...

**Gary:** No. I think it's something that you could do in industry. But the first thing I really am thinking of I guess is the areas adjacent to me. I think that's the sort of approach we want in our government organizations for the administrative part of things.

**Elli:** Even those areas that have nothing to do with science.

**Gary:** Yes. Well they all have an impact on society. I mean, I think there's some aspects of that – local councils. I think they aspire to that type of thing.

**Elli:** It's a very interesting idea.

**Gary:** I think it would work.

**Elli:** Okay. Question No 8: Have you ever considered giving up your professional position as a scientist for a simpler life, and a simpler life here means renouncing material life for a life of austerity and spiritual self-realisation and can you explain your answer.

**Gary:** I haven't and I wouldn't. I mean, I can think better when I'm comfortable and I like to make sure – I mean I'm certainly motivated to make a salary and a wage to support my family and make them comfortable and give them the opportunities that I reckon I've had to develop their lives and careers, and I would be – and then again, yes, because I certainly would consider when I got to the stage of perhaps considering early retirement, so that I can give a bit more time to the family, but it wouldn't be to cut out the science. I would want to try and set up, like Dr Humble is here, at a meritorious position somewhere that enabled me to keep my hands in for the science that I like doing. I would add a bit more golf, a bit more family, a bit more out in the bush, but I would still want to keep ticking over the science. I couldn't imagine not thinking about those areas – it would just not be... - it just wouldn't happen.

**Elli:** OK. Last question. As a scientist are you at all interested in whether or not species of Antarctic fauna and flora have, or are, a spiritual soul and can you explain your answer.

**Gary:** OK. I guess I don't get to that level in terms of I wouldn't express it in a religious context like you have. But is it something that I'm concerned about. I would say yes. Do I have a feeling for them. I mean I keep budgies. Now it took me lot of budgies, finches, quail and we've got two horses. Perhaps I'm not as enamoured by horses – they're too big – that's more the wife and the girls. But I'm judging at the moment – I took ages before I would come from Victoria before I introduced the birds down here and it was only when I settled down and stopped going to the Antarctica that I was willing to start looking after them, and I had trouble dealing with how they're going to cope with the winter. So I'm thinking about that and at the moment I'm dashing out at lunchtime, I'll be going home at lunchtime to bring in some of the older budgies inside because it's a bit too cold for the night and I've got plans for a bigger aviary with plastic down the side to try and make it a partial greenhouse effect inside the aviary to try and make it more comfortable. And I try to think a little bit .... Well I certainly feel that way about animals and it's a real hard, hard issue because you can see in the Antarctic the big male elephant seal squashing the little babies and all that sort of thing and nature is tough. But, yes I look at things and am concerned and admire them, so that's what I would say is the non-religious way of saying they have a spirit. Do you have a concern for them and you can see they are in trouble but you know that you can't interfere with the system, and you can see the viciousness. It's amazing – I've got a dog at home as well. You can see that when there's a bird or a guinea pig there she's looking at it, and if she had half a chance she would be at it. So they don't have that consideration of other animals that I think humans have. I would say, yes, without the religious context.

**Elli:** More ?the ?...?

**Gary:** Yes, but they're importc I would like to have the environment so they were comfortable in their environment.

**Elli:** OK. Well, that brings us to the end of our interview. Thank you very much. Is there anything else you want to add that you're thinking of.

**Gary:** I think you've more than covered it. I'm interested to see what sort of things come out of it because you've got a difficult... - well it's like that qualitative part of science where you've got to be very good at taking a bit of information and putting an insight on it to say what that really means.

**Elli:** Yes. These questions are all based on a specific methodology that I'm using so I've got a guideline. But yes it is challenging research even so. What I want to say again .....

[END OF TAPE]

## 7. CHURCH, John (CSIRO/ ACE CRC)

Start of tape:

**Elli:** This is Interview No 11 with John Church. John would you first of all like to tell me a little bit about your research in relation to Antarctic research. What the connection is.

**John:** I'm interested in sea level rise, particular sea level rise from the greenhouse effect and anthropogenic climate change. A component of that sea level rise is from thermal expansion of the ocean and a component comes from melting of land-based ice and it's flow into the ocean. My own work particularly relates to observe sea level rise, both in the Southern Ocean and elsewhere and also understanding the processes that lead to that, including ocean thermal expansion which 'implies' the Southern Ocean, because the Southern Ocean is the window to much of the world's oceans. It also involves 'a link to Antarctic research' because of the potential contribution from Antarctica to seal level either from Antarctic ice flowing into the ocean or increased precipitation on Antarctica leading to offsetting of some other components of sea level rise. I don't do that glaciological work myself but I'm interested in the results of it.

**Elli:** Okay, thank you very much. With your work, do you work with the scientists from the Antarctic Division at times?

**John:** Yes I do.

**Elli:** Okay.

**John:** The glaciologists in particular.

**Elli:** Okay thank you very much. Are you ready to start with the questions?

**John:** Yes – I can't remember what they are so I may as well be ready.

**Elli:** Okay, No 1: What inspires or excites you the most about being an Antarctic scientist?

**John:** What inspires me the most about doing what I do – I probably don't describe myself as an Antarctic scientist – is sea level rise I think is an interesting scientific – a very challenging scientific – issue. It involves oceanography, understanding how the oceans work, how they interact with the atmosphere. It also involves other challenging components, the work with the glaciologists, work with 'terrestrial' people and it also has a direct impact on society. A lot of the work that I, as an oceanographer interested in the 'role' of the ocean in climate, would tend to be one step removed from the impacts and have to work through the atmosphere to see what the impacts are. With sea level that's direct from the ocean link, so there's a very direct impact on society and I think it's a pretty important issue for the next century, or for this century.

**Elli:** So it's the contributions that you can make without the science itself.

**John:** Yes I guess I want to be part of the solution to some of the uncertainties, but I also want to have an impact of direct relevance to society as well.

**Elli:** Okay, Question No 2 is a little bit similar to Question No 1, but a little bit different. Can you tell me about your original motivations for becoming an Antarctic scientist?

**John:** Original motivations. Okay, well that goes back quite a number of years. Back in the early 1990s and the late 1980s even I became interested in the role of the ocean and climate, particularly the role of the ocean and climate change. The Southern Ocean was a key part of that. At that stage Australia had no Southern Ocean program, either in the Antarctic Division or CSIRO. We were keen in initiating such a program and an opportunity came along and we grabbed it.

**Elli:** Okay, so in other words '...' mainly be '...' role '...' in climate change

**John:** Yes, that's the key.

**Elli:** Okay. Question No 3 – something a bit different. Can you tell me anything about your own consciousness during your working day? In other words what usually goes through your mind during an ordinary working day?

**John:** The main thing is how do I deal with all this bloody email.

**Elli:** Yes I think I tend to relate to that one as well actually.

**John:** I don't know how to answer this question. I guess I'm some sort of practical, down to earth person. I have a huge international commitment.

**Elli:** International.

**John:** Yes, I'm on international steering committees, so balancing those with my obligations to my employer and actually producing results that are both relevant to science and to society and it's getting that balance and also there's also a family commitment. So is that the type of answer you wanted?

**Elli:** Yes.

**John:** I guess what drives me is getting the results but it's then a matter of balancing up all these competing demands, and I guess I'm not as efficient as I should be.

**Elli:** Okay, to summarise, ?...? work orientated goals ?...? and some goals ?...? but mainly work tasks.

**John:** ?...? work tasks, yes. I don't think about what the?...? impact issue all the time but it does come up quite frequently. Like this morning I was discussing with somebody about ?storm verges? And their impact around Tasmania and how we'd communicate that to the public, so I do think about those issues as well, but the focus is on science.

**Elli:** Yes, that's quite an important one. I was just ?thinking? this morning ?...? about the importance of scientists communicating to the public what they know and for the public to receive the right knowledge and I would guess that with your research that that would be quite important because you're dealing with these sorts of issues that people are concerned about ?...? and sea ice level and all those sorts of things.

**John:** [*Indecipherable*] ...I do sea level rise. Sea level rise is not all that different to all the oceanography that my colleagues do. It entails a lot of the same underlying work but it's got this social impact aspect as well ?...?

**Elli:** Would it be correct to say that when you're working throughout your day with your localised work tasks, you are conscious of the big picture, like the results of your work and how it's going to ?...? policy or society.

**John:** Yes, I am conscious of that and I think I do have a pretty good picture of the big picture.

**Elli:** Okay. Question No 4: In your opinion what role, if any, does qualitative science play in Antarctic science?

**John:** Well really what I struggle to do is quantitative work. Beyond that I'm not quite sure how to answer. I think that physical scientists, they're always trying to struggle with making things more quantitative, narrowing uncertainty and actually making estimates of uncertainty.

**Elli:** This is actually why I asked that question because my understanding, having been living ?...? for three and a half years is that most Antarctic science is quantitative, or it strives towards a purely quantitative methodology where one can reduce uncertainties and variables, or at least secure the variables that you're dealing with to arrive at the more predictable data that we get. ?I suppose that's easier to work with? So this is one of the reasons why I asked that because I am a social scientist so working as a social scientist there are so many variables that one works with all the time - working with qualitative data collection.

**John:** Perhaps one area where – in my area where qualitative science ?...? impacts on society and how governments wish to respond to things like [*Indecipherable*] etc. That's an interaction then of quantitative science and qualitative issues, and that's an important ?intersection?

**Elli:** Do you feel that, given that realm, that they are integral to each other. For example the quantitative science that you do has an essential link with society's values and therefore there is that kind of ?...? dependent on qualitative factors.

**John:** Well ?...? there is an essential link and that's a link that's important both to the science and to society, but I guess I would still strive for the quantitative side of the science. While you were talking I was thinking of another example. It's not work I personally do but through my international connections I guess I'm responsible for some programs which relate climate and ?...?. You could

think, well this is a quantitative area but again the science that I'm involved in, or my colleagues are involved in, in this case, would be again more quantitative in the sense of increased rainfall or floods or droughts etc. What's the link between those and 'these'?...? But again we would be striving how to make that quantitative. How much rain?... involved? how many?...? cases of malaria.

**Elli:** Yes, I understand. I had a similar response from a couple of other people I've spoken with that that is the goal to quantify as much as is possible.

**John:** '...?' might need to make a qualitative decision. You might say, I have to decide whether I'm going to invest in additional emergency supplies to respond to a malaria outbreak or not this year and they might say, well you're only predicting one extra death [*indecipherable*] or you're predicting a thousand extra deaths, I'll do something.

**Elli:** Yes. '...?' One other area where qualitative science, if you could call it a science, from my understanding is an integral part of quantitative science. You may have read [*indecipherable*] something that is being discussed more and more. It's call researcher influence. In other words, what other values or biases that the researcher brings to the scientific process. Some people say that you can never remove those so in that sense, from my understanding, that is a qualitative factor they impose upon science. Do you have any thoughts on that?

**John:** I guess my reaction would be quantitative science strives to remove those. I think I recognise that there are – each of us whatever we do bring our own prejudices. But what we do try to do in quantitative science is to put those aside and make our work as objective as possible. This is particularly true in the climate change area. I may have views on whether climate change is real or not or whether it's a good thing or not, but that shouldn't affect the results that I produce.

**Elli:** So personally you strive towards that. Do you think [*indecipherable*] that is the general goal of the type of science that you're working in '...?' Antarctic science.

**John:** Yes I do.

**Elli:** To achieve that goal.

**John:** And pretty well overwhelmingly so. There may be one or two exceptions to that but I think that would be it.

**Elli:** Okay '...?' No 5: Do you have any thoughts on the idea that spiritual insight and wisdom should play, or does already play, an active role in contemporary scientific research such as physics and biology?

**John:** What do you mean by spiritual insight and wisdom?

**Elli:** Okay, well I'm leaving those words – especially spiritual insight – I'm leaving that up to interpretation by the person who is answering the question. You're quite right, I could have '...?' 'glossary' at the beginning of this but I '...?' didn't because my understanding is that we all have our own understanding of what spirituality is. Even '...?' people [*indecipherable*] philosophical persuasion or religious persuasion. I think the dictionary meaning of the word 'spiritual' is something which is not part or as mundane as the world we're living in '...?' something which is [*indecipherable*]...material world. But if you have another interpretation '...?'

**John:** Okay, in that context I don't believe in God and spirits etc., so I guess I'd simply have to say it has not impact [*indecipherable*]. Perhaps, more broadly, certainly wisdom I think does. There would be two aspects of it. One would be physical insight. There's a million things I could do, but choosing which one to do and which explanation to pursue to try and understand something involves physical insight. That's perhaps a little bit more like your qualitative science I guess. That's an important thing to do. It's important to have that physical insight. Another side might be, wisdom probably plays an important role in the sense of – well perhaps in responding to climate change. What are appropriate solutions. When might be the right time for society to adopt these solutions. What are the broader impacts. So in that sense, I'd say wisdom certainly does have a role to play.

**Elli:** Okay. Can you in your position, would you be able to '...?' questions that you '...?' '...?' relevant to your work.

**John:** They're certainly relevant and to some extent I deal with them. I at least interact with them. I'm not responsible for how society responds. On the other hand I do try to influence or at least communicate with society so that society can respond appropriately.

**Elli:** Just on that note. In your position as Program Leader, do you receive any communications from, for example, 'NGOs' or any more environmental groups who might be targeting or focussing on

persons like yourself who are kind of right up the front there when it comes to issues like global warming and the ozone layer and ?...?. Do you get any interaction?

**John:** I have had some interaction with those type of groups but not a great deal actually. I certainly know of quite a number of ?NGO? groups and I've met people and spoken to them. But I've been pretty strong in resisting being influenced by them. In fact I strongly value my independence. There was one group at one stage which wanted me to go and meet a Federal Minister with them and I declined that because I'd been seen to be losing my independence. I'm quite happy to go and speak to a Federal Minister and tell him what I thought but not as a spokesman for another group.

**Elli:** So they wanted you to ?...? on the [indecipherable]

**John:** Climate change ?...?

**Elli:** Climate change ?...?. Okay, interesting. I was thinking that because I know that a lot of environmental groups and ?NGOs?, although they have the [indecipherable] spiritual appreciation perhaps of conservation. [indecipherable] blend science and ethical [indecipherable]

**John:** [indecipherable] ...ethics are an important thing and an important thing for me to consider as well. If I want to have an influence into the future and be influencing society and government, I not only have to be independent but also be seen to be independent.

**Elli:** Yes, I was going to say that that's actually ?...? some people I've spoken with have interpreted ?...? as ethics [indecipherable]

**John:** Yes, I've forgotten what the question was, but certainly environmental ethics has an important role to play.

**Elli:** Okay, shall we move onto the next one.

**John:** Yes.

**Elli:** Okay. No 6: What do you think the goals and values are that are most prominent in your work culture at the – well in your case – the CSIRO?

**John:** I think I should talk about the group that I work within and the culture and values- is that the question - culture and values?

**Elli:** Yes, goals and values that are prominent in your work culture.

**John:** Okay the goals are really trying to understand the environment, the ocean and the climate system, and the group I'm in focus on climate change. Incorporating that understanding in ways that society can benefit from, particular prediction models predicting the future, as well as actually understanding what's happening now. I think there's value in that alone without making predictions for the future. The culture is very much that the science is important, it needs to be independent, it needs to be top quality, it needs to be international standard, we need to link internationally and it needs to be relevAntarctic

**Elli:** Okay, so these are the things that you're trying to ?culminate? in the culture.

**John:** Yes.

**Elli:** The work culture, okay.

**John:** Money is not very strong at all. Research funds? We have to struggle for research funds but that doesn't drive it.

**Elli:** Okay. Question No 7: Do you have any thoughts on the process of peer review as a means by which to ensure rigour in Antarctic scientific research?

**John:** Peer review is important. Yes, I'm a strong supporter of peer review I guess. All our science results get peer reviewed, applications in many areas get peer reviewed, not in all areas actually. Again I think the group I'm in would strongly support peer review and would probably say there ought to be more of it.

**Elli:** Okay, so do you think it actually achieves – keeping Antarctic science rigorous.

**John:** It certainly helps and the problems we face in Australia and Antarctica research is the limited size of the community. Therefore we need to engage with the international community to peer review properly.

**Elli:** Okay. Question No 8: Have you ever considered giving up your professional position as a scientist for a simpler life, and a simpler life here means renouncing material life for a life of austerity and spiritual self-realisation and can you explain your answer?

**John:** I certainly can explain the answer. I certainly have given thought to giving up life to a simpler life and I guess it relates to something I said earlier - the pressures of international obligations and national obligations and obligations to my employer and obligations to society and my family and with my personal life. Sometimes I'd like life to be simple. There have been phases when I've said, well I can stand this any longer I'm out of here. But I have not done it and there's probably two answers. One, like most of us I'm probably somewhat scared of the unknown and perhaps, more importantly, I do actually want to have an impact both in the science and its impact on society.

**Elli:** So those two reasons you mentioned there, they have caused you *not* to want to give up your position.

**John:** In balance, yes.

**Elli:** Okay. Last question. As a scientist are you at all interested in whether or not species of Antarctic fauna and flora have, or are, a spiritual soul and can you explain your answer?

**John:** No I have no interest in that question. I'm not that way inclined.

**Elli:** Okay.

**John:** I do believe conservation and biodiversity, whether it's Antarctica or anywhere else, is an important issue and we need to try and conserve biodiversity. But as to the spiritual aspects of your question I have no comment at all.

**Elli:** Okay, that's fine. Alright that concludes the interview. Is there anything else you can think of that you might want to add?

**John:** No, I don't think so.

**Elli:** Alright, well thank you very much for your time.

**John:** Okay.

[END OF TAPE]

## 8. COLEMAN, Richard (ACE CRC/ UTAS)

Start of tape:

**Ellie:** This is Interview No 4 with Professor Richard Coleman. Richard, can you first of all tell me a little bit about how your research fits within the Australian Antarctic programs.

**Richard:** Yes sure. I guess if I just give you a bit of background. I came to the university down here in 1992 and started working with some of the glaciology group that were in Antarctic CRC at that stage and just through some student projects and honours projects, I was asked to give some help in geodetic analysis of some of the data and I guess things then developed from there. I proposed a few PhD projects for students and then since that time had four students do PhDs on Antarctic work, and then two seasons ago I got a chance to go there myself after sending students for so long. So predominantly my work fits into two of the ACE CRC programs. One is the climate and variability program, and the other is the sea level rise program. The other part of my research involves large-scale oceanography, satellite altimeter work, which I'm doing in collaboration with some other people, but it has an overlap with ice sheet ocean interaction.

**Elli:** So, you're involved in oceanography and ice?

**Richard:** Yes, physical oceanography and glaciology.

**Elli:** Okay. Shall we start with the questions.

**Richard:** Yes.

**Elli:** Okay. Question No 1: What inspires or excites you the most about being an Antarctic scientist?

**Richard:** I guess the main overlap with the science that I'm doing. My main thing in terms of science for the last 10 years I guess has been global climate change and I've been looking at that from the oceans, and also the cryosphere. So the ice sheets are really useful areas to study in terms being

sensitive to climate change. Ice sheets are very sensitive indicators of any climate change. The excitement is the awe and wonder of the place having visited there I think. I sent back a comment, after the first flight down one of the rifts on the ice sheet, to the students and colleagues in Hobart and said 'well, if the helicopter crashes tomorrow I'm happy', because it was just an incredible experience.

**Elli:** Whereabouts did you go?

**Richard:** This was on the Amery ice shelf, which is about 500 kilometres from Davis and so we were right near the front of the ice shelf, flying within a large rift. A big rift had opened up so the helicopter could fit in, we actually flew below the surface of the ice shelf. This big rift is opening up and is part of a thirty by thirty kilometre chunk of ice that will break off in what we think is about five years time – five to six years time.

**Elli:** OK. ...?

**Richard:** So, the excitement is really trying to make contributions that will hold for generations. We are just pushing into areas of research where we think the science is important for understanding climate change.

**Elli:** So it's your contribution to the science.

**Richard:** Yes.

**Elli:** Okay. The next question is actually a bit similar to the first one. It says, can you tell me about your original motivations for becoming an Antarctic scientist?

**Richard:** I guess if I looked all the way back to when I first started a surveying degree, there was a distinctive cover on a text book that had this surveying scientist making astronomical observations in the middle of Antarctica, so the original motivation for going into surveying was it was an outdoors job, challenging, you go to places that most people don't go to, kind of frontier type experiences, but it never turned out that way in terms of my initial career path. The course content of the surveying degree was much the same as in the textbook but groundbreaking type opportunities, in terms of undertaking Survey of India field work or being a frontier-type explorer didn't happen. However the fundamental training and processes and applications of the study were still the same.

**Elli:** Okay. So when you say it didn't happen, was that because you were thinking, well by the time you got to go down there, much of the area had actually been explored?

**Richard:** No, not much that way. It was just the surveying degree was being done in Sydney and there wasn't any interaction with Antarctic people. That was more the issue. I didn't push the opportunity for trying to get to Antarctica as at New South Wales Uni, where I was studying, there wasn't a lot of Antarctic interaction with anybody. So when I came down to Hobart, there was certainly an opportunity for expanding my Antarctic interest.

**Elli:** When you actually went down did that satisfy that initial interest

**Richard:** I guess that engendered, if you like, the inspiration to go again, so I would like to keep going often to do field work and science projects and being able to get hands-on experience in Antarctica. It's so much better for understanding the science. It's a bit like doing satellite oceanography and until you've been to sea and you actually can see what the instrumentation is measuring from space you don't get a perception of, if you like, the awe and wonder of the place.

**Elli:** Sure. So what you're saying is you are inspired by the combination of the Antarctic setting and the science in combination?

**Richard:** Sure. I think it's both. The setting without the science would be interesting to see but the desire to go back all the time would diminish. I mean if you've seen a place once that's fine in terms of being a tourist, but in terms of trying to solve fundamental problems, it is the combination.

**Elli:** So it's the scientific context of Antarctica that makes it special.

**Richard:** Yes. Sure.

**Elli:** Okay. Question No 3: Can you tell me anything about your own consciousness during your working day. In other words what usually goes through your mind during an ordinary working day?

**Richard:** I'd answer that two ways. If I was sitting here at Hobart and I don't have too much consciousness about what I'm trying to do for Antarctic work except make spare time to be able to do the research, which in my position at the moment doesn't happen too easily. So it's usually weekends that are the only time that you could get spare time to plan and to do some of the science. If you're down there, for us, you're just totally involved in doing projects and interacting with other people within the community and being able, if you like, to progress things in the optimum way with the other

constraints that exist. Such things from weather logistics, to just general day to day issues that come up.

**Elli:** OK. So would you say ?...? task of ?...? trying to work through ?things?

**Richard:** In Antarctica it's task orientated, but you really try to make the most out of the science opportunities. If you look at it in terms of the projects that I'm involved with, they are consuming something like a million dollars, or a million and a half dollars of taxpayers money in terms of funding the logistics for the projects. So I'm very conscious of that and trying to optimise the science return and basically what you said you would do, you can achieve.

**Elli:** Okay, and is that at all similar to when you're working on tasks here ?...?

**Richard:** Sure. You're trying to make, if you like, the best use of your time during the day so that when you go home you're happy with what you've achieved for the day.

**Elli:** One question that I want to add onto that one. Do you think that the consciousness of scientists is important in terms of the results of the science that they do?

**Richard:** Sure. I think if you truly believe in what you're doing and the goals that you've set for yourself, then I think it's important that you're actually looking at the bigger picture and involving others and exciting others and pushing that forward.

**Elli:** OK. Well, Question No 4: In your opinion what role, if any, does qualitative science play in Antarctic science?

**Richard:** I think it's certainly an important area that needs to be engendered. When I went down I had an artist and a film-maker sharing the cabin, Steve Eastaugh and Matthew Rork I think. It was an interesting time as a scientist in amongst these other expeditioners and I saw things differently through looking at Steven's paintings and sketches and how he saw the environment and the way that I looked at it, so I certainly think it's valuable.

**Elli:** Do you think that qualitative research can have, or should be, or can be combined with Antarctic science? For example, ?...? human impact ?...? on research. There was a thing that is discussed, it's called researcher influence on the scientific process ?...? social? psychology but also social behaviour ?...? So, as a scientist do you think that it may be necessary to research, for example, researcher influence on the scientific process. I mean qualitative research ?...? study ?...?

**Richard:** Well certainly I think the environment in Antarctica is one that imposes lots of different risks to people if they actually don't think about what they're doing. There are situations, even on our expedition, where you're certainly drilled in terms of social behaviour, the do's and don'ts of field logistics. Things can go wrong pretty quickly and I think the interaction of, if you like, the psychology of interacting with others and the standard social behaviour that happens in a large city to when it's transformed down there into a smaller community is amplified when situations go wrong.

**Elli:** That's interesting. So ?...?

**Richard:** Yes. And for us it was. When we were camped on an ice shelf, there was only six of us and you're in the middle of an ice shelf 500 kilometres away from anybody. A helicopter can come and get you, but basically you're out there and need to survive by yourselves, so if things had gone wrong then you're actually relying on everybody else to be able to survive.

**Elli:** How long were you in that situation for?

**Richard:** About six weeks.

**Elli:** Six weeks, six people and one small tent?

**Richard:** No. Luckily, we all had individual tents and there was a separate work tent. But everyone had to co-ordinate activities, take it in turns to do cooking and not only do field work all of the time.

**Elli:** Interesting. My understanding here is that most Antarctic scientists are aware of this difference in group dynamics that happens when you're down there. Has that been your experience?

**Richard:** Yes, I think by and large that would be the case.

**Elli:** That is interesting to me, the fact that they were aware of that because that to me says that group dynamics can change according to the environment, and if group dynamics are influenced by an environmental setting, what does that say of the environmental setting that we have here in Hobart. How does this environment influence us. We must assume that this environment is also not totally value free, it must ?impact??

**Richard:** Sure. I think we were really conscious of the food stuffs and of waste disposal and all of those things that were likely to impact the environment. But quite rightly, and I think all of us were very conscious of not, if you like, polluting the environment so that when we left the camp area the imprint of us being there would have been taken out probably in the first blizzard that went through.

**Elli:** So just on that ? do you think that ?when you and your friends were? down there, ?your work?? colleagues, would you say that ? environmental conservation ethic was enhanced when you were out in the field? It must change.

**Richard:** No. Certainly back on the base there was a lot of similar behaviour. There was a lot of recycling of waste and people being very conscious of how things were disposed of.

**Elli:** Okay. And again, would you say that there was a difference in attitude back here in Hobart. Like would you normally discuss these things?

**Richard:** I think in a home environment we go through much the same routines, but I think in the general community it's not observed the same way.

**Elli:** No. So perhaps Antarctic scientists or environmental scientists are more aware.

**Richard:** Yes, I would say that would be true.

**Elli:** Okay. Question No 5: Do you have any thoughts on the idea that spiritual insight and wisdom should play, or already does play, an active role in contemporary scientific research, such as physics and biology?

**Richard:** That's a tricky question. I think that's very individual for the scientists. In terms of what you'd look at in old documentaries and reading some of the Antarctic histories, I think religion played probably a more dominant role in previous times than now. In previous times there probably would have been a minister or something like that on the base during the summer and winter programs, whereas in current times that's not the case. So I think the spiritual aspects of what people believe and how they behave is much more an individual behaviour rather than a group behaviour these days. But I think that's the evolution of religion as a whole in current times.

**Elli:** (*indecipherable*) back to the days of Captain Cook and ?...? religion in ?...? society was more of a social ?...? whereas now its become ?...? So do you feel that it's a social change that has ?...?

**Richard:** Well, I think a social change in terms of the numbers. I think if you believe in God or Islam of whatever you choose these days, then I think that's still in terms of, if you like, the power of the effects on the individuals are still the same, but I think the community at large, in terms of worshippers and otherwise in different congregations, has reduced and communities overall attitudes, in terms of religion, have changed and it's not such a powerful influence on people's behaviours. It's not seen as something that's your sense of community duty or anything like that any more.

**Elli:** As a scientist?

**Richard:** Yes.

**Elli:** Okay. Yes will there's nothing mentioned ?...? Antarctic ?...? (*indecipherable*) ?discuss things like that? ?...?

**Richard:** Yes. I think ?...? ethics behaviour, certainly wisdom in terms of making decisions is critical in education for people ?...?

**Elli:** Just on the wisdom bit. Do you think that wisdom is currently ?...? decision-making?...?

**Richard:** Certainly for the scientists that go down. It's more to me common sense in terms of making decisions and some experience in knowing which decisions are the right ones to make. You're certainly made aware of that if you make the wrong decision, it could be life threatening for you and others. So there are general expectations and we do have trained personnel down there that help considerably, such as field training officers that have much more field experience than science people. You do have a lot of scientists that have many years of field experience, but for me, in my case, it was the first time I'd been down there so you're probably a bit more aware of making sure you make the right decisions and think about things before you act.

**Elli:** Before we go on Richard. ?Because of the contract in your life? ?...? quite strongly (*indecipherable*)

**Richard:** (*indecipherable*)

**Elli:** (*indecipherable*) Okay. So you think ?...? that perhaps is particularly ?...? when it comes to experience.

**Richard:** Yes.

**Elli:** (*indecipherable*) Okay. Question No 6: What do you think the goals and values are that are most prominent in your work culture at Antarctic CRC?

**Richard:** I guess I'm in a couple of different organizations but the question's basically the same. I think for me it's about leadership. Being able to make strategic plans for research and setting out goals that need to be achieved over a short and long period of time. Being able to integrate others into the projects that certainly can't be done by yourself so it's including others. Being able to value other's input, by other students or other colleagues and being able to, if you like, get the best out of everybody in terms of the common goal.

**Elli:** OK. So you feel that the culture is actually largely focussed on the work that needs to be done, more than what does happen sometimes in organizations that there are other very strong cultures that exist amongst the people, and they're not necessarily related to the tasks that actually get done.

**Richard:** I guess for me that's the primary goal. If you're not doing science then you shouldn't be in that game.

**Elli:** (*indecipherable*) mind set.

**Richard:** Sure. Those that I've been involved with have a similar mentality.

**Elli:** So, I suppose that comes down to ?...? scientists so would you say ?...? interest in Antarctic science.

**Richard:** Sure. I think the conversations that go on during the voyage down there span across disciplines. Everybody's chatting about their various field

projects and thinking about possible input into others problems.

**Elli:** Okay. So you feel there's a genuine interest ?...? scientists ?...? their job ?...? you feel ?...? genuine interest in the science that's being carried out ?...?

**Richard:** Yes, beyond their own projects and everybody's working really long hours without even thinking about it. Just genuine interest in what they're doing.

**Elli:** So you say that kind of interest ?...? science (*indecipherable*)

**Richard:** Sure, I would think so.

**Elli:** OK. Question No 7: Do you have any thoughts on the process of peer review as a means by which to ensure rigor in Antarctic scientific research?

**Richard:** Yes. This is a standard way of doing things and there's no easy system in terms of evaluating other's work, but I think the peer review system has worked well for the Antarctic work that I've been involved with. Everybody that puts in applications is expected to review other's proposals and I think that if done professionally, then it's an excellent system.

**Elli:** OK. So you think that it's something that works.

**Richard:** Yes. I think there are probably some individuals that if they know the groups that are probably competing against each other, the peer review system can be abused. Some people can be fairly ambitious and be ruthless in assessing proposals and in this case the reviews are done more on a personality type issue rather than on a professional level. I think however that this is a rare situation.

**Elli:** OK. On other question I ?...? There's a saying that goes 'the blind leading the blind', so I was thinking about peer review. I was thinking ?...? education system one always has a teacher or a supervisor and you get to the level of a doctor or somebody of that qualification and then you actually stop having somebody above you so far as science goes. Of course sometimes we have a chief scientist but largely when you get to that kind of level then it's really the understanding is that that's pretty much as far as you can go in scientific understanding. So I was thinking that if we look at peer review then how will you really know if all the scientists that on this doctorate level, what if they're ?...? about something?

**Richard:** Yes, interesting question. I think statistically it wouldn't work that way. I think the more you actually learn, for me, it seems the less you understand. You certainly gain a lot of understanding, but there's always more problems to solve, so that you make an incremental change to some areas, but it just opens up others. So under peer review you certainly have more experienced scientists typically evaluating the work of others, or those less experienced. So that the main criticism I guess that you could level that way is that if they're all just ticking the box or they're not really understanding the critical elements or fundamentals of the problem, then it won't work. But the alternative of selecting somebody has to be done in some way and peer review is what I would consider a more fair and

equitable way of doing it, rather than allowing somebody else, perhaps one or two key people, to nominate who would get the grant.

**Elli:** So again we come down to the experience thing. So there might be some (*indecipherable*)

**Richard:** Well, it could be that the positions of chief scientists or no matter who it is, I think there's certainly somebody that's more expert in the field. I think in terms of the peer review system if you regularly get, for example, an ARC or grant application to review, you develop a fair degree of familiarity with picking up the good science in the proposals. But it's not only on what science is proposed, you are also typically evaluated these days on performance, so that itself is whether people are publishing in high quality journals and if they are producing the science in the previous grant that they said they would do. Obviously the science results might not be the most brilliant, but they've at least got themselves together to produce outcomes.

**Elli:** OK. Now as you were saying before, when you first answered on this question? you said it works. You think the system works, so I suppose if somebody did publish something ...? peer review and it ended up being wrong? ? discredited, it would be thrown out.

**Richard:** Yes. I think people publish and put it in the international arena so that it is open for peer review. We've had work ourselves, done with John Hunter, and David Pugh and others, published on sea level rise estimates that has been attacked by people that were from a non-science type background, but still this still enabled healthy debate on what we had been investigating.

[END SIDE A]

**Richard:** It's been open to scrutiny at some level.

**Elli:** Yes sure. That's interesting. So it was coming from a non-science....

**Richard:** Yes. Well the person was a high school teacher, but with an avid greenhouse interest, so we were largely attacked through his own website and through mailing lists.

**Elli:** But you as far as the scientific merit of that work? went? you weren't discredited on ...?

**Richard:** This person had actually written to a journal trying to put forward his arguments and his work went through a peer review system and his arguments were, from a science point of view, thrown away by independent journal reviewers.

**Elli:** Thrown away.

**Richard:** Yes. And then the comment was, well you scientists stick together and won't take any notice of somebody without a Dr in front of their name, but that certainly wasn't the case.

**Elli:** OK. I'm sure they ...? non-science bodies that (*indecipherable*)

**Richard:** I think just getting back to this peer review system, it brought up another problem where again we were criticised. I think generally in some science arenas peer review is done on an anonymous basis. In other areas, it's done where people actually know the authors and you're given the option of saying whether you want the person whose paper you are reviewing to know your identity as a reviewer. So again it's done on a fairly open basis.

**Elli:** Most of the review process is anonymous though isn't it?

**Richard:** Not completely anonymous. You actually get to know who the authors are on the papers that you typically review and their names are not normally made anonymous. It is more the case that the reviewer can choose to be anonymous or not to the authors. I think in the social sciences area, the whole review process tends to be completely anonymous. In the sciences area that I've been involved in, it is the reviewer who is anonymous by his/her choice.

**Elli:** Is that (*indecipherable*)

**Richard:** I think so, yes. So I guess potentially because of freedom of information you can ask to see details of reviewers.

**Elli:** 8. Have you ever considered giving up your professional position as a scientist for a simpler life, and a simpler life here means renouncing material life for a life of austerity and spiritual self-realisation and can you explain your answer.

**Richard:** Well, firstly I don't think I would give up the life of a scientist because I think it is a pretty simple and focussed life. You're not in the game to make money, well certainly from the science that we're doing here. In other science areas, I guess you can make inventions and make large amounts of money from the work undertaken. And you don't have to be a scientist to do that as you can see from

Mr Gates. Like Bill Gates' opportunities, you can come up with a good invention and things happen. So no, I don't see trying to stop what I'm doing in terms of work practice nor at an age that one should stop doing science.

**Elli:** OK. I was interested in what you said first. You said you wouldn't stop because you actually see your life at the moment as being simple and focussed.

**Richard:** Yes, well simple and focussed in terms of I'm pretty locked onto achieving what I am trying to do, so that way there's a few peripheral things that I ignore and so you're setting priorities in what you want to do next. So there are weekends where family sometimes takes second priority in terms of doing what I think needs to be done.

**Elli:** OK. The last one. As a scientist are you at all interested in whether or not species of Antarctic fauna and flora have, or are, a spiritual soul and can you explain your answer.

**Richard:** In terms of my work environment, being well away from flora and fauna, but having worked with a few scientists down there that have been doing seal studies and human impacts on animals, yes I think all creatures have a soul in some way and you can certainly see the effects of some of the behaviour of human existence on the animals. Their patterns of adaptability are certainly obvious.

**Elli:** Do you think that Antarctic biology programs should either perhaps research this aspect of animals or at least be mindful of this when they go ????? the animals.

**Richard:** Definitely I think so. It really is a difficult set of questions to prioritise. For instance, the use of helicopters and other craft near rookeries or seal colonies are given certain distances of how far they should be away, but even flying at high altitudes above seals across the sea ice, you certainly can even see with your eye that the seals notice that you're there. They look around, they've looked up despite you being well within the guidelines of where you should be. However the seals were still aware of our presence. It's a bit like us if planes fly overhead, they're way above you but you still actually notice the sound or the image or have some awareness. And what sort of disturbance that has on the animals, it's just about impossible to quantify.

**Elli:** It would be. Yes, because animals, or my understanding is that animals are individuals just like people, just like some people might respond differently to those sorts of stimuli, I was going to say intrusions ?. We respond differently ?...?

**Richard:** I think it is an environment that has got to be preserved for its uniqueness and the flora and fauna are part of that environment. So it will be interesting with the air transport to see what changes are needed.

**Elli:** Yes, I think it's rather that there are ? more people in Antarctic in future ?it's hard to interpret? I think I read somewhere? ten years ago that Antarctic is now the ?world's? fastest growing tourist destination (*indecipherable*). So it's going to be interesting (*indecipherable*)

**Richard:** Yes. There are some areas that may be opened for tourism but to me it's a bit scary, depending on whether it's done properly and whether it's abused. It is a very hard area to actually, if you like, police in some way. Because to do that implies having the resources and rules imposed as well. We can certainly do things from satellites, such as surveillance, but you can't stop things happening.

**Elli:** No, that's true. And technology is getting better and better ?...? easier and easier for people to get down there (*indecipherable*). OK, what else can I ask you. Just on that last one, do you think that your appreciation of the Antarctic fauna, do you think that's reflected in the Antarctic scientific community, or do you think that your outlook on that is different to other Antarctic scientists?

**Richard:** Again a bit hard to comment on because I haven't been involved with a lot of those programs, but just talking to the scientists on the base I think, yes they're certainly well aware. The experience I have had with some students doing PhD projects where they were very aware of these aspects. They were having to tranquillise animals to put sensors on them, so it was using guns and firing darts and drugs into the animals and it does produce noticeable crisis situations for the animals. I think in some cases if it's not done properly you'll potentially kill the animals in terms of either not getting the correct dosage or hitting them in the wrong spot. But probably overall it's one of these aspects similar to what happens in war time now, where you're actually going to have some loss of innocent animals. In this Antarctic case, it is trying to do a study for the animals own larger good.

**Elli:** OK. Is there anything else that you think you might want to add to this interview on anything (*indecipherable*)

**Richard:** No not really. Just that it's exciting to be able to be an Antarctic scientist and Hobart provides a unique opportunity for us in terms of being within a unique environment. Certainly scientists that come from other cities can have similar experiences but the community here allows probably a bit more opportunity for being involved.

**Elli:** OK. So just one last thing. Do you think you could be happy in another environmental science working position, or .....

**Richard:** I think for me in terms of what I'm doing, whether it's on the ocean or in Antarctica, that it can be pretty awe inspiring in terms of you really in being areas where you can survive or not, depending on the conditions at hand. It is doing science but also potentially living on the edge in some situations.

**Elli:** What about the conservation aspect. Is that something that ?...? you a environmental conservation ?...? big picture of it.

**Richard:** Sure. I think the planet is under lots of pressures from lots of different aspects and if we don't actually understand what is happening to the planet as a whole then these places may not exist in generations to come.

**Elli:** Alright.....

**[END OF TAPE]**

## 9. DAVIDSON, Garry (UTAS/ AAD)

Start of tape:

**Elli:** So Gary can you start by explaining a little bit about how your research fits within Antarctic research?

**Garry:** Yes, certainly. I'm a senior lecturer here at the University of Tasmania, School of Earth sciences and 50% in what we call the Center for Ore-deposit Research, which is a dedicated unit within the school, and what we do is work on Macquarie Island, so we don't work right down in Antarctica, and our interest there is to understand more about the hydrothermal history of ocean-crust that covers 70% of the Earth. So we've come into Macquarie Island because it's a chunk of this ocean crust that's been brought up by tectonic forces, and we're able to carry out very cheaply, studies that are very expensive. We have to undertake them on the ocean floor itself. So my role, I guess, or the way I've become involved, is through perceiving that there was an interesting scientific problem down there, and then becoming aware that we could get support through the AAD to do research there. And then going through the normal channels to make that happen, over I guess the last eight years. It was.. it started off as the nub of my ARC fellowship, and then I've carried that through as a series of other grants and a whole lot of other scientists have sort of become involved at the same time.

**Elli:** So you work within ... what's this...

**Garry:** This part of the building is CODES, but how big CODES is depends on how successful CODES is being within a particular year, compared to the school.

**Elli:** Thank you very much for that. So are you ready to start the questions?

**Garry:** Yes

**Elli:** Question No 1: What inspires or excites you the most about being an Antarctic scientist, or perhaps in your case, doing Antarctic science?

**Garry:** Doing Antarctic science. I looked at that question and I think it is relevant to the question we often ask of why to people become geologists. A lot of people become geologists, or one of their motivations, is because they're interested in the outdoors and adventure and having a diverse life I guess, and getting down to Antarctica or something with Antarctic elements is one of those really enthralling, diverse places. So it's terrific to fulfil that ambition as a geologist. The other thing about this in particular is that the science that you can do on Macquarie Island is very special in terms of its geology, so that's exciting too, that we're able to, I guess, be competitive with much more wealthy

research programs who are working on the ocean floor, because we're working on stuff that's brought up to the surface.

**Elli:** Alright. Question No 2: Can you tell me about your original motivations for becoming an Antarctic scientist, or again in your case, for becoming involved in Antarctic science? It's quite similar to the first question.

**Garry:** Yes, and probably quite similar to my preamble. I've always looked at Antarctica and realised that a lot of my research interests are very much ore deposit geology focussed and for reasons of the Antarctic Treaty, it's never been a very likely thing that ore deposit geologists spend much time on Antarctica. We can make the case to go down there where we want to look at analogues, that we can then apply those lessons back onto mainland or more global problems. That's certainly the line we take at Macquarie Island for instance because that's a world heritage site. Also, when you look at the rocks in Antarctica generally there are very few examples of problems, as an ore deposit geologist, that I'm used to focussing on. So when I learnt about Macquarie Island geology and realised, well this is a very interesting opportunity. Probably that came about through a scientist who died here about five years ago now, ?Prof. Rick? ?Barn?. In a sense Macquarie Island was his. I'd spent like ten or fifteen years here occasionally listening to his seminars about Macquarie Island but it didn't seem very relevant, but when I started talking to him in more detail I realised that the sorts of rocks that we were interested in could be looked at on this island. Particularly my research interests headed off ?area of geochemistry, it hadn't been applied to this island. So I realised that there was an opportunity to bring this new area of geochemistry and apply it to these interesting ?...? on the island and that there was this wonderful way of getting down to the island that we could never afford otherwise. We put all that together and applied and that was the skeleton that underpinned the successful ?...? fellowship ?...? so then I had a funding body as well. You always need the money, it doesn't work without money.

**Elli:** So the Antarctic program was ?...? facilitated ?...?

**Garry:** Oh, greatly. Yes, greatly.

**Elli:** Can I ask you – when you speak 'ore deposit' you're speaking about minerals, is that the same thing?

**Garry:** That's right. Economic minerals.

**Elli:** Economic minerals. I hope you don't mind me asking, but I know at the moment there's a lot of ?...? on mining in Antarctica, mainly southern Antarctica as well ?...? ?...?. So you're looking at the economic use of minerals, is it foreseeable that there are minerals in the southern Antarctic or Antarctic that could be mined in the future?

**Garry:** Oh, there are, yes. I think the Australian Geological Survey Organisation [*indecipherable*] ... a guy called Bob ?Kingey? wrote a book on the Australian parts of Antarctica and he included a section on the ore deposits that they know about down there. There's a lot of coal, there's a lot of iron ore – they're the obvious things. I think in the parts close to South America there are several know large copper deposits but they've never been evaluated in the way that we would look at normally because of this Treaty. In Macquarie Island we look at things that have a relevance to ore deposits and we're interested in the hydrothermal history. Hot fluids often carry metals and then deposit those metals out in special sites and we're interested in studying that process. In our studies we've not found anything that could be called an economic type of deposit down there, but we have found many indications that more rigorous research perhaps might find something.

**Elli:** I'm thinking that [*indecipherable*] ...the ?demand for? these sorts of minerals might have changed. I've heard that coal is on the way out or the demand isn't so great any more...

**Garry:** It's an interesting question really. Liquefaction of coal is something that people are interested in, in terms of not using coal itself but developing hydrocarbons from coal, so it could be of interest. A lot of those sorts of issues come down to how far it is from market.

**Elli:** [*indecipherable*]

**Garry:** Yes, that's right. The transport costs to market are very great. In the case of Macquarie Island it has the additional protection that it's a world heritage area and a Tasmanian national park, so it's pretty likely that no mining would ever occur on Macquarie Island.

**Elli:** [*indecipherable*]. Okay. Question No 3 – something a bit different: Can you tell me anything about your own consciousness during your working day. In other words, what usually goes through your mind during an ordinary working day?

**Garry:** Yes, well that's an easy question to answer I guess. My employer would hope that my mind is focussed on the business of the day. I think you spend probably half your time planning for the next few days and if you're teaching then you find you're teaching just saturates your time ?...?. When you're working on a teaching day, or prior to a day that's going to have a lot of teaching on it, then you focus on the logistics and really preparing your mind to be on top of the subject that you're going to be talking about for hours on end. You might not have talked about that for many months before. I do have to brush up and then if it's a span that I'm focussing on my research, then I'll be dividing my time between the things that are imperative to do quickly and also then looking at contact with my graduate students, so that we are all going forward as a team. So there are those thoughts, and there are thoughts of 'wouldn't it be nice to be out on the snow that we've been having'. It's an interesting thing I suppose. You could really find out what people are thinking about in the working day by looking at what they're looking up on the web. I'll have the ?...? on the web and will be checking the weather to see what's coming. I'm always interested in that, and you might be using it to look at the surf conditions. I think it's fair to say that most people in a working day – or ?...? during a working day – you do spare a bit of time for thinking, 'how can I be involved in the rest of world outside of these four walls', especially on the weekend.

**Elli:** So Friday's are different.

**Garry:** Yes, Fridays are a bit more relaxed. Sometimes there's a lot more ?...? you realise you haven't done so much during the week that you wanted to get done. I find in this job it's quite a busy job. It is a consuming job and you need to keep on top.

**Elli:** You mean time-wise.

**Garry:** Yes. Time-wise, being aware of deadlines, reporting deadlines, teaching deadlines, being aware of the requirements of how long things take and being organised. ?...? they have samples going through the preparation, how long it would take them to interpret them, and keeping all of that going to meet deadlines.

**Elli:** Would you say that time constraints can, or could, impact on the quality of the work that you perform?

**Garry:** I think so, yes. You need to be careful that you don't – we work with companies and at the inception of projects you might make commitments to them and you want to stand by those commitments. If you haven't got it right, or if the work turns out to be more involved, then that can often end up cutting into your interpretation. I think with those sorts of projects we do our best work after the projects are done in the write-up phase.

**Elli:** When you've got more time.

**Garry:** Yes, that's right.

**Elli:** Okay, so time constraints can impact on your work. What about this being a condition of a scientist's consciousness. Say if you had two different scientists and one of them was, apart from not being focussed on his or her work, his or her consciousness would be filled with thoughts on, for example, the money that they're going to make out of this work or the prestige that is going to come from doing this work, as opposed to if you had a scientist who was solely thinking that this is really important work, I want to do this right because if I do this then we can really make a difference in ?...?. So those two examples might not be the best but do you think that in that sort of ?...? ?...? ...scientist's consciousness can actually contribute to the outcomes of ?science?

**Garry:** I think that would be a fair comment. You can judge I guess people's consciousness or the ?work? of the work that they're doing in terms of the journals they end up trying to put the work into and you do strive to put your work into high impact areas. You can't get away from the fact that success and longevity in the scientific arena does partly revolve around recognition and a perception by the granting bodies of continued industry. You have certain unwritten contracts that you need to be fulfilling all the time with these granting bodies and in some ways you realise that there are shortcuts that you can, for instance, write a short high impact paper that achieves greater recognition and will give you a greater chance of success in a future granting process, which then will reflect on the whole centre. I guess a lot of our underlying motivations on the quality of our work come from trying to succeed in that area so that there will be more assured future success. For instance right now we're heading into a period of where we're going to apply for a new centre and everybody's focussing on publishing and high impact publishing. In terms of what does high impact publications – what are they – they are things that people perceive have moved beyond, moved the science another step. Then people look at that area in a slightly different way, so recognition in that sense is, in ore deposit geology, isn't about making it a better world in terms of improving the environment. I guess it's about

sustaining economic growth and when you look at where geology fits into government priorities, it is in the area of a sustainable use of resources. This is one of those so in that sense we can think that we're contributing to the national priorities and ethos. A lot of what we say there – I'm just trying to think of that from an *Antarctic* point of view – that those sorts of thoughts of economic growth etc are very much what the ore deposit geologist thinks about. When we do our work on the Macquarie Island ocean crust, we're also looking at things from a fundamental perspective. We're trying to work out how does the world work so I think you get some gratification for getting involved what we think is really fundamental, pushing back the boundaries of knowing what the links are between chemical processes in the crust and the chemistry of ocean water, because that impacts on so many other things.

**Elli:** That, what you call fundamental knowledge, will more than contribute towards what in particular?

**Garry:** I think that that is an interesting one. Sometimes fundamental knowledge can end up being applied. At other times it's simply trying to push the boundaries of knowing more about the world around us. In the granting process the government recognises that and asks you is it strategic research, is it applied basis, is it pure basic. They have these different shades of 'basicness'. Fundamentally I guess it comes down to there's good scope, there's simply curiosity-driven research in the stuff that we're doing down on Macquarie Island.

**Elli:** Okay, curiosity on behalf of the individual scientists...

**Garry:** There's a collectiveness. Everybody's sort of aware of what the general knowledge is, so you think well my curiosity's been answered about all those because somebody else's solved that. But pushing the next step of trying to understand linkages that are not clear and being the group that works that out is very gratifying.

**Elli:** Okay. Question No 4: In your opinion what role, if any, does qualitative science play in Antarctic science?

**Garry:** Well qualitative science plays a large role in geology. A lot of our science is based on observation, texture. People always do try to make those observations more solid by quantifying their observations but a lot of geology is about process. There's a lot of emphasis if you can on observing real time processes in action. That's not often possible in a lot of aspects of geology but a lot of geology is highly qualitative. We're an area of science where that linkage is qualitative/quantitative. It's actually quite a blur, it's quite a transition between those. I also work in hydro geological science, which is much more quantitative and in some ways that's good because you always know where you stand. Most geology is qualitative and interpretive and that allows some of our ethos as generalists comes out of that because in some areas of geology everybody accepts 'yes, there is no actual answer for this, there's only interpretation', so it's a little bit religious.

**Elli:** Interesting. I don't know but I'm estimating that the public's perception of geology is that it is more quantitative because it's not like biology where you have living organisms that bring so many variables into the study because they're living and changing and behaving. Rocks don't behave as such and they change very slowly, so myself anyway, I think generally people ?...? geologists ?...? ...more quantitative.

**Garry:** There's some very numerical parts of geology, like the whole field of geochemistry, geophysics – they're very numerical and there are other whole arms that are not numerical at all.

**Elli:** Yes, when you do ?...? work, when you have to actually interpret say the age of rocks and then you have to try to draw conclusions about the formation of rocks and even continents and things like that, I suppose that's highly qualitative when you have to interpret that.

**Garry:** Yes. It depends on the sorts of data sets or observations that you're using. Say age dating, that's obviously highly quantitative, but the process of being sure of a link between say one continent and another, that can be quite qualitative. I think it's not an easy line because one's often stepping across – you're making observations, you're coming up with hypotheses and then you try to test them by maybe quantifying something, measuring something. You make an observation on a texture in a qualitative way and then you might try to go to an arm of geochemistry to provide support for it. So you're jumping across it all the time.

**Elli:** Okay. Question No 5: Do you have any thoughts on the idea that spiritual insight and wisdom should play, or does already play, an active role in contemporary scientific research such as physics and biology?

**Garry:** I looked at the question and I thought this is going to be a tricky question to answer. I'm not a religious person so in that sense I suppose I'd probably have less – my answer to that would be that it

doesn't play a large role in contemporary scientific research. Than again it depends on what people interpret as spiritual – that word spiritual.

**Elli:** Yes it does and I've left it open to interpretation ?...? ...most people have a different understanding of what it does mean even if ?...? people belong to the same faith or the same philosophical ?...?, so I've left it open.

**Garry:** In terms of an active role I don't think it would be an *active* role. I think that it may be for some people, but it's not for me. There are no religious boundaries for instance that I feel inhibit or impede or control the nature of my scientific research as might occur say if we had a fundamentalist Christian undertaking this sort of geological work and their rigorous notions of time can often come into conflict with what they're observing. So I don't have those sorts of things but I think that the fact that you're trying to work on very large scale processes, trying to perceive things that occurred long ago that really are sort of sub-planetary scale type things, it does give you a sense of awe, which I think has a spiritual aspect, and I guess it's partly a motivation to connect with that. I see that very much as a subconscious thing rather than playing in terms here an active role. That would be my tack on that. I'd be interested to eventually see the compilation on that and see how other people respond to that question.

**Elli:** I've had quite a number of different responses. What about wisdom?

**Garry:** So when you read this, spiritual insight and wisdom or is that spiritual wisdom.

**Elli:** Yes, somebody else pointed that out. I probably should have put wisdom first because the wisdom I'm not implying that that's spiritual, just wisdom on its own.

**Garry:** Right. I think that wisdom is always important in scientific research, knowing what to study that is not going to be a wasted endeavour. I guess that the whole process of supervisor, fellow and student is one that assumes that there's an accumulation of wisdom at the top of that chain. I think that wisdom does play a very active role in the structure of scientific research. It's wisdom and insight that allow scientists to know where are the holes in here or where are the weaknesses in understanding here, so that's fundamentally what's pushing your perspective on an opportunity. I think that you could term that wisdom. Certainly, very important

**Elli:** Okay. Question No 6: What do you think the goals and values are that are most prominent in your work culture – so here we could probably say, the work culture that you experience when you're working either with Antarctic scientists or with the other geologists on say Macquarie Island, like when you're engaged in some Antarctic or ?Southern? Antarctic research?

**Garry:** Okay, I'll probably treat those two quite separately – goals and values. When we work on the island we are working within a very strict code that's imposed by the wilderness heritage values of the area, so one of those things there under 'values' would be making sure that we don't infringe upon our permit conditions, which I guess are the bureaucracy surrounding the spirit of not harming the environment and they're not engaging in activities that might potentially harm the environment. We don't want to harm the environment and we're undertaking research that we perceive has very little impact on the environment. It's not something that's interventionist with the local flora or fauna generally – very small scale sampling activities. The values that we'd be pursuing more generally in our research would be to undertake, or to pursue, accuracy and represent ?stability?, so one of our goals would be to collect data sets that are going to be statistically robust and at the end of the day give you a very solid and reliable picture of the group of perimeters that we're trying to study. We do that for two reasons. We do that because scientifically you need to be doing that, and the second reason is economic, and logistically we're quite unlikely to be getting back to the same spot again. We certainly have a goal down there of being very thorough and we have to balance that against the logistics of actually working down there. You work everywhere and the logistics are quite difficult. So it's not surprising that we would have those sorts of goals to undertake credible research. I'm not sure, could you maybe elaborate on what sort of other goals and values you're interested in.

**Elli:** Well, one thing I'm thinking of – this question also extends to the work culture, not necessarily down there. For example, in your association with other scientists or Antarctic scientists, are there any underlying currents that are ?...? motivational factors that are there?

**Garry:** One of those would be – and these are sometimes driven by the way the granting process operates –

[END SIDE A]

**Garry:** ...goals is always to forge new linkages with other institutions, mostly overseas because the rewards in the granting process are greater for working with overseas people. It's a rewarding thing in itself because of their different perspectives that they bring and certainly that's been terrific in our work. I also have a goal of not trying to do too much, not extending past into new fields too much and I hope that other people respect that as well. You don't get too greedy, even though you may have a unique opportunity to do research, you don't try and do everything.

**Elli:** The reason you don't want to move into new areas, is that connected with that you don't want to be greedy.

**Garry:** Well that's right. Well, it's two things. I'm actually quite an extended scientist in a sense I do cover quite a few areas, so I feel that I'm at my boundaries. I think there's a moral requirement here that in this granting process you often say you're going to work on a particular problem and there are no grant police that come around and say, well you said you're going to work on this but you've ended up going down there and working on this completely different problem, which now overlaps with what this other person's doing. So morally I think that you should not be trying to impinge on other people's research areas and it's better to do that through collaboration. I have a goal of maintaining my research area of going through the process continually of converting my results into published works so that is the process. There's a sense of failure if you're not completing that process. There's a lot of hurdles that you have to get around but at the end of the day in this job you are judged, although you have many duties, you're largely judged on your ability to convert research from thoughts into published works.

**Elli:** ?Thoughts? [*indcipherable*]

**Garry:** Yes, but it all starts with the thoughts and even if you wrote up reports, in a sense you've failed because you haven't pursued that into the published and peer reviewed arena. There's a very strong undercurrent through the scientific world of that and it's driven by the granting process.

**Elli:** So, when you do publications, article writing in the geo-sciences, are you saying that it's a lot more than report writing, it goes beyond that.

**Garry:** Yes, well a report is not necessarily something that's peer reviewed. We go through this a lot because we work with industry, not at Macquarie Island, but elsewhere we work with industry. We convert our results into reports and that's how we transfer the information to the industry partners. [*interruption by third party*] We convert things to results and the industry doesn't care if they're published, but for us our bread depends on us publishing that stuff.

**Elli:** Just very quickly, what are the basic differences between a report and an article that's going to publish.

**Garry:** Peer review.

**Elli:** I mean the actual contents of the paper.

**Garry:** You would find that a report could have oodles of appendices and be very data rich and might not be very strongly interpretive, whereas papers are much more streamlined, the data might be present in digital appendices but what you put in the paper might be representative and typical rather than being the whole data sets. Generally it's broken up into very strict introduction methods, results, discussion, conclusions sort of format, but reports can sometimes be much more adventurous than that. It's much more firmly connected into the literature so it'll be routed in the contemporary definition of where you're at in that subject.

**Elli:** Well, that kind of leads us into the next question: Do you have any thoughts on the process of peer review as a means by which to ensure rigour in Antarctic scientific research, or geophysical scientific research that is connected to Antarctica?

**Garry:** Sure. The peer review comes in two parts I guess in Antarctic scientific research. It's always been present when you want to publish your work and it ensures rigour because other people are providing their professional opinion if their idea of where the science is compared to your perception of how you've advanced it. It's a very important continual process of yard-sticking. The other part of the process of peer review is in the granting process where it's mostly peers who might, usually anonymously, make judgement on what you say would be a good idea in terms of advancing the science. That was quite soft in Antarctic science for many years. It was sometimes only done internally by scientists down there who – it's a little bit like our institutional research grant scheme here – often they won't really know a lot about the area that you're trying to talk about, but more recently they have tried to go down the road of going to peers that are expert in a much wider group of fields and identifying those, which is quite involved. I think that's good. It has two effects. It lets the wider

world know of what's going on down in Australian Antarctic science and it just means that the work is likely to make a contribution to the wider scientific literature. If you're flawed in what you set out to do it's not likely that you're going to make a solid contribution to world science. I think it's important in both of those areas.

**Elli:** So within the context of both of those areas, would you say that peer review ensures that rigour will be there.

**Garry:** Yes. It doesn't ensure it, but it makes it more likely. There are many competing things. There are people who will peer review but they don't peer review thoroughly because of time constraints. There are people who peer review who don't do it thoroughly because of inexperience. There's many problems now that most of our fields are growing so fast that there are very few people who are actually on top of it. Although it's an imperfect process I think it is the best that we can offer within our limited resources. Nobody pays you to peer review it's a purely voluntary process.

**Elli:** Okay. Question No 8: Have you ever considered giving up your professional position as a scientist for a simpler life, and a simpler life here means renouncing material life for a life of austerity and spiritual self realisation, and can you explain your answer?

**Garry:** I have never considered doing that. I think when we go on extended breaks, particularly when you're not encumbered with kids. I'm encumbered with kids now so my perspectives have changed, but when you go on extended walking trips, a week to three weeks, I think that's when you come closest to realising the simpler life. You still have goals generally. You're setting goals that are physical, goals of getting to certain places and achieving the trip outline, but everything breaks down to being much simpler. I guess a lot of the times those of us who journey up into the mountains on the weekends are groping for a simpler life. I personally can't relate all of the other complexities in my life to the realities of being able to achieve a simple life. You may achieve a simple life if you came into great wealth that would allow, it would allow you then not to have many of the pressures that a normal working has to deal with.

**Elli:** In order to keep that material side of life.

**Garry:** Yes, that's right.

**Elli:** I suppose that's what the challenge of this question is whether one would be prepared to give up material comforts such as a car, holidays ...

**Garry:** Yes, it all comes down to the definition of a simpler life. If a simpler life is self-realisation I guess I have a template that wouldn't necessarily occur right in your house and a simpler life might mean that you don't have a house, so your life still could be struggle. To what extent that then struggle is a simpler life, I think that there's a tension there so my '...?' idea of a simpler life is that all you needs are taken care of because they're very minimal but that you are still able to obtain the circumstances of basic necessities of warmth and food and health. In this notion of a simpler life I think there's an assumption that the things that we struggle for have been met somehow, so there is an unreality to that.

**Elli:** I was just going to mention something interesting. Within Australia I believe that the poverty line at the moment is, I think '...?' families is only less than twenty or twenty-three thousand dollars then they're considered to be living below the poverty line, but if you were to give that sort of money to a family in one of the Third World countries, or even if you were to bring them over here and then give them that amount of money, they would consider it to live in luxury because they're not used to all of the facilities that we have come to categorise as being essential over here. So, yes, as you were saying it depends on where you're standing when you discuss a simpler life.

**Garry:** Yes and in that context I haven't considered doing it. I haven't considered taking the family to Vanuatu and becoming a member of a simpler community. I guess I'm too comfortable in what I'm doing now and I'm able to achieve spiritual comfort by interacting with the environment here in Tasmania. I think that is the closest to spirituality that my life sees, apart from looking up into the great firmament. We do aspire to experiencing the natural environment and getting away from it all, going out for a long days skiing out in the wilderness. There's a strong sense of spirituality there but it's only achieving a simpler life for a very short period.

**Elli:** Okay, last question: As a scientist are you at all interested in whether or not species of Antarctic fauna and flora have, or are, a spiritual soul and can you explain your answer?

**Garry:** Am I'm interested in it. I guess I haven't given it a lot of thought I have to say, but when I'm – this is a question that I think has greater impact if you imagine yourself being in Antarctica. Certainly when I'm sitting here in this room I wouldn't be giving a lot of thought to that but when I'm

down there and I'm in some sense undertaking a simpler life that we were just talking about, that you're life say on Macquarie Island when you're down on the island is reduced to more fundamental issues of warmth and food and comfort, just to be able to maintain yourself, and you do feel empathy with the animals. The unreality of that I guess is not being able to truly appreciate what their state of consciousness is. A lot of this comes up, say, when you see a seal and it's wounded – they fight on all the time – and there are cuts there. To what extent that is pain for them for instance we don't really know. I'm not saying that between animals and us what's pain but for those particular animals they have a very high threshold of pain potentially because of how fat and their physiology. They're just conditioned to be able to take a lot of damage, so to what extent I can truly empathise, because of my ignorance, I think that's an issue. I do, nevertheless, have an empathy that they're down there coping with this awful weather and these awful conditions day in and day out and we get to experience it in very short times. Whether that truly comes close to appreciating spiritual soul I don't think it would get that far, again because I'm not a religious person or not a ?...?. It's not a question I can answer in a black and white way.

**Elli:** So would it be correct to say that when you speak about empathising with them and what they experience that you are aware of or concerned with their ?...?

**Garry:** Yes, I'm certainly concerned – when you see an animal that looks damaged you think, do they feel pain and then that relates to sentience and at what level they appreciate that pain. You never want to see an animal in pain but the sense of whether the animals – what is it all about and why do they go through this struggle. I look at it as they are dealing with circumstances and adapting to circumstances that are beyond their control in a lot of ways. I don't necessarily think that that has a spiritual connotation but it's a genetic connotation and something that I admire greatly. I don't think of a place fundamentally where the seal souls go or something like that – or maybe there's such a place. Personally I am a little bit ambiguous that I do believe in ghosts from a personal experience, that something happens that there are essences and you do go to a place like Macquarie Island and if you're going to have a spiritual experience and a sense of a past struggle, then Macquarie Island is one of those places where there has been through, the ?sealing? era, a lot of past struggle and a lot of seal and penguin souls went into the blubber vats of the early nineteenth century. I guess some part of me recognises that you may have some anguished essence that may settle around areas like that but whether it's real or not I don't know but I certainly appreciate it.

**Elli:** So you think there may be a non-physical dimension.

**Garry:** It's evocative. It's a place that is evocative of those sorts of thoughts and I guess you couldn't have those sorts of thoughts without feeling there's some sort of spiritual dimension to the struggle of life down there.

**Elli:** I wasn't ?...?

**Garry:** ?...?

**Elli:** Very interesting. I wasn't aware that Macquarie Island had been ?...?

**Garry:** Oh yes. I don't think they did any serious sealing and whaling – Oh they did whaling, but no sealing down at Antarctica itself, so Macquarie Island would be, as well as mainland Tasmania, the main place in Australia.

**Elli:** Okay. I've read a lot of stories about the atrocities of the numbers of seals that were killed and the numbers of whales and so forth.

**Garry:** Oh, yes. It was very, very extensive on Macquarie Island – seals and penguins.

**Elli:** And on the peninsula there was ?...? ...islands that surrounded the peninsula, the Antarctic peninsula.

**Garry:** I don't know. I would think that you would be right. It was sort of occurring in a band right through the sub Antarctic and the Antarctic peninsula sticks right up into that. A lot of that's not covered in ice – South Georgia and over there.

**Elli:** Alright, that concludes the questions. Do you have any other thoughts on what we've talked about that you might ?...?

**Garry:** No, not particularly. It's an interesting group of questions though because it spans quite different and diverse aspects of being an Antarctic scientist. Is there some underlying theme that links these diverse questions.

**Elli:** Yes there is. ?...? my preambles ?...? information ?...? I'm basically looking at – my methodology is based within conservation psychology and my specific approach is looking at a

consciousness based approach to both behaviour and outlook, or attitude, and all of these questions – or all of them except for the peer review one that I put in there because we’re doing a specific study on peer review and so I thought it would be very interesting to get some opinions from scientists themselves on the process of peer review, but all of the other questions fit into a very well defined structure that looks at different modes of consciousness. I can’t divulge more than that at this point because what I’ll be doing is transcribing our interview and then I’m going to send you a copy of that and give you, as I do will all the other interviews, the opportunity to adjust any of your answers, or just add anything if you’ve thought of anything. Then after that, that’s when I actually process the results. I can’t tell you too much about the structure at this point because I’m trying to avoid what we call in social science desirable responses.

**Garry:** Yes, okay fair enough.

**Elli:** If people understand exactly what I want to hear or what might work for them best, then the chances are that they’re going to tell me what they think I would like to hear, rather than...

**Garry:** Yes, well probably you’ve got a good range of questions there because each one does seem ‘out there’.

**Elli:** They do and I can appreciate that a professor who doesn’t know the methodology looking at those questions they might think, well how does this all fit together ?...?. They actually do. They fit within a very well defined structure.

**Garry:** One thing that you could consider, I think comes out of the general theme of these questions can be the tension between a lot of Antarctic science, which the scientists perceives as conservation based and they nevertheless come into conflict with bureaucratic definitions of conservation. I guess that comes up a lot on Macquarie Island where the scientists, when you read their grant applications, often say the motivation is the preservation of the species and such and the fact that on the island their activities are severely curtailed or constrained from other people’s perceptions of things that are good for the species. The same happens in geology. We think we’re doing a good job on fundamental science say down on the island and we still have to negotiate what people’s perceptions are or the extent that we can investigate all of those pure science investigations so that we don’t interact with the fauna too much in a bad way.

**Elli:** Yes, I think you’re right. It does come down to what people think is the best or what actually defines conservation. I went to a seminar a couple of months ago that was given by – I can’t think of it now – his now a retired scientist. He used for work for CCAMLR. He’s quite well known and I’m sure you will know his name. Anyway he was speaking about the history of CCAMLR, how it all came to be and one of the things he mentioned is that one of the problems that they’ve come up against, because as you may know CCAMLR is an international body of different countries ?...? Southern Ocean, and he was mentioning the different cultures can have very different interpretations of the word conservation. So that was one of the issues that they had to deal with. It was just different people’s notions of what conservation actually is.

**Garry:** I think that it falls within a mesh of those questions that you’ve got there.

**Elli:** Yes, what you mentioned ?...? the sort of things that I’m going to be looking at. How do different Antarctic science organizations, because that’s my case study – I’m using Antarctica science as my case study – how does that community evaluate or determine what is good science and what is the best in terms of environment sustainability ?...?

**Garry:** Yes I think it’s an interesting one.

**Elli:** Alright thank you very much.

[END OF TAPE]

## 10. MILLER, Denzil (CCAMLR)

Start of tape:

**Elli:** So this is interview with Denzil Miller, Executive Secretary of CCAMLR. So Denzil would you like to start by just describing a little bit about your position within CCAMLR, and how your position fits within the broader umbrella of Antarctic research and management.

**Denzil:** Well, CCAMLR is a management authority set up initially under the Antarctic Treaty. It's been a force, the Convention which set up the whole system has been in force since April 1982. It deals with managing marine living resource exploitation and environmental interactions with.. in the context of that management- interactions between species that depend on harvested species or relate to them\_ and interactions between species and the fishery itself. It manages an area of ocean approximately 38, 000,000 square kilometers- it has all of the world's four major oceans within its remit, the southern extremities of those. It extends the Antarctic Treaty's boundary to a , a bio-geographic boundary to the Antarctic polar-front, and that is situated between 45 and 50° south, depending on the longitude and obviously on the water circulation attached to ... that manifest itself. The commission makes ... meet every year and that's the commission is, if you like, the authority, the legal authority that takes the decisions subject to the convention, and in order to meet the convention's objectives and to ensure the implementation of its principles. There are 24 countries that are members of the commission, they contribute financially and they take part in decision-making, all decision-making is taken by consensus, and there are an additional seven countries that are not members of the commission, but have agreed ... taken it upon themselves to be contracted to the provisions of the convention. So, they operate, if you like, as honorary members, and that's the best way I can put it. And they behave in a manner that is consistent with the convention. The formulation, the scientific element of the convention, and it has a scientific committee which has a number of independent, a number of subsidiary specialist committees. The management decisions are taken on the basis of three principles- two of the principles are set up in the convention, and in article two of the convention those are the principles that take account of conservation in respect of both the need for ecosystem management- to look at all interactions across the harvested and dependent and related species. And also it attempts to minimise irreversible changes that the possibility of ... the risk of irreversible changes as a consequences of various human activities associated with fishing, or in the ocean and in the marine environment n general, in the convention area. The third major principle was set up under ... is set out in article nine, and that is that all the decisions of the commission are based on the advice of the scientific committee, which uses the best scientific evidence available, information available. Now that information consists of a broad spectrum of data and knowledge, in terms of data, fisheries data is used, a large amount of fisheries data, daily collected virtually on a daily basis, 24 hours a day, 365 days a year, and that comes in from al the fisheries it has- it's not only reported by the members concerned and the fishing vessels, but also by scientific observers in many of the fisheries that are ... as their task to collect particular scientific information – to throw light on how the fishery is operating and to provide input to scientific models that are looking ultimately to develop ways of insuring that the fishery, if you like, doesn't violate the principles of article 2 of the convention. There is also independent research information, that comes in from the member states, that is used along with the fisheries information and assessments- it's the kind of information that goes to studies and things like growth rates, interactions between species, general knowledge about, or natural history knowledge about how the targeted resources grow, how they aggregate, how they feed, how they reproduce, those kind of things- all essential elements for developing proper, appropriate statistically-robust models to ensure that the management decisions are taken on a basis of realistic scenarios. And finally there is a third element which is the CCAMLR set up in 1984, an ecosystem-monitoring program which is carried out again by scientists in the individual member states, but it's geared towards understanding, or trying to gather information that will help us, assist us in being able to determine what is the result of human activity as opposed to natural change. So that's quite a long-time series in which we are starting to reap the benefits some of that. Now in terms of the secretariat, the secretariat which is domiciled in Hobart, and has always been here, is essentially the executive arm of the commission. It's the body corporate that's responsible for archiving all the information in terms of all the fisheries information and auxiliary trade information, information that deals with compliance. It also uses or sets up and standardises the various assessment models and procedures that are used to estimate potential catches and to estimate trends in the various populations parameters of the species that are being harvested and of the species that fall within the ecosystems monitoring program. It has both administrative functions, which deal with such things as publication of reports, which are published in a journal once a year, a peer-reviewed scientific journal, CCAMLR Science. We also cover a great deal of material, statistical material and documentary material relating to the meetings and decisions discussions attached thereto, in four languages, French, Russian, English and Spanish, so we have a communications team which is essentially responsible for that- translations teams. We have obviously an administrative section, we have a section that deals with data, that manages all the data that comes in, we not only manage, as I said, fisheries data and science data, we

also manage data that comes in in relation things like marine debris, are washed on the shores, data that comes in from direct interactions with the fisheries species for example, data from bird mortality, from long-line fishing. Then we have a science-officer who is responsible for very often drawing together the very independent scientific opinions, drawing those together into... and summarising them so that they can be dealt with an efficient way. He also doubles as a compliance officer- we have a large compliance section that deals with not only reported information from the fishery, but deals with information gathered through trade-documentation schemes, and through now, most recently with the trial of essential system for monitoring all fishing vessels in the convention area- satellite driven system. Now the commission- I'm responsible to the commission to make sure all those tasks are filled and to make sure the commission gets all the information in a timely and coherent manner, as well as just the administrative management of a staff of about twenty people. The commission uses the information and its both archived and the information that is drawn to its attention by the scientific committee to base its decisions. It bases its decisions ... the information is presented in a way that has evolved through time, and apparently that way indicates attached risks with various scenarios that would be consequence of a particular decision. So the commission takes those decisions in that full knowledge of possible consequences of best as a scientific information can give them. So it may not be ... the decision come from science, but they're not necessarily scientific, there's a subtle difference there, which is the way of much fisheries management ... there are other factors ... polar social-economic concerns, even politics in some cases. So, that's really what we do, and that's really what I do, I come from a natural science background. I worked ... I did a PhD in marine science on the aggregation behaviour of Antarctic krill, and I've worked on ... in the Antarctic prior to coming to this job two years ago, since 1977.

**Elli:** Thank you for that. It's very interesting how the different ... how the management and the science side of things fit together. And I'm also interested to find out more about the ecosystem program. Perhaps if we can get more time towards the end of it, perhaps I can ask you a few more questions about that.

**Denzil:** I didn't put too much elaboration of the connections, I glossed over ... well I didn't really ... I gave you the connection with the Treaty, I didn't give you any of the connections with the scientific committee on Antarctic research, because they are not many. They are interchanging information, and much of the information that set up CCAMLR in the early days, including the information from the base of the ecosystem monitoring program, came out of a program run by SCAR, known as the Biomass and Biological Investigations Marine Antarctic Systems and Stocks. So while the two organisations are scientific contents, may not necessarily, what's the word for it, be close, be allied, and I think that's import Antarctic Equally, on the other tack we interact- we are not a UN convention, we don't fall under the UN like some of the other fisheries bodies, we're independent to them. However, we do interact with the food and agricultural organisations of the UN quite closely. Not only on statistics but also on some of the other factors that I've talked about, incidental mortality of seabirds being one, looking at illegal, unregulated, unreported fishing being another, the compilation and dissemination of the fisheries statistics being another area.

**Elli:** So just very quickly, do you think that a HI type of program is feasible maybe within the ecosystem ...

**Denzil:** Well unfortunately- that's a very good question- you know, fisheries management authorities are generally not ... generally have a very narrow remit. The convention is, if you like, a biological remit. It's looking at minimisation of risk of biological systems as a consequence of human activity, and how to manage those activities. It does not look at the driving forces behind those activities. So I would say yes- there's a very definite need for as many fisheries organisations – 13.00 there's a definite need for scientific study of the socio-economic drivers of a fishery. And this has become very, very much to the fore with respect to the practise of illegal and unregulated fisheries. By that, it becomes more and more obvious that- these factors really influence the decisions, either in the basic sense or even more so in how they are enforced, and those are value-systems that CCAMLR can not, as an organisation, because of the way that it is up, has very great difficulty in penetrating. Also having said that, CCAMLR in itself in its own right is not a trade authority, like the world's customs organisation or the world trade organisation. So while it interacts closely with those, it also is not able to take, if you like, a strategic front seat, because of these are competencies of somewhere else. So there is a need, I think there is a need, to take those things into account. The OUCD of the UN in Paris is now working on an inter-ministerial commission, which is looking particularly at illegal, unreported, unregulated fishery, but looking at the socio-economic drivers and how these intertwine with the biological drivers that the fisheries authorities, well the biological drivers and the practical drivers, which are obviously fishing boats, that the fisheries authorities are focusing on. Until we get that, there's

an amount of information that we don't know a great deal about- it's all done by intuition rather than by direction.

**Elli:** Yes and I was thinking that those sorts of studies could contribute enormously towards research done already

**Denzil:** They can, they just need a catalyst, and the recognition is coming, most certainly.

**Elli:** Yes, I think so also, with the global trends with the way things are going. Are we ready to start the questions.

**Denzil:** Ready when you are

**Elli:** Question No 1: What inspires or excites you the most about being an Antarctic scientist?

**Denzil:** Well if you want to really put it down to three things, species from the Antarctic, Antarctica and Antarctica but it's a bit more than that. I think first and foremost it's a challenging area to work so it brings the best out of an individual person in terms of the logistics of actually carrying out the science, the difficulty of achieving the mental focus that's required to achieve it. It also is like many frontier areas and presents particular challenges that are not necessarily common elsewhere. The state of knowledge on Antarctica, because it is remote and it's hostile the oceans in particular, is still pretty minimal. It's better than it was but it's still pretty minimal. This means that there are places where one can work and feel as though one's making a contribution, and an original contribution which always challenges. It's always a wonderful thing to validate one's professional focus, and also in terms of the kind of applied science that this organization is responsible for and what I was doing before coming here. That applied science brings a bit of a social conscious to what you're doing and kind of makes you feel that what you're doing is worthwhile. You can influence things, and you can influence things maybe not for the better but you can at least influence them in a way that is scientifically defensible. I think those in their ways are all challenges but they're also very much raise the level of excitement and no two days are the same. Every day is different and it's a laboratory really where you learn skills and you can take those skills anywhere you go it doesn't matter. It brings the best out of people.

**Elli:** So when you talk about making a contribution and making a difference, you're speaking about environmental conservation or other things as well?

**Denzil:** Yes. I think obviously the basic science body of knowledge as well – you're improving human knowledge. I think that's one place you make a difference because if you don't know something you do get to know a little more than you do. I think that's once again why Antarctica is unique in that respect because it provides us opportunities. I think the second one is that certainly in the applied context I always ask the question, 'what would have happened if CCAMLR hadn't been here. That's a question that's very difficult to answer of course, but one looks at the progression of the history and CCAMLR, with much of the Treaty being very strongly science driven, has gone a great deal further than many other fisheries authorities in getting scientific principles and understanding ecosystem management of a whole system, including the fisheries, and in applying precaution to management. In other words, removing the burden of proof that goes something like in the old days being 'well, I'll continue with fishing or carrying out some environmental practice until you can show me that it isn't helpful', to the other way, 'well, if you're going to do this, do it in a way that you can be sure that there should be no negative effect later on and you should be, number one, able to pick it up and number two, able to pull back from it. CCAMLR is I think probably at the forefront of this international practice in that respect. So the feeling is that some of the work that you've done is used and it's used to make a very, very important environmental consequence.

**Elli:** Okay. Question No 2. It's a little bit similar to question number one. Can you tell me about your original motivations for becoming an Antarctic scientist?

**Denzil:** Well again, you've probably heard this from just about everybody. Spiritual I guess isn't a proper word for it. I mean I didn't grow up anywhere near the sea but my mother read a book to me when I was about four and a half years old called "The Long White Road" by Marvin Albert which was an account of Shackleton's expedition where he got within twenty miles of the Pole - the one prior to Scott's expedition that Scott perished on. That to me linked some added attraction in many ways and although I never really consciously thought I wanted to work in Antarctica a series of circumstances unfolded. So certainly when I finished my Masters degree and I started on a PhD I really was floundering. I really didn't know where I wanted to go. I'd done my thing of being a teacher and whatever and I just didn't think that was for me. I essentially picked a job that was out of the wastepaper basket, applied for the job and got it, and that was documenting some of the first, well the first scientific study since Challenger in the 1700s, marine fauna around the islands of Marion and Prince Edward in the south-west Indian Ocean and that went on for a year or two and then the institute I was

working for got interested in, as the rest of the world became interested in Antarctic krill as a potential fisheries resource. I got involved in that for a couple of years and really loved it, then they wanted me back in the local fishery. I remained interested in Antarctica because I now knew where I wanted to go. So I chose to remain involved in krill and in 1984 came into CCAMLR as a national representative in the scientific committee and from then on that involvement has built experience and it's built knowledge and whatever and ultimately I finished the PhD – not the one I started on – another one, and formed this long association with CCAMLR. A long association with scientific input to management decisions and later on in my career I became more and more involved with science policy and resource management policy, fisheries management policy, until ultimately I got the job here. I'm one of the lucky individuals that's come from a science background into essentially a political kind of job, but the political job depends heavily on science.

**Elli:** You have the background ?...? ...

**Denzil:** Yes, it's really a fulfilling way to have done things. The way it panned out was not my design, it panned out by circumstances and luck really. Obviously one works quite hard to achieve anything, but it didn't seem like hard work at the time, it seemed like fun really. So I live out my hobby actually.

**Elli:** Yes, okay. Now this one will be a little bit different. Question No 3: Can you tell me anything about your own consciousness during your working day. In other words what usually goes through your mind during an ordinary working day?

**Denzil:** Well there's a number of things. It depends on the day quite obviously. There are elements obviously of things like frustration and that's normally because either you feel you're not in control of the situation, or you feel someone's done something you wouldn't have done. That takes a bit of maturity in dealing with. However, my general consciousness of each day is exciting. I do find every day is something exciting presented to me and in that I always try and go back to the basic principles that I've trained on when faced with a problem I would much more take an analytical approach than a fragmentary one. So I always try and think 'well what are the options attached to doing this and what are the options attached to doing that'. That doesn't mean I'm indecisive because I'm not a procrastinator but I analyse what I'm doing and try and analyse the consequences of what I'm doing. Of course, when that works out it's very rewarding indeed because one feels justified in what one's done. If it doesn't work out then one has to be big enough to then ask 'well hang on a minute, I've got to learn from that. I mustn't make mistakes from it again. Maybe I started in the wrong place, maybe I didn't use the right information' or whatever, any reasons. One has to be able to be, if you like, objective enough to be able to do that. I think that that kind of approach does come from a scientific background. There's obviously character and personal nature and stuff which I'm not really going to comment on. I'm sure my staff would comment on it otherwise. Certainly in terms of how I try and run my day that's what it is and that gives a great sense of excitement because it's your profession and your life running together in practice. That's very fulfilling.

**Elli:** Alright, just one other question in relation to that question. In your opinion how or does the consciousness of scientists impact on the results of their work. Say the moment of consciousness ...?

**Denzil:** I actually think there's two answers to that. I think one answer to that is the answer that enthusiasm and what one does really helps in applying oneself in an appropriate way. I don't mean enthusiasm to the point of view of just going on and on and on about everything, but it raises your energy level, it raises your nervous energy if you like, it raises your vision – lifts your vision outward. I had a chemistry lecturer at university once who said you cannot expect anybody to be enthusiastic about what you do unless you are enthusiastic about it yourself. Science is very much an element of that. Now the important thing about it, and that's the second part of the answer, is that how far do you let that go before you start trying to manipulate the scenario or the system. I want to solve this problem, I'm very enthusiastic, I'm very keen, I think I'm a good scientist, now I'm going to cut a few corners here and there, maybe. Just to show that I'm right. Now that's very human. I believe in applied science that's not such a risk because the applied scientists are accountable. If their management decisions or the science fails based on the management decisions rather than the management decisions failing on the basis of the science presented to them then scientists should stand up to be counted for their science. So I don't see applied science, certainly in the field that I work, I don't see applied science or that kind of management science being anywhere inferior. Good science is good science it doesn't matter what it is. Where it becomes dangerous is where it becomes ego-driven. Scientists are independently speaking and independently thinking and they're very often smart in many cases. They do in sometimes believe that science is infallible and therefore it's unquestionably correct. Well it's not. It's correct a good part of the time, if you think by the principles it isn't. I think one has

to be conscious and certainly in reality I can't say it always works. One has to be really conscious of being objective, of making sure that the energy that you're using because you love your job, because you love what you're doing and you're genuinely intrigued by what you're doing is not subverted. You must avoid trying to manipulate what you're doing to some higher cause, particularly if that higher cause is your own ego. But it's equally as bad if you manipulate to the higher cause of whoever pays you. There are cases where you can get scientists to take the side of one particular agenda or another and they have been found wanting later on because they haven't been objective. Objectivity is something I think should sit over your shoulder the whole time. It has to because otherwise you violate everything that you believe.

**Elli:** So you're saying that yes consciousness does, within the second scenario.

**Denzil:** Oh certainly. Oh certainly. We're human beings. Yes certainly no question about it in my mind, none at all.

**Elli:** Okay. Thank you for that. Question No 4: In your opinion, what role, if any, does qualitative science play in Antarctic science?

**Denzil:** Well I really don't like the word qualitative as opposed to quantitative. I do understand the distinction. Quantitative science is science based on numbers and prediction. Qualitative science is, if you like, a little more 'woolly' if you're going to use science speech. I think the important thing – it crosses over between the first question and this question in some ways. Is that science has a great deal of power as an educational medium. Because of the principles it abide by science understandings train minds. Now you can do that in a way that it's not mathematically based as training or logic do not necessarily have to follow a prescribed quantifiable mathematical equation. It can be done in terms of intuition and I don't know that anybody's really quantified intuition. You get proxies of it but it's not intelligence. You get proxies of it but what do they mean? So I think the important thing one has to realise is that, yes because of the way the human mind works we like clearly defined, structured little blocks that we put things in and we organise things. The systematic simulation and particularly the diffusion of information I see as being the scientific way, and it doesn't matter if it's qualitative or quantitative. If it's done properly, if it's done to principles that are clear and transparent, although I don't like that word particularly, but are visible, then there's no distinction whatsoever in my mind. It does what it's supposed to do.

**Elli:** Yes, okay. Thank you.

**Denzil:** It helps us understand the environment in which we live really.

**Elli:** Yes, okay. Question No 5: Do you have any thoughts on the idea that spiritual insight and wisdom should play, or does already play, an active role in contemporary scientific research such as physics and biology?

**Denzil:** Again I think it's definitional in some respect, what you mean by spiritual. I think coming from a biological background awareness if you like – it sounds almost arrogant – of natural order is spirituality in its own ends in many ways. One cannot be unmoved by standing back from a biological system and seeing the way it manifests itself in all its variations and variability. One can only sit back but in awe and say, well that really is an indication of something that is beyond our consciousness. Now you can call that whatever you like. I don't think the point is that it can be called a design of God or it can be called evolution or it can be called all sorts of other things. It doesn't matter, those are just human labels to try and characterise it. My feeling is, yes. I don't believe that one can be an objective observer of any scientific process or quality without having some form of understanding of what you are as that observer. Even the advanced, highly specified and very highly advanced physics of thinking in quantitative physics always has a place for the observer. Does he/she observe or influence that observation, does he/she observe or bring things to bear that aren't there it shouldn't apply. One always needs to be conscious of that and that's not a bad thing. Obviously you relate any observation to reality completely and utterly on the basis of your experience. You can't do otherwise because you document it and then ultimately your interpretation of that documentation, you do it. You don't go to with a clean mind and then stand back. So, yes I do believe spirituality and also it does make the enthusiasm thing. That insight enthusiasm comes from a commitment and that commitment is sometimes very intangible. You have to believe in what you're doing and if you want to say spirituality is a belief, well it is as well. It's all those things.

**Elli:** Yes, I deliberately didn't give a definition of that because I think it comes up again in question nine. I think it is up for interpretation because everyone has a slightly different perspective on it. I was going to say, in reference to what you were saying, there are quite a lot of publications today ?...? within quantum physics and what they call the observation problem – how this whole thing works.

How can we separate the observer, can we separate the observer – no we can't, and the debate goes on back and forth.

**Denzil:** Well I think the wonderful thing – I don't know if you've read the Brief History of Time by Stephen Hawkins where he gives a very understandable interpretation of the big bang theory And where he talks about that but he also talks about the time horizon in relation to black holes and he elaborates to say – and there's a very simple, I can't remember exactly the sentence – but it goes something like this. It's because of the human experience of time, it only works in one direction and therefore it's self-defined. It starts at the beginning and goes to the end, time only works in one direction. So he cannot, in the arguments, justify the recreation of time. He makes the analogy that in the big bang and time is in fact like the eternal sphere or a bowl and there's no end. He says in that context you move through time, you move forward on the basis of a human experience of time, and he makes no excuse for that. He does enter into some discussion whether or not that's a divine force or something else and in the end he begs the issue and walks away and says, if it is it isn't – this is what it is. I find that interesting. He's one of the greatest thinkers in modern physics, and he's using human experience to justify a really important concept – the core of a lot of quantum mechanics.

**Elli:** Yes, I actually think that there's a level where time stops moving in the direction that we experience it, but I was also going to give you another quote that's quite interesting in relation to the big bang theory. It's probably put forward by ...? and it goes like this: The likelihood of an intelligent mind eventuating out of the big bang explosion is similar to the likelihood of an abridged version of the English dictionary eventuating out of an explosion in a printing shop. I thought that was quite clever.

**Denzil:** Yes, sure. We don't understand it yet, an abridged version of an English dictionary before the printing press was an equally remote possibility.

**Elli:** Okay. Question No 6: What do you think the goals and values are that are most prominent in your work culture, and perhaps in your case we might say within CCAMLR, or amongst other Antarctic scientists or colleagues that are somehow involved in Antarctic science?

**Denzil:** I don't necessarily know that it goes just only with CCAMLR, I think it goes into life and not only into science. It is part and parcel of your work. That has a whole number of qualities that feed into that and in science those are the qualities of accuracy – the qualities of precision, the qualities of presentation, the qualities of logical flow, the qualities of principle, application of principle. In any human endeavour they're very much the same. We all want to be as precise as we can. We want to make sure we use the information in the best possible way that we can use it. We want to be sure that we're aware of any of the limitations in that information so we can either quantify them or at least identify them. We try to make sure that when we either present it to ourselves or kind of communicate it to others that it's intelligible, that it's logically constructed. It's those qualities that we certainly, within this organization, ascribe to. I think it's almost inherent and general scientific and as a whole, it has to be.

**Elli:** So what you're actually saying is that the quality or the value that is there, that is prominent, is to produce quality, or good quality, for work results.

**Denzil:** Yes. It's particularly important but is not really a scientific quality, but we stand to be judged in many ways. Everybody's scared of failure. That's fine, one can fail through no reason of one's own, but if one fails because one has not put the right number in, or one has used the right number in the wrong way, then one has failed. That's always a judgement call. It's always a judgement call and sometimes it's unfair and sometimes it isn't. And that of course is what you're trying to avoid. You're trying to avoid a need for a judgement call. Someone needs to be conscious and one needs to be focussed, committed, to be able to do that.

**Elli:** Yes and I suppose CCAMLR is very much in the public eye.

**Denzil:** Oh yes. We get held to account for things that we don't even know we've done.

**Elli:** Can you undo them then.

**Denzil:** Not always, but there is no such thing as bad press./ Something I feel quite strongly is that the counter to bad judgement is information. People can come to different conclusions using the same information, but make sure that that is done genuinely on the basis of the same information. That information is accessible, that it's not done in the absence of information that's accurate and precise because then it becomes essentially unsubstantiated opinion. As science does it, there is a very strong need to communicate the correct information. People can then make their own judgements on it.

**Elli:** When you say “communicate the correct information”, are you meaning communicate with other scientists and with management?

**Denzil:** Whomever. If someone says, ‘well I think you badly manage the Southern Ocean’. Well you say, ‘well that might be your opinion but what information can you bring to me to substantiate that’, and you say well, ‘there are three illegal boats that you haven’t caught’, or you say, ‘well that’s okay but we have caught five, and we’ve recovered this or we’ve done that’. They can go and form an opinion, that’s not your problem but at least they’ve got all the information to do that – to choose what path they’ll take. They are not just doing it on the basis of no information at all. In many ways a lot of it goes back to the question of science in terms of corrupting what it’s doing. We talked about ego a moment ago. I think there is a perception, and it’s becoming less and less and I think the reason for that is that science has become more accessible in terms of information. Anybody can get on the internet and get the latest information – unfettered, there’s no longer the secrecy attached to science – this is my information I’m not going to share it with anyone. There certainly was a perception, and it’s still there in some cases and I wouldn’t say it’s a perception, it’s an arrogance that I’m a scientist and therefore you have no right to question what I’m saying because I’m correct because I’ve followed the right procedures. You are, but someone else might interpret the information that you’ve used in a different way. Provided they’ve got the same information that you have – exactly the same – then that’s the natural way of the thing. That advances science very much. But if they haven’t or they have been selective with the information, then that’s your job to actually communicate what’s missing.

**Elli:** Yes. So you think that’s something that’s changing ?...?

**Denzil:** I do think it’s changing and I think science has, in some ways, almost gone too far in some areas where it’s kind of had to communicate its results and the timeframe of political thinking. Global warming – if you’ve got a five year program and a million dollars to solve global warming – what are you going to do. Set up all the disaster scenarios as quickly as you possibly can and you don’t try and solve one so you can get your next five year set of funding. Unfortunately global warming took a hundred million years to get where we’ve got today. You’re not going to solve it in five years in the life of the funding body or a politician. Scientists in some ways are being forced to play that game, but they’re also a bit of a victim of that game themselves because that’s what they said was ‘well, we can answer these things’. It was a bit of an unrealistic expectation, we’ve seen far more ‘tempered’ reasoning now, particularly with climate change. We’re saying, ‘well I may never actually have the information necessary – but we see it going this way. However, these are the things that we can’t get a handle ...

[END SIDE A]

**Denzil:** This may change, or this may change and they may interact in that way. As the general population gets more information and becomes more comfortable with it then you start entering into this discourse. Debate is the core of science if you lived in a society of Socratean philosophy. There people lived in a society of principles open to scientific debate and that’s very healthy.

**Elli:** Yes I think so too.

**Denzil:** Very, very healthy. We’ve gone in a full circle. We lost sight of it in the technology boom of probably about the 1960s to the early 1990s. We’ve come away from that now and we’re starting to go through a far more informative, far more open, far more justifiable defensible and structured approach.

**Elli:** Yes. Okay I might get back to another thing there later. Question No 7: Do you have any thoughts on the process of peer review as a means by which to ensure rigour in Antarctic scientific research?

**Denzil:** I think peer review is per se a good thing. I do think that it’s important. It’s important to bring scrutiny to your own work in terms of what you do, but it’s also important to ensure that there’s at least some form of standard across science that’s documented and presented in the public domain. I suppose I’m in a minority in some ways. I believe two things – if I’m asked to peer review a scientific article I will peer review it to the best of my ability and if that means I have to become completely and utterly ruthless I will, but I will always identify myself. That’s not necessarily the norm. Now if you are prepared to criticise, constructively or destructively it doesn’t matter, then you should be prepared to be made accountable for that. I cannot abide the peer review process as a screening process, either to get people to agree with you or to get people to fit into some kind of channelled, structured thinking. The end result might be that but at least provide an opportunity and don’t hide what you are or who you are because you may have something to learn from the mistakes that you see having being made. They may not be mistakes at all – you may not just be intellectually

capable of seeing the reasoning behind them, so you kill this thing. We are in many cases forced into the position if you have a lot of peer reviews to do that you do cut corners. You do say, well this is a paper that I really can't be bothered with – it's got nothing, it doesn't follow that, it's written badly, whatever, whatever – no, send it away. If you don't identify yourself you have no comeback. So it's gone, you've killed it, whatever it is. It's a very, very difficult thing but as a general standard I think it's essential. I really do think that

**Elli:** The whole process in general.

**Denzil:** Yes. I think if it's done properly – if it's done as a constructive process, and the opportunity is given for dialogue between the referee and the author and it's not seen as a way of holding back or pushing people back. If someone challenges your ideas, what a compliment. Don't see it as, 'gee what right to they have – I'm going to make sure this paper doesn't get published because it questions what I've done'. Well then go and do something else – go fishing, because you're going to make a whole bigger contribution to science than you are taking that attitude.

**Elli:** Okay, so as far as rigour goes, do you think that it ensures rigour?

**Denzil:** I think it does. Most referees take their job very seriously, so therefore they do apply a rigour and one of the hardest things for a referee is to actually put yourself, when you're writing a scientific article, in the shoes of a referee that might be refereeing it. You can referee a paper and you do a really good job on it, and you know when you've done a good job on refereeing a paper, but you're almost incapable of applying the same principles to your paper. That comes with experience – that really does come with experience. When you get there I think that helps everybody, it helps you and there's a benefit, it's not a cost, it's not all outgoing. You learn from having been challenged or you learn from looking at problems and ideas and equally you can provide input on things and notions it brings fulfillment. That's the only reason I can think of. It distils down the essence of what's going on and that brings rigour into it.

**Elli:** Do you think that that requires something more than just experience though?

**Denzil:** It requires a lot of things, I think experience is one. Experience makes it easier, I don't think it's alone. I think awareness, I think confidence in oneself, I think confidence in what one does, confidence in the work, philosophical distance of being able to perceive the value of what's being done rather than what it actually is. All those kind of things. I think it would probably be a list of a hundred things – I've only named a few. I'm sure there's a large number of things that would impact on all of us. I'm absolutely sure of that.

**Elli:** Okay. Question No 8: Have you ever considered giving up your professional position as a scientist for a simpler life and a simpler life here means renouncing material life for a life of austerity and spiritual self-realisation.

**Denzil:** Every day. Science is a job that lives with you. I always say I never used to take the office home and I still say that, and I don't. I turn off and when I go to the office I turn on. You don't ever. You look at all sorts of things. You're always thinking, you can't get away from it. There's times when you kind of feel well I'd like a rest from my mind being active all the time, it gets tired. It's like your body, it gets tired. I'd like to go simple and maybe live in a cave on the beach and make sandals and candles and things like that. Has it ever entered my mind – yes, in that context, but I don't think I'd have the courage to do that. Plainly and simply because I guess a lot of what I'm doing in my science and a lot of what I do in my daily life, in this job in particular, I see as revealing things about myself all the time. That is from how you react to situations to how you structure your thoughts to how you deal with certain crises, how you deal with everyday things, how you deal with frustrations and all these kinds of things. I would be really afraid of losing that if I didn't have the stimulation that keeps me going and quite honestly I would be afraid to go and do that. Having said that though I certainly seek a great deal of solace, of a learning time reading on my own, walking, sitting quietly somewhere, reflecting on all sorts of things not necessarily work related, reflecting on life in general, birds. That's one of the things that has drawn me back to the Antarctic again, again and again. It is such a 'in your face' kind of place that you are forced to reflect on and you are very much forced to reflect on who you are and what you are. I think it's fine, I just don't think that I can get that by renouncing all things. For a start, what would I do with all my books, I love my books. I couldn't do that and I'm afraid to do that and I'm quite happy working I'm equally accepting if that's comfortable for people and yes, sure go for it. It's not my choice.

**Elli:** Okay thank you for that. Okay the last question. As a scientist are you at all interested in whether or not species of Antarctic fauna and flora have, or are, a spiritual soul?

**Denzil:** One only has to look at the order of a krill which is a relatively primitive animal in the food chain – it's the centre of a food chain. One only has to look at the way it has a role, its swarming behaviour evolved as a very powerful mechanism to link animals together – it's environment in the terms of relation to food resources or in terms of relation to its own reproduction. It also serves to protect the animals on an individual basis from predators. Now one can argue, well that's fine because the way the swarm works for elective? predators – predators eating single animals – how does it work for animals like whales that are mass feeders. Well, it does because there's a relationship between aggregation and disaggregation and the less formative that is, you're getting advantages. You're getting one by being unpredictable and where you are in the swarm, but you're always getting some protection in terms of the individual within the swarm. You look at that quality as well as that the whales have evolved to this and they, for example, they circulate around the swarm blowing bubbles and they herd and to me anyway there's an underlying – I don't know what the right word for it is – there's not only an underlying order but there's an underlying substance there that is way off our prediction meter. We're never going to understand it and you take one of these animals and you hold it in your hand and you think, 'well here's this animal, it looks very primitive, it's got a lot of legs and whatever, and it's got this very, very complicated and very, very highly developed survival instinct and behaviour. Whether it has a soul or not is irrelevant ... Antarctic. It has a place and it's supremely adapted to that place, and that's a quality that one has to stand back and say well if there's anything that's pure, that's it. A purity in a sense that there's no energy wasted, there's none at all, it's a consequence of evolution energy and everything else. That to me is pure, there's no wasted effort, none at all.

**Elli:** Yes, they are self-preserving aren't they ?...?

**Denzil:** That's right.

**Elli:** ... every single living being wants to live and that alone ?...? some interesting questions. Okay, getting back to the question. If you're interested in whether or not they have or are a spiritual soul, you said that you think it's irrelevant whether they have or not?

**Denzil:** To me I think it's irrelevant because they have something and that's something that I'll always tried to understand. I may never, I may not have the tools to do it. If you call that spirituality, yes. Am I interested to find out what it is, yes. Will I – I don't know.

**Elli:** Would you consider it a waste of resources if, for example, the Australian Antarctic Division decided to implement a program as part of the biology research project shall we say, part of the biology program, to look into whether or not, for example, megafauna have a non-material soul, do you think that such a research project would be a waste of resources?

**Denzil:** That's a good question. I was reading somewhere, I don't know where it was, it was somewhere. Some study that was done many, many years ago where some scientist quantified the human spirit as weighing twenty-six ounces because this was the change in the body weight of a human being the instant before they died against the day after they died. Twenty-one grams exactly. Now whether or not that was a scientific based experiment or not is irrelevant ...Antarctic. The search for order and sometimes if you work in behavioural science like I did in krill swarming it was behaviourally based. I spent a great deal of time trying to understand and I didn't get it right – ten years of study – I mean I didn't get it right and I tried to distil it down into mathematical approximations and they're pretty descriptive but they're not very realistic. They say probability in even counting a swarm of this size of that size is XYZ and the animals orientate in a certain way, they're statistically defensible and those kind of things. That in itself has helped us understand and little bit more about what motivates these animals, so in searching for the swarming behaviour, when searching for the spirituality you're in no position to actually say, 'well I'm not going to foreclose on some another form of understanding'. The question of course, should the division fund that or not, obviously goes down to the major, major science rationale and that's a question of priority. In terms of what we are trying to understand, is this a higher or a lesser priority, and that of course becomes a judgement and you may find that, yes it is because you don't know what the answer is. You'll hear some of the upper level physicists argue exactly the same thing saying, 'If I'm not allowed to study whistlers in the upper atmosphere'. We're never really going to understand how radio waves move through the ionosphere and the stratosphere and if we don't understand that we're not going to understand the consequences of electrical storms or solar storms as sun spots affect our abilities to communicate across the earth's surface using things like short-wave radio or whatever, or even even simple life evolution. If money's not an issue and priorities are not an issue I would think there's every reason you should do it

**Elli:** Yes I can imagine that ?...? ... in general would be interested in ?...? research if it could be done.

**Denzil:** Well I think also too one has to understand that the public actually likes to be informed. One needs to say 'look we're doing this for whatever reason' and be honest about it. Otherwise all you're going to say is '... wacky guys going up to Kingston, what are they doing, they're now looking for the soul of a krill'. I mean that's stupid, there's much better things to do than that. Well from the outside that's exactly what it might appear to be. Again it goes back to how the scientist puts the question to the public and how the scientist provides the public with an outline of the scientist's approach to answering that question. I think the public is very receptive.

**Elli:** I think so too.

**Denzil:** I think the Antarctic also carries some pretty powerful inherent priority. Yes, I think it would be every reason to do.

**Elli:** Okay, well that brings us to the end of our questions.

**Denzil:** Was there only nine?

**Elli:** Yes, there were nine questions.

**Denzil:** There was one you said you wanted to go back to but that doesn't matter.

**Elli:** There was. We've got four minutes left on the tape. There was one that I wanted to go back to but it's a bit complicated in my mind what I wanted to ask you. I did want to discuss with you further about the human impacts program again, not necessarily for this interview but I know that it's actually been changed – the Antarctic Division human impacts program down there – it has changed quite a bit. I know that Melissa ?...? ?...? ... monitoring of the heart rates of the penguins ?...? I don't know, was she doing online research.

**Denzil:** She might have been doing it with Graham Robertson I don't know her.

**Elli:** It's an interesting thing for me because my understanding of the global trend, again getting back to the public – well the Antarctic Division of course is a public service organization and not only the public it's also, for example, I've just come from a conference in Colorado in June, it was call the International Symposium on Society and Resource Management, and there were people there from all over the world and there was a lot of discussion about how environmental management – well, there was certainly a very strong message that there is a very strong trend globally that the public want to be involved in decisions, or in the process of environmental management, and also that the social sciences need to be looked at in conjunction with environmental sciences ?...? manage the environment. This to me says well human impacts programs, according to what I learnt at this conference are going to be on the increase. It's going to be something that is going to gather pace within global environmental management regimes, and yes I was kind of interested in the changes that have happened at the Antarctic Division also.

**Denzil:** Well I also think that one of the things that we have lost in sociological advancement in some ways, we have lost this ability to allay responsibility and accountability in terms of environmental impact. I believe that in many cases this is a consequence of two things. One is obviously consequences of human success in respect of human procreation, but the other thing is also in response to the changing human values. Now the person who's living in Sudan at the moment doesn't give a continental about the environmental impact. They just want to live and they want their child to live. Equally, the person who values the Antarctic as a supremely beautiful pristine place doesn't want one single thing to impact upon it in a negative way and even may go as far as one single minor impact on it at all. I see that as being an unrealistic expectation. The problem is of course that what we have to try and do is find the middle ground and the middle ground can only be done by allowing people participation in the situation, by allowing them to feel that they are of value to part of this problem and also be assured that any cultural values from one end of the wide spectrum to the other are not forced. Why tell the rest of the world, for example, that you need to conserve petroleum stocks when you're consuming sixty per cent of it. Why tell people not to cut down the hardwoods in Tasmania where you're using them, because you have a different cultural value. I'm not saying that it's right. I'm not saying either of those things are right or wrong. What I'm saying is that it needs to be understood and I think as the resources on the planet become more and more limited and the population becomes greater and greater and I don't know if we'll ever have the time to do this. We need to do it and we need to realise that there is accountability and responsibility attached to the use of planetary resources or the use of the environment even. Not only resources, the environment as a whole. We are no longer, no matter how clever we think we are, as a race. We are no longer immune from nature and we're starting to see it. Small changes – you start at a small place – from the small changes ultimately must have a beneficial effect but they must be allowed to. That's the challenge for us and I think the next fifty years is going to be a real interesting place and I think what I do here – the high seas, that's what

Antarctica is to some extent. The hardest thing is really, really the trial simulator where this is all going to come together and if we don't get it right we're not going to get it right anywhere else and we're not going to get it right if we should one day move into space, because we'll just continue to screw everything else up that we put our hands on as a race. It sounds like a bit of a gloomy, doomsday kind of prophesy

**Elli:** I think I understand the reasons why you say that because when we talk about Antarctica and the Southern Ocean as a last frontier, it's not necessarily only the last environmental pristine place it's also, as you say, in on sense it's the last frontier to see if we can achieve international co-operation?...? It makes it all very interesting.

**Denzil:** Yes it does.

**Elli:** Alright, we might wind it up.

**Denzil:** Okay.

**Elli:** Thank you very, very much for your time.

[END OF TAPE]

## 11. MORGAN, Vin (ACE CRC)

Start of tape:

**Elli:** This is Interview 2 with Vin Morgan who is a member of the Ice Cores Program, the Ice Cores Study.

**Vin:** Yes, the Ice Cores Group within Glaciology Program, which is within a different program in the CRC, the Climate Variability Program.

**Elli:** So how do they fit together, do you mind telling me just quickly.

**Vin:** It's difficult and obscure really. The glaciology program of Antarctic Division, which is a part of the CRC has different groups. It has the Ice Cores Group, it has the Sea Ice Group and it has a Remote Sensing group, and those are then distributed to different groups within the groupings and the research and the CRC.

**Elli:** (*indecipherable*)

**Vin:** Yes.

**Elli:** OK and your specific focus is the ice cores.

**Vin:** Yes. We make climate records from ice cores, so we're looking at climate variability. We're looking at climate variability in the past, other parts of the CRC Climate Variability are looking at the past and the present.

**Elli:** That's important actually. OK, alright so are we ready to begin?

**Vin:** OK.

**Elli:** OK. Question No 1: What inspires or excites you the most about being an Antarctic scientist?

**Vin:** OK. First, all your questions here have got about Antarctic scientist, Antarctic scientist, Antarctic science and I don't really see that there's all that much difference between Antarctic science and other science. I mean I quite enjoy doing Antarctic science. It's interesting. I like it because it's research and it's fun doing research. There is a lot of scope in Antarctic science. It's got all sorts of aspects. Also, field work is fun – it has built-in holidays!!

The climate research, the ice cores climate research that I've worked on has developed a lot in the time. It really only started a few tens of years ago, and there's been a lot of progression and now ice cores are really a very important source of climate information. They're about one of the best sources of

information on past climate. So it's sort of a nice thing to be doing things where things are happening. Is that the sort of thing you're interested in?

**Elli:** Yes it is. So you're saying, I mean you made a few points there. One was that you think that in one sense Antarctic science is no different to other science. And another point you made was that you think that the Antarctic setting is kind of interesting, or ...?

**Vin:** Yes, that's right the Antarctic setting is nice, and just the aspect of what I'm doing is varied.

**Elli:** And you also mentioned that you feel that working with ice cores in particular, it has value to you because it's an important part of the research that is going on ...?

**Vin:** Yes. There are things going on. A lot of sort of different things. The whole ice cores science has really come up in the last few tens of years and it's quite interesting. I don't believe that the science and the research should be aimed at some immediate problem or some specific thing that we really want to find out about. ...It's very difficult to aim science. ...I think really good things that have come out of science have been because someone's just sort of put their head down and sort of done that work. I'm a little bit sceptical of the government goals of science and things. If you know where you're going it's really not sort of... basic research I think the science should be interesting for its own sake.

**Elli:** Would you say that the science serves a greater purpose in as far as environmental conservation goes?

**Vin:** I think it probably does. I think that's the point I was trying to make I don't really feel that we're working towards some specific "useful result".....OK, we are in some respects (and I think you can make a very good case at the moment for climate research). Climate research is obviously important ... Antarctic. We know that climate has changed in the past, and we know that it's probably changing at the moment because of our big unintentional global experiment – which is essentially putting a large amount of carbon dioxide into the atmosphere and seeing what happens to the climate system. We understand some bits of how the climate system works. We sort of understand the 100,000 year cycle of glacier interglacials are driven by variations in the amount of solar radiation striking the earth. But our understanding of how the earth's system responds to the variations and makes the glacier interglacial cycles is really quite poor. Therefore you can make an argument that it's really quite important that we find out how it works because of possible future changes.

**Elli:** With the understanding that if you knew more about how it works then you could control possible future mistakes being made.

**Vin:** I don't know whether we can control it, but we might be able to predict what's happening, see how important it is, or whether it is important to try and stop making these changes. And that's still arguable.

**Elli:** OK, the next one's a little bit similar to the first one ...? but can you tell me about your original motivation for becoming an Antarctic scientist.

**Vin:** Well I needed a job, and this was a matter of falling into the right place at the right or wrong time, whatever you think. I really didn't make a conscious decision to become an Antarctic scientist. I really made a conscious decision I think to spend a year in Antarctica and because I'd done a science degree, it was going to be doing science. The disaster just went on from there.....

**Elli:** The disaster – that's interesting. You think it just happened at random, like it was just a random selection or it was just something that happened to you.

**Vin:** No. A few things happened at the right time because I changed from the physics program to the glaciology program and the glaciology program at that stage was fairly go ahead and doing interesting things and that was a nice thing to do so I stayed with that.

**Elli:** ?So you're happy? ...?

**Vin:** Oh yes. But in the beginning there weren't any specific motivations. I certainly didn't seek to do Antarctic science. I really sort of got into it and found it was quite nice and enjoyable when I was in it, rather than wanting to do that.

**Elli:** Specifically, yes. OK. Question No 3: Can you tell me anything about your own consciousness during your working day? In other words what usually goes through your mind during an ordinary working day?

**Vin:** I think the answer to this question is no.

**Elli:** OK, valid response.

**Vin:** I don't really see what you mean.

**Elli:** OK. This question is ?...? (*interference – noise*) supposed to try and ask scientists, for example, do they spend their working day thinking about, 'Oh, I've got to get this work done. I've got plans for this evening and if I just get this project done then I've earned that extra \$10,000 that ?I really do need?. Or is more a case of scientists being very mindful of their work, and perhaps even thinking, well I'm doing this work for a particular reason. It's going to serve this particular goal, or are they kind of thinking, 'Oh, I'm just doing this because it's kind of fun', or a mixture of all of those. That's kind of what the question is meant ?to be?.

**Vin:** Haven't you just laid out the reasons that you should be coming into work in the day as opposed to the reasons why probably lots of people are, but you actually should be coming in and having a - I mean this is what you should do isn't it - you should come in and have your plan for the day.

.....

(informal discussion if Dictaphone is working properly)

**Elli:** ? still running?

**Vin:** But it's starting the time again.

**Elli:** Yes that's OK. We're starting on another track. Maybe it just doesn't show all the way through the track.

**Vin:** I would have thought it would

Tape blank for some time here

*Some discussion between Elli and Vin with regard to the track, and whether some of the recording is on the tape or not*

.....

**Elli:** If you want to summarise the very last question, just very quickly. Only if you want to.

**Vin:** The quantitative science question?

**Elli:** Yes.

**Vin:** What was I saying. Yes, that there is qualitative science as I think you defined it in going from say a data set to an interpretation, which is different from my initial 'shoot from the hip' answer that qualitative science isn't real science. It's like go off and see if you have to be able to express in numbers and then you can talk about it. But in fact I do think that you actually, especially in our climate research, you have data sets and then you go to that from conclusions about cause and effect and this involves judgement and qualitative things about the importance of some data, and the quality of data, and you have to make judgements on all of that. We certainly think that some people make enormous leaps without very good reason. Of course the problem is that in the past, I mean in the distant past, people have made enormous leaps and they've proved to be correct, and there have been big advances. ?...?

**Elli:** Yes. So you think it's something that perhaps should be investigated.

**Vin:** Yes. Anyway I think that it is. It is a useful thing to look at to see and perhaps people should have better training in going from data sets to results and real scientific conclusions.

**Elli:** (*informal discussion-Elli & Vin re recorder*). No 5: Do you have any thoughts on the idea that spiritual insight and wisdom should play, or does already play, an active role in contemporary scientific research, such as physics and biology?

**Vin:** I need a lot of help here. What do you mean by spiritual insight?

**Elli:** OK. Well first of all I suppose it's a personal....I mean just about everyone has a different slant on what spirituality is and ?...? same spiritual understanding. I think I'm meaning that spiritual insight, in other words – ?an active role? So what I'm meaning to say is that should our decision making process within areas such as physics and biology, should they incorporate studies or some guidelines that are based in spiritual teachings. Again I'm not being specific which spiritual teachings, it's a question ....

**Vin:** You're meaning religious spiritual or ...

**Elli:** Well some people don't like to call their spiritual understanding ?...?. I think that is not something that is a belief system of something that pertains to not ordinary mundane ?...? but perhaps,

for example, guiding principles that belong to high understanding of life, and some people might just they're higher ethical.

**Vin:** I was going to say. There's higher principles, such as just being honest, and you can be honest in different ways I suppose in research. Again, this is just scientific research anywhere. I mean it isn't specifically Antarctic research of course. There's a lot of discussion at the moment about ... and there's been a few cases of people being dishonest. There's something (the journal) nature - an article recently saying that you should have to have a licence. You can lose your licence to practice medicine. If you behave really dishonestly, should people lose their licences to practice science, namely their PhDs???

**Elli:** That's interesting.

**Vin:** Yes, I mean people should be honest. That's very obvious because if people aren't honest they system collapses and becomes a terrible mess. There's been a few cases. I think a lot of people are worried and yes, I think it's of concern.

**Elli:** Again I didn't give a specific definition of that, but perhaps wisdom, as opposed to shall we say knowledge or information. Wisdom is a little bit different because it takes a more holistic look at our decisions, the decisions that we make. So it's perhaps again an ethical ...?

**Vin:** Yes. I think the wisdom one is very like your question 4 though, and that's where when you do research there's simple things like if you just crunch the numbers and that can almost done by a machine, but that can be very simple. Then you have to make judgements and that's where wisdom comes in on how much weight to put on some numbers, perhaps as compared with other numbers, and that's the whole wisdom qualitative bit of interpretation. It has to be done and some people do it well.

**Elli:** So do you think your wisdom does already play a role, or do you think it needs to be enhanced. Do you think the ethical ?basis? or perhaps the honesty ...? spiritual insight. Do you think that that's something that needs to be enhanced in current Antarctic science?

**Vin:** I don't think it's too bad. There's a problem that actually just relates to further questions - it relates to the peer review question for instance. Well, I guess a simple example is just simply checking results which because of time restraints ...? and because of the pressure to publish and get results out there's a lot of pressure to get things out and therefore - you know not thoroughly check results and do things that might be nice to do. And that's a bit of an honesty and ethical thing ?as well?. Do you put out results when you're not quite sure whether the numbers are good. Whether you should actually just check calculations, or whether you should actually get some more data to check things.

**Elli:** And if the time restraints you mentioned before, they may contribute to some decisions being made a bit too quickly.

**Vin:** Yes. Because now scientists who are working and being paid have to produce results. You have to produce a certain number of papers in a certain time.

**Elli:** Yes. Interesting. I wonder if that can be remedied.

**Vin:** No, It's a problem. And the trouble is the enormous number of papers that come out, especially ones from sort of not very well completed work, clutter up the literature and are a nuisance. On the other hand people should put out results from work in progress because then other people get to make comments on this work in progress and other people might take it further, or make good suggestions and help the system. So these are all qualitative judgements really on whether you should publish something at some stage. Of course in fact it doesn't always work like that. What happens is it gets published because there's an important scientific meeting coming up and you have to have a paper to present at that, so that determines the timing.

**Elli:** You're saying that it's really the whole global scientific community that is contributing to this because, as you were saying, you have to kind of keep up with your peers, if we can say it that way. I mean you have to produce a certain amount of results and publications, but it's only because it's relevant to the arrangement which other scientists are working on ...? I mean it's really the whole global scientific community in once sense.

**Vin:** Yes. I mean the scientists are responsible now to governments or organisations because the majority of them are paid by governments, by tax payers money, so they're responsible. They shouldn't be allowed to just sort of mess around and enjoy themselves and not do any work. The way work is measured is mostly by published papers. It's by data reports and other bits of work as well. Maybe there should be some more other methods of doing that so that there isn't quite so much pressure to just publish incomplete work. This has been known for a long and this is nothing new, it's common knowledge.

**Elli:** No. It's more or less ?...? If you say that really the ?...? someone's work is their publications and publications are based on peer review, which we'll come to, then ...

**Vin:** Peer review is broken too. That doesn't help.

**Elli:** It's what?

**Vin:** Peer review as a system is a bit broken as well so that doesn't help.

**Elli:** So the whole thing really runs on peer review.

**Vin:** One of the problems is that there is much counting of the number of publications, as opposed to the quality of the publications. Again, attempts have been made to try and look at this, for instance there's some counts done by counting citations. Whether the papers are cited ?...? The problem with this is, it doesn't really work either because some really bad papers might get cited just because people want to lay into them. And the citations build up after a lot of time. You know a paper might have been out for quite a lot of years and then (the work becomes recognized) and citations start coming. There's just too much time delay in that. I mean if you're coming up for (promotion) when your job gets reviewed or whatever it is next year – citations aren't going to be out.

**Elli:** So ?...?

**Vin:** There's been discussion and there are citation indexes for this purpose that have been out for a long time. I mean people recognise that there is a problem in judging a person's output.

**Elli:** ?...? Question No 6: *(indecipherable- question copied in parts from another interview)*. What do you think the goals and values are that are most prominent in your work culture at the, shall we say ACE CRC or Antarctic CRC, or...

**Vin:** Well, there's certainly a goal that's required and it is to get work out, to do research and to get things out, and in fact to get papers published.

**Elli:** Is that ?...? culture or is that something that's more on a employment expectation level.

**Vin:** Both I think. I mean certainly it's an expectation amongst the scientists that work for ?AAD? and that are working here.

**Elli:** That's the main one that comes to mind?

**Vin:** Yes. Actually I feel there should be other things but we'll leave that one for now.

**Elli:** You might think of something. No 7: We're returning to peer review. What are your thoughts on the process of peer review as a means by which to ensure rigor in Antarctic scientific research?

**Vin:** Or in any scientific research of course.

**Elli:** Yes, that's true.

**Vin:** Peer review's under a bit of a cloud because a few poor scientific papers that have come out and that have been picked out. Peer review is in some trouble because everyone's under time pressure a bit. It takes time to do a really good peer review of a paper and so if you spend a short time reviewing a paper you do a fairly ordinary review. Reviewing papers of course is not a bad thing to do. You need to read other people's papers that are in the field, so reading a paper carefully to review it is not a bad thing - that's how the system presumably should work. The problem is that it isn't clear, and it still isn't really clear to me even after all this time puddling around reviewing papers what you should be reviewing. Should it just be the science, should it be the language?? You have to make a judgement. If there's obvious errors in the paper like ?...? equivalent of 2 plus 2 equals 5. That's very easy, you can say that's wrong. But I'm not sure that a reviewer should really question too many of the conclusions that have been put forward by a person who wrote the paper unless the reviewer really feels that they can say that they're wrong. Any reviewer can say that they think it's a good idea, they can say they think it's a nice paper and it's got nice ideas. There's a history of course of papers having got knocked back by reviewers who've said 'no this is a stupid idea, it's completely against everything we know in science, and then, often a long time later the paper was shown to be correct. The reviewers were just wrong. So I don't think it's the reviewers place to actually put their opinions into the review like that.

**Elli:** So can I just jump back now. We were talking before about the need for more research into qualitative sciences when we look at things like drawing conclusions, so you don't think if there was more research into that factor then it should not be research within the system of peer review. It should more be research within the actual science methodology process. Because if science as we know today really does rely on peer review, that is really not what makes the scientist ?...?. ?...? scientist is for

others to review his or her work. But if you're thinking that it's not the role of a peer reviewer to criticise the conclusions that have been drawn, then perhaps you're suggesting that that kind of research into qualitative influences, it should be done on another level, in a more fundamental ?kind of way?

**Vin:** No. I think it has to be done and actually I think the peer review system the way it goes is probably, although it's not a super good system it's probably the best, we've got. It has to be done - the scientist who writes the paper comes to these conclusions and the reviewer can make judgements on them, and it's just a balance. If the reviewer really thinks the scientist has made a totally lunatic ... no that's wrong, because in some of these old cases the reviewer really did think that the scientist had made a totally lunatic conclusion and after a long time, I mean a very long time in many cases, they were turned out to be right. I don't know what the answer is to that. Unless I really thought I understood it very well and I was very sure, I wouldn't say something shouldn't be published because I didn't understand how he'd sort of got there in doing it...[END SIDE A] ... into the conclusion.

**Elli:** So to summarise, would it be fair to say that you are saying that the peer review system is not perfect, but it's the best system that we've got or it's the only system that we've got.

**Vin:** Well, it is about the only system we've got. Yes, I mean you can't think of anything else. There needs to be some sort of reviewing system, well except of course of the world wide web where you can put up anything you like.

**Elli:** Sure yes that's true. OK. (*How are we going on time.*)

**Vin:** (*Pretty bad – it's 8 minutes to morning tea time*)

**Elli:** OK. Second last one. Have you ever considered giving up your professional position as a scientist for a simpler life. A simpler life here means renouncing material life for a life of austerity and spiritual self-realisation.

**Vin:** Yes. But not for very long.

**Elli:** For a short period of time?

**Vin:** No, I mean I haven't thought about it for very long. No, I haven't really actually thought of that. I mean I occasionally about thinking of retiring but that's for a life of austerity, no I haven't really thought of giving up the scientist, just being a scientist to sit in a cave and contemplate or whatever...(this is nonsense)

(*very bad crackling on tape for some time here*)

I think you actually – why do you say giving up. There's two questions here. You've got giving up being a professional scientist, that's one question, and going for a life of austerity, but I mean you can give up a life as a scientist and ??? become a banker

(*bad interference*)

... like someone I know. Yes, that's much more likely.

**Elli:** OK right. Yes, I can understand what you're saying. The question can be divided into ....

**Vin:** Argued – you're looking at a scientist because you've got other questions here you're looking at all those sort of things about inspires you about being a scientist and motivations becoming a scientist. So then this question is logical. Have you ever thought about giving up being a scientist into something totally different like a real estate salesman or anything else, and people do and have done that, much more than have gone for the sort of life of austerity. That sort of thing anyway.

**Elli:** Yes, it was specifically under this question of asking would you give up what you have and totally step out of - have you ever thought of totally stepping out of this way of life into a more contemplated life where you stepped out of society. We ?treat? you very different. I mean I've actually heard a couple of people that have been down to Antarctica say that then they've been down there, which is so removed from normal everyday life that we know, you know there're not surrounded by shops and buildings, they've actually had what they call ?trans...? experiences because it's taken them out of the situation ????

**Vin:** Yes, but anyway, no.

**Elli:** No. OK, the last question. As a scientist are you at all interested in whether or not species of Antarctic fauna and flora have, or are, a spiritual soul and can you explain your answer.

**Vin:** It's just Gaia idea???

**Elli:** It could be interpreted. I mean if you had something that you relate to in the ??? concept.

**Vin:** OK. Well the first thing is it doesn't necessarily need to be Antarctic flora and fauna. Obviously ?...? assess whether the whole system is a ?system of? things. Yes, I'm slightly interested in whether the whole thing is perhaps a system but no, I can't make any sensible comments on that question at all.

**Elli:** OK. I just thought I would throw it in towards the end just to see what sort of responses I get because again part of the methodology that I'm using. OK, so you can't make anything specific out of the question.

**Vin:** I don't think I'm really interested because I ... no, I can't make a sensible comment on that.

**Elli:** OK. Just very quickly. One thing that some people do think like the ?? concept, that's one thing that was also presented in what we call ecopsychology and that is basically that all living beings are connected. We all have an influence on each other and we all have what they call intrinsic value, which I think is very close to the ?? (Gaia) concept. So I've had a couple of scientists – that is kind of interesting to them that we all function as one organism, not specifically going into the words such as spiritual or soul, so that's kind of a middle ground and I've had some scientists ?...? ?...? ... or anything like that.

**Vin:** No. I mean I take the point you're saying and yes, I take on board the concept but I don't have an opinion on it. I really don't have an opinion on it.

**Elli:** That's a valid answer. OK, so is there anything else you can think of that you just want to add?

**Vin:** No I don't think so. I think that's all pretty rambling and whatever but you can see what you can make out of it.

**Elli:** I think your answers were very good. ?...? You were quite direct and precise.

**Vin:** Well actually I should have looked at the questions a little bit ... Oh, it doesn't matter.

**Elli:** No, I'm happy with your responses, definitely. I just hope I've got all of them.

[END OF TAPE]

## 12. NICOL, Steve (ACE CRC/ AAD)

### Start of tape:

**Elli:** This is Interview No 18 with Steve Nicol. Steve would you like to start by just saying what your position is as Program Leader of the new AME program within the new ACRC and also a little about how your research, or how your other tasks fit within the broader umbrella of Australian Antarctic research.

**Steve:** Okay, well I'm the Program Leader of the marine ecosystem ?theme? of the new CRC and this is essentially the newest part of work that has been done in the ? Cooperative Research Centre, which is bringing the physical sciences into line with some of the biological questions that we have been asking in other areas of the Antarctic program over time. I'm also the Program Leader of the marine living resources program at the Antarctic Division, which is the program that focuses on Antarctic fisheries. My background is largely in research on Antarctic krill and also into areas generally dealing with the Southern Ocean ecosystem.

**Elli:** Okay, so you're actually two Program Leaders.

**Steve:** Yes, you get two for the price of one.

**Elli:** [indecipherable]

**Steve:** Well, that's why [indecipherable] because I'm trying to get away from my other duties for a while.

**Elli:** Okay, are you ready to start.

**Steve:** Fire away.

**Elli:** Question No 1: What inspires or excites you the most about being an Antarctic scientist?

**Steve:** Well, the answer to this questions is that I'm not actually an Antarctic scientist. You've probably heard this before – I'm a scientist but I tend to work mostly in the Antarctic. I don't actually see much ?...? Antarctic scientist. I'm working on a series of problems that at the moment happen to be focussed on the Antarctic but it doesn't mean that I see myself as an Antarctic scientist with a ?...? ?...Scott? or anything like that. I came into Antarctic science through an interest in particular creatures and particular problems related to those creatures, not specifically Antarctic problems. So that evaded the question completely. But what excites me about that sort of ?...? research that I do, what we're trying to do is to answer some fairly fundamental questions about particular organisms, organisms that are being harvested commercially and how those organisms interact with that physical ?environment?. It's a very difficult thing to do and it's a field that developing rapidly and it has ?practical? outcomes. That's what really drives me on in doing this.

**Elli:** Okay, so the actual outcome and what you intend to do with it.

**Steve:** Yes, absolutely. If I thought that I was just doing academic research for the sake of academic research, I wouldn't be involved in this. I'm involved in it because I do think it does contribute to helping to solve some particular problems that are fairly pressing.

**Elli:** Problems like environmental sustainability problems?

**Steve:** Oh, ?completely?. ?...? The sustainability of the fishery?. My background, as I said, is in krill biology and krill fishery is the biggest fishery in the Antarctic. It has the potential to be the biggest fishery in the world and what we want to make sure is that if it does start developing then we have the ability to manage it sensibly. That means understanding a great deal more about the animal itself and how it interacts with the environment.

**Elli:** Okay. Question No 2: Can you tell me about your original motivations for becoming an Antarctic scientist, or perhaps in your case for becoming involved in the research that you're doing now?

**Steve:** ?...? money. [*indecipherable*]. That may not underlie everybody's motivations, but it certainly underlies a 'if we weren't paid to do this we probably wouldn't do it'. My motivation for becoming an Antarctic scientist, when I first worked at the Antarctic Division I worked on North Atlantic krill before, and so when there was a job available for a krill biologist working at the Antarctic Division it seemed an ideal job. It fitted exactly my experience, so that was the motivation to sort of work on something I was familiar with and work in an area where krill ?...? had a very real relevance in terms of management, in terms of a key role in the ecosystems.

**Elli:** They're a little bit similar – those questions. Question No 3 is quite different.

**Steve:** Yes it is.

**Elli:** Can you tell me anything about your own consciousness during your working day. In other words what usually goes through your mind during an ordinary working day?

**Steve:** Right now the way that I operate, because I'm not actually in a management role now, and so I have a large number of people who want things from me all the time. I find that, particularly when I'm working at the Antarctic Division, that almost my entire day is spent reacting to other people's wants and needs. There isn't a lot of time for consciousness, there isn't enough time to actually plan to do things. You end up responding to other people's needs, so if things go through my mind they're generally in relation to the last person who bothered me, the next person who's going to bother me, and if possible if I get a spare moment of time to actually try to do some of the research work as well. It's a very reactive mode that I'm in. Generally I've got several different things on the go at once so what I'll be doing is going from ?wanting?, waiting for somebody else to provide information onto the next thing while I wait and so on. It's a juggling process and you have to be able to switch from research to people management, to being a travel agent to doing all sorts of things. It's very rare that you get a period of time where you're actually able to sit down and devote yourself to a single task for a protracted period.

**Elli:** So you find time constraints is something that you're aware of during the day.

**Steve:** No, I'm almost completely unaware of any time constraints because the time just gets filled up. You can come in with a blank calendar and the day goes because it starts as soon as you arrive. Emails coming in, when you've dealt with the emails the people come in and then the people go when you go, so it's a continuous ?...? process. You don't have an awful lot of day to process any of the data that is coming in.

**Elli:** Okay. Do you feel that a publisher of papers [*indecipherable*] ...scientist that the consciousness of a scientist, or scientists in general, can impact on the outcome of his or her work, or the work of scientists?

**Steve:** It has to otherwise everyone ??? be making ??? Everybody approaches problems differently and that's obviously a product of their individual makeup. So you end up addressing a particular set of problems in one way because you happen to ?think ...? that way. Although science is fairly rigid in the way that we say we go about things and in actuality for *most* science most of us are engaged in, as opposed to theoretical physics which is really mathematics ??? very formally defined, most of the science that we do is based on a series of guesses, value judgements and so on and that all goes together and the question is whether your guesses or value judgements – you set up your science to try and see if there's a way. Given a particular set of observations my hypotheses, my guess is based on that sort of ??? but it would be very different from somebody else's, depending on the way I think and the training that I had.

**Elli:** I suppose that would also include interpreting or making a decision on the significance of the results because that's the ????

**Steve:** Yes.

**Elli:** One ?exception? was the significance of being one ?thing? ?another researcher? might ??? something else significantAntarctic

**Steve:** Yes exactly. Everybody has their own pet theories and they will interpret the data to indicate that their pet theory is probably more likely to be true than somebody else's. You do develop schools of thought and that's the way it operates generally in science I think.

**Elli:** Yes, I was going to say that I have had a couple of scientists say that this is not the case, that science – at least it strives [*indecipherable*] ... totally objective.

**Steve:** I think over a period of time that's probably the case. If you're looking at a particular problem, while the problem is largely unsolved you will get a whole lot of people addressing it with their own particular viewpoints and so on. If that problem then does get solved, then all the alternative hypotheses might disappear and you get through to that. You go through this period where people are trying to solve problems and in a number of ways getting lots of different ideas about how the system works, but then what the system has, once you get that final piece of the jigsaw puzzle if you like, and it becomes obvious to the majority of people that that's the way the system works. It's not beyond that, but it's the best possible explanation, that it meets all the facts at the time. Then all these other bits fall away. There's a case ??? at the moment – I mean I'm sure it's our physical colleagues who would say that it operates much more rigidly – but [*indecipherable*] at the moment is that there is some debate as to whether there has been a decline in sea ice over the last fifty years. There are a number of innovative ways of looking at it and there are those who believe the results of those innovative ways of looking at it and there are those who point blank refuse to believe them. There's no reason for them to refuse to believe them other than they don't think that there has been a change and everything in their experience says there has been no change. Until you get to the point where the evidence becomes overwhelming you don't actually get that change. The way I would interpret it right now – one more piece of evidence that comes up which says there has been this change and the entire community will roll over and say, okay case proven. But it's that build-up if you like of evidence.

**Elli:** Circumstantial or ...

**Steve:** ?Not quite? Circumstantial. It's very difficult [*indecipherable*] ...to get actually definitive evidence, so what you actually need to do is get enough pieces of evidence that means that the most likely explanation in this case would be that there has been a change in sea ice. You're never going to prove it completely because nobody observed it at the time but there are a number of proxy pieces of information, and if you get enough of those coming together then you have to say, well okay that is the most likely explanation for all these observations.

**Elli:** Yes. We ??? on the programs based on scientific theories that haven't been definitely proven. ??? this goes on and it's an interesting thing.

**Steve:** The question is, at what point do you consider to prove to be better. If you take something like climate change, it depends on what side of the political fence you're on. You can either say, no it's not proven. You'll never prove it until after it's happened. What you have to say is that the overwhelming amount of evidence that is believed by the overwhelming number of credible scientists working in that area would say that it is happening. It's not proven. Most scientists never prove at all. You can say on the balance of probability – complex problems this is – on the balance of probability,

this is most likely what is happening. That's the way real science works. It doesn't work on the nice experiments in physics where you can actually prove cause and affect. Most science is far too complicated for that so you actually have to work more on the balance of probability.

**Elli:** Yes. ?I think? that's how the public sees [indecipherable] ...impression that people who are not scientists they tend to think that science is a definite thing, it is the [indecipherable] ...can actually deliver absolute answers to problems.

**Steve:** Well in some cases it can. You can definitely prove that if someone had a malaria parasite they will get the symptom of malaria. That's sort of cause and affect, so in some complex systems you can do that. Others are much too complicated to do that. I think scientists are actually rather bad at saying, okay this is a really complex thing, the [indecipherable] ...if you put this bit and this bit and this bit of evidence together – and we're not being selective here – then you have to come to the conclusion that this is the most likely cause of this particular ?...? that you're seeing. If scientists were a bit less shy about doing that, then we actually might be able to contribute more to environmental debates because right now we can be sidelined because we can be told, well come back when you've got the proof. That's what we have to be able to do in the end is come back – we'll never have the proof. We have the information at our disposal that allows us to make the best ?...? that are available and if we can make those ?...? we can help you. So if we say that sea ice is going to melt in thirty years, it's a far better bet that if you go and ask a bunch of lawyers or anyone else and so if you want the best bets on what's going to happen you go to the people who have the information. If you want a legal opinion on whether the sea ice ?is going to melt? go to the lawyers, but if you actually want to know what the scientific opinion is as to the most likely thing to happen you [indecipherable]. ?...? ...?forestry debate?. If the scientists don't come out and say, I know a lot about ecological processes and this is the consequences of these particular behaviours, I can't prove that that will happen but based on everything that we ecologists know, this is what's likely to happen. It actually has a lot more weight than if you go and ask a lot of chartered accountants what they think will happen. We scientists have to get used to operating in that fashion because if we're shy about giving our opinion, then there are lots of people out there who aren't. [indecipherable] ...much more qualified to offer an opinion in environmental issues than other people.

**Elli:** Yes it's an interesting situation where the perception of the public of the scientific community...

**Steve:** Well, it's almost more scientist's views of themselves. Scientists are really cautious because they don't want to be seen to be stepping outside their field. They don't want to say anything that cannot be entirely justified. If you look at the way a scientific paper is written, every statement is nailed down with a reference – I didn't say this, somebody else said this, somebody else has already demonstrated this – and you go through it on that, so you put scientists in a position where they actually have to say, well what do you think is happening, and they'll ?...? well, I don't have all the evidence. Scientists have to get a lot better at actually thinking and saying, well okay I don't know everything about this but based on what I do know this is what I would suspect would be happening.

**Elli:** [indecipherable]

**Steve:** Yes.

**Elli:** Okay thank you for that. Question No 4: In your opinion what role, if any, does qualitative science play in Antarctic science?

**Steve:** That's pretty much the same sort of thing I think. It's a question of we're never going to be able to prove ?most of? the things. It's a question of making some value judgements on what is happening relative to other areas that are put forward. As I said, it's very difficult to take a snapshot through time because these things change all the time and you will find that the ?...? opinion is broad at one point and narrow at the next and so on. It's an evolving system. That's one of the things about science is that it actually does build on a system of knowledge. You actually get a build-up of knowledge and people depend on that build-up of knowledge to make their value judgements and set up their hypotheses and so on and that's building all the time. Whatever anyone says there is a huge qualitative element in it but at any one time, and I think that over time you find that it's all built into a rigorous system and eventually you come up with something that is better than just merely a guess.

**Elli:** One scientist said that he thinks that qualitative science is always based on quantitative science because whenever an environmental scientist sets out to research, his main ?...? hypothesis or some query which has to be qualitative in nature because it ?...? ... ?questioning?

**Steve:** Yes, well it would have to be that way. I work on krill and drive up the road and work on whales. Why is that happening. Why am I asking questions of krill and then asking question of

whales. It's because that's the way I have to have an interest. They have to have an interest in that and so at some level down there they're 'refitting' the bigger element which is, what interest, what is the way you think, how do you address this particular 'issue?'. You do have people who have very rigid and formalised ways of addressing problems on one hand, and then on the other hand you've got people who are much more freer thinking '...?'. They're both addressing the same problems but you may – and one isn't right and one isn't wrong necessarily – but they both help to address the same problem.

**Elli:** Yes. Just very briefly. As a biologist, or someone who works with Antarctic fauna, do you think that there is a place for 'qualitative' analysis of species of fauna. For example – I know you're studying krill - would you see that there would be a reason to study the *behaviour* of krill. For example you observe the way the krill live and the way that they behave and then if you make a record of that, then that would be qualitative science because it's descriptive. Do you think that's qualitative science – well let's say with krill that you have found that they need '...?' for such descriptive analysis...

**Steve:** Yes. Particularly when you're dealing with animals it's vitally important because if you don't understand how the animal lives and behaves, you can't actually interpret '...?'. I'll just give you an example. 'The very first time? [*indecipherable*] was – and this is very rare who works on marine organisms – you very rarely '...?' animals alive in the wild and I was on a small boat in Canada and swarms of krill came to the surface and we were in the boat there and there was a little school of krill swimming past and one of the krill looked – I swear this happened – looked over and it swam over and checked the boat out, and thought, 'Oh they're mostly harmless' and then went back into the school. Now, that krill was capable of individual behaviour. Capable of not only the group behaviour of the school but capable of actually leaving that school, going and doing something individual and go back. That's an insight that you get into krill that you would not get any other way. Most people when they see krill they put a net down into the water two-hundred meters, they drag it through the water, they bring up these dead animals and then they pickle them, and they try to interpret how krill are living their life based on that. For me the critical '...?' is how an individual krill lives its life. How it lives in relation to the rest of the krill population and how we can actually study that and it's an incredibly difficult thing to do. If '...?' something you grab out of the water you lose the context entirely so you do have to do these really complicated, almost ethological investigations into the behaviour of these animals to understand what they're capable of. There are two schools of thought in looking at krill. One is a very mechanistic thing, they're just dragged around by the currents and that's that and the other of which is that they're actually fairly complex animals and they live in social groupings and they have a fair degree of control of where they find themselves. They sound like really academic '...?' but they're not. There's a fundamental difference on the way you might manage a krill fishery. If they're just drifting around the Antarctic, then it doesn't really matter where you fish because they're just going to get replenished from further upstream. If, on the other hand, krill can find really good places to be and remain there and reproduce there and their young will grow up there, then you have these hot spots which can maintain themselves because the krill are actively doing it. That's the way I view it. If that's the case, if you go fish one of those hot spots you'll fish it down. It won't recover – well it will eventually, but it won't recover quickly. In terms of management, understanding which of those is more likely to be the case is very important ... Antarctic. You may call it qualitative science but it's a different sort of science. What you have to do is to be able to convince other people that in actual fact they can behave in this way, and that's not an easy thing and it does require a great deal of observation and in the end quantification of the behaviour that you see.

**Elli:** Yes, this is very broad in a way. Qualitative 'as is? Qualitative. I'm using qualitative and I'm really referring to anything that's not counting or '...?' or measuring. Whether we call it descriptive or observation or whatever.

**Steve:** All science starts from a description of some sort. A description of an observation and that observation is what you then try and explain through a series of hypotheses. Nobody can say that you don't have a '...?' the observation because the observation is the nucleus on which you build.

**Elli:** Yes and I suppose you must see the bigger picture to understand what research to do. [*indecipherable*]

**Steve:** Yes but it all depends on your mindset as well. If I see a little school of krill it leads me off in one direction and it leads someone else off on a totally different direction. So it does come down to who's doing the observing as well.

**Elli:** Yes, just curiously. Krill [*indecipherable*] ... One other question very quickly. When that krill looked at you '...?' singular '...?' it's krill it's not '...?'

**Steve:** Yes, single krill.

**Elli:** When it looked at you did you feel that it had a consciousness [*indecipherable*] actually acknowledging you.

**Steve:** No, I don't think it was acknowledging me. It was obviously, in the way that an animal does, it was checking out a part of its environment and it obviously was processing that information in some way. You mentioned size as if to say 'well they're only that small?' but if you think of ants – look at ants, bees – you think '...?' incredibly complicated social organization that they have and krill is hundreds of times bigger than an Antarctic. It's got a brain that's bigger than a whole ant and yet part of the problem in marine biology is that people don't credit the animals that they see out there as having the ability to totally organise and behave in a 'complex' fashion. The reason for that is because it's just so difficult to actually go out and see them doing that. We can see it on coral reefs [*indecipherable*] 'Oh, isn't that amazing'. Then you go offshore and you pull a plankton net through the water and everyone says [*indecipherable*]

**Elli:** Yes, well this is part of the mystery of how human beings behave towards animals. We treat some animals in one way and other animals in a totally different way.

**Steve:** Yes.

**Elli:** Okay, thank you very much. Question No 5: Do you have any thoughts on the idea that spiritual insight and wisdom should play, or does already play, an active role in contemporary scientific research such as physics and biology? And it's been pointed out to me a few times now – the wisdom is not necessarily '...?' it's just wisdom as we know it '...?' wisdom and spiritual insight.

**Steve:** Well, my interpretation of what wisdom is if you like an accumulated series of insights, of what you accumulate with time that allows you to process your universe. Some people are obviously much better at this than others and the people whose opinion I actually value most are people who have what I would consider to be wisdom, who have a broad view of what goes on and who are able to put things in a much wider context and '...?' their particular species, their particular field of study. There are some people out there who are like that...

[END SIDE A]

**Steve:** ... make a statement about something it actually means something to me because they have a much broader context than most people, so I think certainly wisdom does.

**Elli:** Okay, and spiritual insight?

**Steve:** That's a more difficult one because it's something that most scientists wouldn't deal with at all in terms of they wouldn't reveal to other scientists whether they use spiritual insight and they wouldn't admit to it if they did, so you're unlikely to find out whether they '...?'. Personally I don't use spiritual insight very much.

**Elli:** Okay. By the way 'no-one?' used that word spiritual. I think '...?' comes up again '...?'. That's up for interpretation. I think everyone [*indecipherable*].

**Steve:** [*indecipherable*] ... your other question '...?' wanted to know if I was the 'supreme' and I said "Of course I am".

**Elli:** Most people [*indecipherable*] anyway.

**Steve:** Yes.

**Elli:** Question No 6: What do you think the goals and values are that are most prominent in your work culture at the Australian Antarctic Division, or ACRC? And also here, when I say 'goals and values' I don't necessarily mean mission statements.

**Steve:** Yes. I don't know. You '...?' the Antarctic Division has several different cultures for instance. It's very difficult to actually stipulate that there is a single work culture '...?'. I could actually narrow it down to the scientific work culture, would that help, or do you rather it broader?

**Elli:** No. Of course if you can identify different work cultures within different departments '...?' that would be interesting but it's mainly the science personnel and '...?' yourself, the science personnel you associate with.

**Steve:** In terms of science one of the most important things that scientists value is integrity I suppose and being taken seriously so that when they actually make a '...?' on something people actually sit up and take notice. They believe them because they believe in that particular person because of their track

record or their – basically their track record – so I think that that, for most scientists, would be one of the most important things. They would be seen to have integrity.

**Elli:** Credibility.

**Steve:** Yes, credibility and integrity. Those would be pretty much the things that would drive most scientists. They put up with most other things – being appalling communicators, rotten managers – but if they have credibility then they'll be happy with that.

**Elli:** ?...? Anything else ?...?

**Steve:** No I don't think so.

**Elli:** Okay. Question No 7: Do you have any thoughts on the process of peer review as a means by which to ensure rigour in Antarctic scientific research, or any other scientific research?

**Steve:** Again, it's one of these things that if you look at individual cases you can obviously pick out flaws. If you give me something to review, I can decide if I want to can it or whether I want ?it? to go ahead based on any number of criteria I want to. You can make a ?...? judgement, 'God I don't like this person and I'm going to destroy this particular paper', and you can do that. Or of the same paper you can say, 'I like this person, I like this area of work, I think this is a neat approach, I'm going to give it glowing remarks and it will go ahead'. There's very few papers that you have make that sort of split decision about so you can actually – generally you have to make a decision about which you're going to go. How you do that is based on a huge number of factors, so that's for an individual case. If you give me a single paper and I will make a decision at some point after having read that paper, 'well this flies, it doesn't fly or it's going to require a bit of work before it flies'. So those are the sorts of decisions you make when you review a paper – that's for an individual reviewer. The value of it is that there will be somebody else looking at it and they have to make exactly the same sorts of decisions and usually there will be say three people doing that and they will all think differently. They will all have different prejudices, different experiences of the authors and so on. It's ?all? a statistical process so that you will get to the right answer by involving a number of people. So for an individual case, if you have say three referees, you'll probably get the right answer out of it – this is a useless piece of work, or it's a very good bit of work. Then if you put the whole process into the wider context of peer review more generally, again you'll find that overall the peer review process will come up most often with the right answer in that this particular piece of work should be published and this one shouldn't. You could always pick holes on it in a case by case basis, but if you actually got all the papers that had been reviewed in 2004 and you had some sort of quantitative measure of whether it should have been published or not, you would probably find that the majority of papers that had been submitted that should have been published were published, and the majority of papers that shouldn't have been published weren't published. It works in the bulk.

**Elli:** It's not ?...?

**Steve:** Of course it's not ?...? because it relies on people to do it. It is something that – again it comes down to this sort of balance thing. It's not an exact science. You're relying on people to make value judgements on particular pieces of work and sometimes they get it right, sometimes they get it wrong, but by using a variety of people you're more likely to get the right answer than you are to get the wrong answer.

**Elli:** So as far as rigour goes, would you say that it works to more or less ensure rigour.

**Steve:** Yes, and the other thing you have to ask is what's the alternative. Nobody seems to have ever come up with a better alternative. Yes, it does ensure rigour far more than the alternative, which there isn't any ?...?. You publish anything and that does not ensure rigour at all.

**Elli:** Okay. Question No 8: Have you ever considered giving up your professional position as a scientist for a simpler life and a simpler life here means renouncing material life for a life of austerity and spiritual self-realisation?

**Steve:** Not since this morning. I wouldn't give it up for a more complex – but I would give it up for something that involved a great deal less stress at times. It might not necessarily be renouncing material life. It might ?...? ...if I won the lottery I would certainly drop science and go and do something far more material. I don't see myself currently wanting to have a more austere and spiritual life.

**Elli:** Okay, last question. As a scientist are you at all interested in whether or not species of Antarctic fauna and flora have, or are, a spiritual soul?

**Steve:** *[indecipherable]* ...Not really, no. For science it's not a question as a ?...? study for a start. From a scientific point of view it's a non-starter and from a personal point of view I'd actually be more interested to know I had one. I'm not entirely convinced that I do so I shouldn't go out looking for it in krill.

**Elli:** So you think it's a ?program? that should be implemented into the Antarctic biological program – the study of whether or not the Antarctic fauna ?...? soul?

**Steve:** If you can come with a testable hypothesis that would bear scrutiny, then by all means. For tens of thousands of years people have been trying to work out whether humans have souls and no-one's come up with a good answer yet. I think that if one is actually going to look for a soul it's probably better to look for it in humans who are in some ways easier to study. I just don't think it's something that can ...

**Elli:** That can be done.

**Steve:** Well it can be done very easily. If I want to find out whether I've got a soul I need to kill myself. That's really the only way I can know and no amount of killing krill is going to let me know whether they have souls. If I'm ?...? ?...? ... question I really have to commit suicide.

**Elli:** Do you think that that would be the only way of finding out ....

**Steve:** Well it's the only way for sure. I don't know that there's another way of doing it.

**Elli:** Okay. If there was though, would you be interested?

**Steve:** If you could come up with a good way that would give me a guess whether ?there's a soul? I'd love to ?...? ?...? ...it's a fantastic question but I don't know how you'd do it.

**Elli:** Okay, interesting.

**Steve:** I mean I think everyone in the world would be interested if you can come up with that but it's what people have been looking for.

**Elli:** That's true.

**Steve:** This is the ?...?. That and time travel and all these things so if you can come up with a good way of doing it let me know.

**Elli:** I will. I'll let you know if I come across a suitable method ?of a way of doing it?.

**Steve:** Yes.

**Elli:** Okay, well thank you very much Steve.

**Steve:** That's alright.

**Elli:** I really appreciate your time.

[END OF TAPE]

### 13. Ramm, David (CCAMLR)

#### Start of tape:

**Elli:** This is an interview with David Ramm, Data Manager at CCAMLR. David would you like to start by just explaining a little bit about what your position is within CCAMLR and how your work contributes to the management of the Southern Ocean.

**David:** My position's called Data Manager, and obviously manages data, but the way the position's evolved it encompasses more than data management – when I was recruited for the position they were looking for somebody that was a fisheries biologist with data experience, rather than the other way around. I work with a team of people that manage mainly the fishery data and the research data, and we process and analyses these data in support of the Scientific Committee as well as the Commission. .

**Elli:** Okay, so you're a biologist, or you're qualified ...

**David:** I'm a fisheries biologist by training

**Elli:** Fisheries biology.

**David:** Yes. We get data in the raw form that comes in from, for example, boats that catch fish and report the catches to us. We process all that data but then we do quite a bit of analysis for the working groups as well.

**Elli:** Okay. Do you also deal with the illegal side of the fishing?

**David:** No. There's a clear separation in the work between what I do and the illegal aspects of fishing which are monitored by compliance people in the office. We work closely with them but most of my work focuses on the scientific aspects of managing the fisheries and assessing the environment.

**Elli:** Okay, so are you ready to start the questions?

**David:** Yes.

**Elli:** Question No 1: What inspires or excites you the most about being an Antarctic scientist?

**David:** I had a look at all these questions before the interview and they're all fairly challenging, but I guess I've always been interested in the marine science side of things, the Southern Ocean and being involved with the ocean and Antarctic because it's just such an extreme place, and essentially untouched. They're the key elements.

**Elli:** The scientific side of it as well as the environmental side?

**David:** Yes.

**Elli:** Okay. Question No 2. It's a little bit similar to Question No 1. Can you tell me about your original motivations for becoming an Antarctic scientist?

**David:** I guess it's partly circumstance. I was fisheries biologist before getting the position here. I was actually working up in Darwin on tropical fisheries. I'd heard of some of the work that was being done down here – The Antarctic has large scale, big fisheries which was appealing. When I saw the position advertised there was an opportunity to continue the sort of work I was doing but on a larger scale and in an area where there was little known.

**Elli:** Yes. I imagine that the environmental setting is quite different, working in that area, in that climate, and coming to work in the Southern Ocean. So far as the actual science goes it would be quite different is it?

**David:** The basic sciences are there, the same. Assessing stocks and managing fisheries, but obviously completely different climate; different depths of water. Most of the Antarctic fisheries are very deep fisheries, and they have a completely different set of users. I was used to dealing with commercial fisheries as well as recreational and indigenous fisheries in the Northern Territory. The recreational and indigenous elements are not there in the Southern fisheries. I was involved with work with Indonesia so there was the international element there which is also a major part of our work in CCAMLR.

**Elli:** Yes, and of course the logistical side of it as well. Challenging ?...? ?...?

**David:** Yes.

**Elli:** Okay. Question No 3, something a little bit different. Can you tell me anything about your own consciousness during your working day. In other words what usually goes through your mind during an ordinary working day.

**David:** Well to a large extent it depends on what I'm doing at the particular time. At the moment for example I'm developing some fishery reports so it's a lot of programming and thinking about ways to manipulate the data and what needs to be done. I'm a fairly practical person so thoughts usually extend to what I'm doing at the moment.

**Elli:** So sort of task orientated.

**David:** Yes. There are other issues that come up in terms of strategic thoughts but a lot of it's task orientated.

**Elli:** So, just a question in relation that question. In your opinion would you say that the condition of a scientist's consciousness could influence the outcome of his or her work?

**David:** I would think so, yes. Both some short term and long term.

**Elli:** Do you think that that's something that perhaps environmental management organizations should research perhaps, or taking into consideration maybe when they design research programs or when they designate a certain personality to do a certain task?

**David:** It's an area that it would be worth considering, but whether there's much that can be done I don't know. It's a human characteristic. However I don't know that if you were recruiting someone for a job or some specific task you would select on the basis of that characteristic – I don't know what you could do about it

**Elli:** Okay, but you do think that it is possible or probable that there would be some...

**David:** I think there might. If, by consciousness you mean like the thought process and how we go about our work, or whether we think about it in advance or just at the time.

**Elli:** What fills our consciousness because different things fill different people's consciousness. Some people may be thinking about a whole range of things that the scientist next to them is not even contemplating, whilst both scientists are conducting similar research.

**David:** We notice that in the working groups that there are generalists and then the specific expert and you need both to get the best out of the system I think. Clearly some people are good at broadly integrating ideas whereas others can be very specific and detailed about models or whatever they're doing.

**Elli:** Yes, okay. Question No 4: In your opinion what role, if any, does qualitative science play in Antarctic science?

**David:** I think it's important. What role does it play at the moment I'm not sure. For example, in the Northern Territory there is a lot of local history about places that, by interviewing indigenous people you can learn a lot about how the system might have operated. It's not qualitative so that sort of thing would be good. I don't know about in Antarctica whether there would be opportunities like that but I think it's important to consider.

**Elli:** Yes, I came across that a few days ago. Apparently the Bureau of Meteorology, in it's website, has one page that you can go into that gives indigenous knowledge on meteorology. I didn't have a good look at it but I was pleasantly surprised when I found it because that says that indigenous knowledge of weather systems ?...? ?it doesn't really say? how the Bureau of Meteorology actually considers. I didn't read anything that said what they actually thought of indigenous knowledge on weather, but at least it has been considered and it's been put up there for other people to have a look at. And of course, yes, indigenous communities in Australia didn't have access to quantitative systems of knowledge gathering that we do today with our science.

Okay, just in relation to that question. As a biologist, do you think that, again on qualitative science, there is one way of gathering information about different species and that is through description, through observing them and describing them, rather than weighing them or counting them or so forth. What role, if any, do you think that sort of science should play in biology. Do you think that it's important?

**David:** Yes I think it is. Taking the krill fish as an example, we try and quantify as much as possible of that fishery. But there are other elements such as the skipper's choices of where they're going to fish and what they intentions are which are important. That's qualitative information that we're trying to gather, in the long term, and we would like to quantify that information so we can put it into the models. At this stage it's really important just to even have the diary of the skipper to see what their intentions were on a particular day to try and understand how the fishery operates. Qualitative information has an important place.

**Elli:** And that ?...? part of the science isn't it.

**David:** Yes. Ultimately people tend to try and categorise things and put numbers on qualities to try and plug them into models. In the krill fishery example, our plan in the long term is to use a questionnaire, for example, that we could give skippers. We are looking at how to put that information into a spreadsheet and how do summarise that so you can make some sense of it.

**Elli:** Is that questionnaire something that is given to all the skippers.

**David:** Yes.

**Elli:** Okay.

**David:** Well it's available to all skippers. Whether they read it or make use of it, most don't at the moment.

**Elli:** Most don't.

**David:** No.

**Elli:** What sort of information does it seek to obtain.

**David:** Krill fishing is very patchy. They either catch huge amounts or they don't... ? The vessels search for krill and we try and work out on a particular day what the intention was – if the boat was simply relocating to another spot then they'll go past aggregations of krill and not stop, but if they were looking to fish then they make all sorts of decisions depending on the quality of the krill and the market values and how the boat's going . And if you're only looking at the catch rates then you miss out on a lot of information there.

**Elli:** Okay. Question No 5: Do you have thoughts on the idea that spiritual insight and wisdom should play, or does already play, an active role in contemporary scientific research such as physics and biology?

**David:** I think it does. I think big bang theories and creation of the universe, they're on the edge of being spiritual I guess. I think it's important. It should definitely be included.

**Elli:** Okay. I kind of left that term 'spiritual insight' ?...? I didn't give you the ?...? ?...? People apply it in different ways.

**David:** I think certainly in high energy physics when you start to lose touch with the macroscopic world and delve into fundamental particles and how the universe was created - this definitely has elements of spirituality .

**Elli:** Yes, and what about biology?

**David:** I guess the main discussions I've had in the past would have been to do with physics rather than biology. There's definitely links there.

**Elli:** Okay. Question No 6: What do you think the goals and values are that are most prominent in your work culture. In your case I suppose it would be at CCAMLR, but also amongst other scientists and managers who are involved in the Southern Ocean ecosystem. I should also mention that the question doesn't actually ask about the official goals and values, like what we read ?...? ?...? Antarctic Division website – they have official goals and values – but it's more the goals and values that are actually part of the working culture.

**David:** I think probably the one that stands out in my mind is the influence of science in the whole process and CCAMLR tries to use the best available information or the best science possible, and that's quite unusual for a body that's involved with managing fisheries. All the other management agencies that I know of let politics play a lot bigger role than we do at CCAMLR. In that sense CCAMLR has a Commission, which is basically the political group and a Scientific Committee which is an independent body that provides scientific advice to the Commission. The commission always takes note of the scientific advice. All of my work is channelled to the Scientific Committee so that side of things is important.

**Elli:** I thought of another question I wanted to ask you but I might get to it after we've done these ones. It's a little bit unrelated.

Okay Question No 7: Do you have any thoughts on the process of peer review as a means by which to ensure rigour in Antarctic scientific research?

**David:** Yes I think it's essential to have peer review. Whether it be through publications and journals or contracting others to review work. I think it's an important process.

**Elli:** Do you think that it does ensure rigour in the science?

**David:** I don't know about *ensure*, but it certainly enforces rigour. The reason for hesitating about 'ensure' is that some of the science is fairly basic because of the lack of information.

**Elli:** Very basic, did you say?

**David:** Yes. I guess 'ensure' rigour – I think it's an important process and definitely improves the research that's being done.

**Elli:** Okay. Question No 8: Have you ever considered giving up your professional position as a scientist – in your case, Data Manager - for a simpler life and a simpler life here means renouncing material life for a life of austerity and spiritual self-realisation?

**David:** I've definitely thought about giving up this for a simpler life. I don't know whether it qualifies under your definition, but the idea to set sail on a boat and go around the world is very appealing. That doesn't renounce material life but it's a much simpler existence.

**Elli:** Okay, and spiritual self realisation, do you think that that would be included in your, for example, ...? boat and sailing around the world?

**David:** I think so, yes. I'm not a religious person but sailing around the world would definitely be a journey of self discovery and facing challenges and so on.

**Elli:** Okay, the last question. As a scientist are you at all interested in whether or not species of Antarctic fauna and flora have, or are, a spiritual soul?

**David:** Yes, I'm interested. It's a question people ask. It influences the way people perceive not only Antarctic fauna and flora but all fauna and flora and charismatic megafauna and those sorts of things. It's something that comes into even the work I do in terms of the ethics of tagging animals or capturing animals. What you do influences their behaviour.

**Elli:** So do you ...personally? as the Data Manager, but do you have any knowledge of whether or not CCAMLR has to deal with much activity on behalf of the ?NGOs? for example, like Greenpeace. Do they confront CCAMLR ...? environmental ethics?

**David:** Yes they do.

**Elli:** They do.

**David:** Yes. NGOs are invited as observers to the meetings.

**Elli:** Every year?

**David:** Yes, so they're part of the CCAMLR community and they certainly have their opinions and voice their opinions. We have even had demonstrations during meetings, most recently in relation to seabird mortality in longline fisheries.

**Elli:** The longlines, yes.

**David:** Yes. We take note of what the NGOs are saying and it's a balancing act to take everything into account and move ahead.

**Elli:** If you don't mind me asking, what are the grounds of most of the protests. What sort of things ...?

**David:** Activities that CCAMLR is involved with may, in some circumstances, threaten some species species. Albatross for example, or toothfish.

**Elli:** Are they putting forward that they are concerned with the lives of individual animals or is it more, as far as you know, that they are concerned with populations of animals.

**David:** The basic concern is at the level of populations, but I'm sure there are some people who are concerned about individual animals.

**Elli:** Yes because, getting back to this question, it would be interesting whether or not – well, the question reads, species of Antarctic fauna and flora have a spiritual soul, but if they do then ...? people would think well an individual, or a spiritual soul, that's something that belongs to one living being such as a seal or a bird, so if we're speaking about the preservation of populations of animals then the context of this question becomes different between ...? individual animals as having – if each individual animal had or were a spiritual soul then I can understand that some environmental ethics groups would promulgate the need to preserve individuals, not just populations. So perhaps this question discusses ...? make a difference if we were to look at preservation of individual animals ...?

**David:** I can't answer that but from a CCAMLR perspective it's the populations that are important and the principles of conservation are based on the population as a whole and not allowing the population to fall below certain levels. The focus of our work is managing populations.

**Elli:** Is it correct that CCAMLR is the first science body to (is it) manage, or to manage an ecosystem?

**David:** Or to apply an ecosystem for management. I think it is. These days a lot of agencies do that sort of work but CCAMLR was the first.

**Elli:** Okay, one last question again in relation to the last one. Would you say that it would be a waste of resources, such as funds, for biologists - whether they're CCAMLR biologists or Antarctic Division biologists – to design the research program into whether or not Antarctic fauna, and perhaps

we could say megafauna - birds and seals - whether they do have a spiritual soul or ?...?. do you think that that would be a ?...? ?...? research resources or not.

**David:** If you're asking me, probably not, only because I think it's a bit too soon to do that sort of work. I'm not convinced that humans have got a spiritual soul. I'm not sure what's meant by that so I think you'd spend the rest of a lifetime working that one out...

**Elli:** It's interesting that you say *too soon*. Are you implying that perhaps in the future when science improves, or something else has changed, that we will be in a position to research that?

**David:** Yes. I think our knowledge is developing over time. I don't know how you'd establish it but if it was established that these humans and a number of other animals have spiritual souls, then you could address whether Antarctic fauna species and Antarctic flora also have spiritual souls. At this stage I don't know where you'd start addressing that question anywhere so I think it's too soon to look at that specifically with Antarctic animals.

**Elli:** Okay, interesting. Alright, what more can I ask you. There was another question but I think we've already covered it actually. Okay, I think we might leave it at that.

**David:** Alright.

**Elli:** Can you think of anything else that you have thought of in relation to any of these questions?

**David:** No. I guess if you are going to do a transcript I probably have the ?...? ...see it in writing, or maybe provide some more examples.

**Elli:** Yes because sometimes it takes a while to turn things around and come up with other ideas and things.

**David:** And they're certainly unusual questions from my day to day work.

**Elli:** Alright, thank you very much David.

[END OF TAPE]

## 14. REID, James (UTAS)

Start of tape:

**Elli:** This is Interview No 9 with James Reid from the ?...? ?...?

**James:** That would be ?Rehab? ?...?

**Elli:** Okay. So James, can you tell me anything about the work that ?...?glaciology program? (*indecipherable*)

**James:** When I write ?...? I had a particular technical speciality and that just happened to be electromagnetic methods and on the glaciology program we're using electromagnetic techniques remote measurements ?...? ice thickness. So I guess I got involved with the glaciology program as a kind of someone who had technical expertise in electromagnetics, whereas the other people involved here were probably coming from a glaciology background. So my background is more in geophysics, environmental, mineral exploration kind of thing, but the physical principles are exactly the same.

**Elli:** So, how would you define your position at the moment within the glaciology program?

**James:** I've had several grants with the Antarctic division since 2000 I guess ...That's a bit tricky to say, but I wouldn't say I'm involved in the day-to-day running of the glaciology program. I've had several projects which have dealt specifically with technical issues involved with these type of measurements. For instance I don't really have a lot of day-to-day contact with them or I'm not usually actively involved. I mean at certain periods of time we're writing papers and things are going on or ?work? is under way then basically ?...? lot more active, and part of that is because I'm mainly teaching ?...? sciences and I have limited time available for research so things tend to go in starts and stops.

**Elli:** Can I ask you... (*indecipherable*)

**James:** It's part of it. It's very large, it covers an extremely large range of topics and it's one area within the area that I'm really mixed up with and I guess my main interest is actually how to do the measurement and not really what happens to it after that. There are various people in the CRC who are interested in these types of measurements for different applications, they want the data and the thickness? distribution of Antarctic sea ice for modelling purposes or whatever, but I don't have that background and my interest is more in how to do the measurement and how to calibrate the instruments and make sure the data they get is probably the best that you could hope for from that type of measurement. Is that unusual. I mean is that .....

**Elli:** That's good. That gives me some idea of what you're doing ....?

**James:** But I mean I've often felt I'm not bombarded with requests from the CRC to give seminars or anything like that and in a sort of funny way I'd feel a bit more involved if that was the case but I'm not about to chase them really either.

**Elli:** ....? (*indecipherable*) ...within Antarctic science ....?

**James:** I've got a lot of other pots on the boil in terms of research so it's one aspect but I find it's really interesting. It's probably the most interesting thing that I'm doing at the moment. There's not much money in it. You get a grant from the mining company ...? ...Antarctic funds ....?

**Elli:** (*indecipherable*)

**James:** Well I think there's amounts available for Antarctic research ....? amounts of money.

**Elli:** (*indecipherable*)

**James:** We can ....? to get? serious amounts of money, it's more difficult but because we are able to apply for collaborative grants for the industry ....? mining? industry or City Councils in Tasmania or something like that. That's an easy way to get money – 50/50 between the government and the industry. ....? (*indecipherable*)

**Elli:** Are you ready to start the questions?

**James:** Yes.

**Elli:** Question No 1: What inspires or excites you the most about being an Antarctic scientist?

**James:** I suppose the most exciting thing about it was the idea of going to Antarctica and working there. I guess that was my main motivation. The work that I do involves a lot of travel, a lot of fieldwork as well as office work and that's just a really exotic vocation?.

**Elli:** ....? Antarctic setting ....?

**James:** Yes I guess that's a fair description. There are various technical reasons why it's a fantastic place to work as well, but I don't know if they belong to this question.

**Elli:** (*indecipherable*)

**James:** Yes. It's a really great testing ground for equipment. It's one of the few situations that we know a lot about – the measurements we're doing. We actually know more about the environment we're working in ....? ... I think the work that I've done there it's given me ....? other people a better understanding of some of the physics of how these things work, just because it's a really great test – these ideas.

**Elli:** OK, so the Antarctic ....? environment (*indecipherable*)

**James:** Test ....? and understand the physics of what's going on better. As I said some of the things that I've learnt from working in Antarctica relate to all aspects of any applications of that same technology, and it's usually used for ground water exploration or mineral exploration or whatever. There are a whole range of uses there and you can learn some very general things from working in Antarctica.

**Elli:** OK. Question No 2: Can you tell me about your original motivations for becoming an Antarctic scientist?

**James:** I fell into it by accident. I'd never set out deliberately to become an Antarctic scientist. When I got the job here the guy in the office ....? ...scientist. So as soon as he found out what I was doing he actually ....? ....? and things all developed from there. ....? sounded pretty exciting. I'd just arrived so it was within a month of arriving here and I hadn't developed research ....? ... that's where it came from.

**Elli:** (*indecipherable*)

**James:** Well, it sounded like a really bad place to work ?...? the kind of application is an interesting one.

**Elli:** (*indecipherable*)

**James:** Yes. (*indecipherable*)

**Elli:** ?...? similar to the first question ?...?

**James:** Yes ?...? sorry I thought I was answering another question then.

**Elli:** ?...? No 3: Can you tell me anything about your own consciousness during your working Day. In other words what usually goes through your mind during an ordinary working day?

**James:** In an ordinary working day I might be teaching and a whole lot of admin. and not much research so it's hard to say what is going through my mind. When I'm able to spend a lot of time on research then you usually get caught up in it a lot and there's the desire to resolve problems with data or ?...? ...quite motivating. There's this sort of excitement with Antarctic stuff ?...? ?when data comes from the ship? ...getting the stuff, and you're the first person to see it.

**Elli:** So for you it's like (*indecipherable*)

**James:** Yes. I find I have too much to do.

**Elli:** So, time constraints?

**James:** Yes, time constraint's very huge. Just prioritising various things that you have to do. With teaching ?...? ... you can't do much about that. There's always marking and ?...? supervision and there are so many demands ?...? let alone administration. Often you can come in and have your whole day completely written-off with stuff that you hadn't even thought you were going to do that day – a knock on the door at nine o'clock and it's an honours student and that's it. So you can't ?...? preconceptions there.

**Elli:** OK. ?...?

**James:** Not really. Usually I have some sort of ?...? ...one sort or another and ?...?

**Elli:** OK. Question No 4: In your opinion what role, if any, does qualitative science play in Antarctic science?

**James:** I don't really have a strong opinion on that. I think it's probably a necessary part because it's just a very difficult place to work - difficulties in acquiring data sets ?for? the appropriate coverage and things like that. I think it's always ?had? some role?.

**Elli:** In relation to that question, have you ever (*indecipherable*) ?researcher influence? (*indecipherable*) ... ..on how the researcher or the scientist ?will always bring some value? or ?...? to the scientific process ?...? Some people say that it's impossible for a scientist (*indecipherable*). Do you have any thoughts on that.

**James:** I think that's definitely true. I think people have quite different philosophical ideas even about things that are facts. There are still different points of view on how they can or should be interpreted and you can get quite strong differences of opinion.

**Elli:** So you would say that as far as research (*indecipherable*)

**James:** I guess it could – I haven't really thought about that idea. I'm certainly aware ?...? That sort of comes in the peer review question later on.

**Elli:** OK. No 5: Do you have any thoughts on the idea that spiritual insight and wisdom should play, or does already play, an active role in contemporary scientific research, such as physics and biology?

**James:** I don't really have a strong point of view there. I guess something like wisdom is ?useful?

**Elli:** How would you (*indecipherable*)

**James:** I guess I'm thinking ?...? common sense kind of. I haven't got any strong ?...? ideas.

**Elli:** Question No 6: What do you think the goals and values are that are most prominent in your work culture at the ?Australian Antarctic Division? ?...?. I want to point out that when I say goals and values I'm not referring, for example, the goals and values of the public service, it's more the goals and values that you might experience in your working atmosphere. (*indecipherable*) For example, ?...? ?...? other Antarctic scientists (*indecipherable*)

**James:** In terms of goals you're looking ...

**Elli:** What do you experience when you associate with other Antarctic scientists. Is there *(indecipherable)*

**James:** It's a very difficult question. There are usually specific reasons I ...? working on paper ...? I guess that's where the pressure is, to publish data or to get things ...? ... it usually pays to get everything organised and make sure the whole voyage isn't going to be a fiasco because you've forgotten to put in some piece of ?gear?. I'm not sure if it's really what you're getting at.

**Elli:** It is. *(indecipherable)* ...

**James:** Publications.

**Elli:** Publication, yes.

**James:** Certainly in terms of building up a track record if you ?going to? go back to the Antarctic Division next year and ask for another grant, and you haven't published anything ?for the three? previous grants, your chances are getting slimmer.

**Elli:** So that's something that you think is ...? ...?

**James:** I would say it probably is. It certainly is important. Just because you work in a university that's one of the ...? ...? assess your progress for promotion and things like that. It's a motivator *(indecipherable)*

**Elli:** A motivator because it's expected of you?

**James:** Because it's expected and the timeframe is so long ...? ... to actually getting it published, you would be lucky to do that in two years. You've really got to keep it going and you can't stop, you've got to keep producing so it keeps coming in two year's time.

**Elli:** So what would happen if somebody ...? stop publishing ...?

**James:** I don't really know. I think you can quite happily work in a university without publishing papers, but I think it would affect professional career development, and it would certainly, as I say, make it more difficult to get grants – sort of proof of having actually done something.

**Elli:** OK. That leads me to the next question on peer review. Do you have any thoughts on the process of peer review as a means by which to ensure rigor in Antarctic scientific research?

**James:** I think it's necessary. I think one issue with Antarctic work is it's probably quite common to get ...? ...? ... people who might not be exactly in the same technical specialty. Everyone's got their own ...? – say, glaciologists ...? All of those people have got different strengths and sometimes there is a bit of trade-off with that ...? a more general audience and to your specific research area. Just because, if you ?print? something, and the reviewer misunderstands it, say, or isn't exactly in that field, it might not be the greatest review I suppose. That can really seriously effect the publication schedule for a start and it can knock things completely on the head. You have to be a bit careful where you're submitting articles to. That ?is? written for the audience ...? ...? general problems with peer review. You can get three people with three reviewers. One will love it, one will think it's OK and one will say this shouldn't even be published and that's ...? idea, everyone having a different philosophy about stuff and I think editors in general are pretty lazy when it comes to that. You get letters to say you should address the comments of your reviewers ...? ?I just like to say? well I like reviewer one. He said he loved it ...? guidance as to how you should deal with that situation.

**Elli:** This is ...? ... idea of peer review *(indecipherable)*

**James:** I also think that a lot of reviewers don't really live up to the obligations of peer review ...? ... they have really valid comments and they justify the comments and you get other reviews where they'll rubbish something and not provide any evidence, or just say everyone knows this and from that point of view I suppose ...? anonymous peer review it's very ... If you get something like that ...? It basically means another year till it gets published. You have to do something ...? ...? I think a lot of reviewers *(indecipherable)* ... some really great reviews in the past ...? proper job and others ...? ... two sentences I still don't think it's a great review.

**Elli:** ...? ... do you think, as the system is now, *(indecipherable)*

**James:** I think it does. Often reviewers will bring your attention to things ...? ... broader or different technical background and they say this is exactly what we see in some other field, which makes it all the more relevant, and sometimes they can suggest better ways of doing things. I think it can be a really great way of improving the quality of research.

**Elli:** It can be, but is it necessary?

**James:** I don't think it necessarily is. I think everyone's had negative experiences with peer review.

**Elli:** Question No 8: Have you ever considered giving up your professional position as a scientists for a simpler life, and a simpler life here means renouncing material life for a life of austerity and spiritual self-realisation, and can you explain your answer.

**James:** I haven't really thought of doing that. I've thought of trying to get a research job done ?...? something that's got less varied demands on your time. It would be nice to either have a job ?... teaching? or have the ?...? ?...?

**Elli:** ?...? less demanding

**James:** Less demanding in terms of the variety of things you're expected to do. ?...? trade-offs ?...?

**Elli:** (*indecipherable*)

**James:** Yes.

**Elli:** OK. Last question. As a scientist are you at all interested in whether or not species of Antarctic fauna and flora have, or are, a spiritual soul and can you explain your answer.

**James:** I don't have any thoughts about that at all.

**Elli:** OK. Well I think that's the end of our interview. Do you have any other thoughts that (*indecipherable*)

**James:** I don't think so. There were a few ?...?

**Elli:** OK. Thank you very much.

[END OF TAPE]

## 15. RIDDLE, Martin (AAD)

Start of tape:

**Elli:** So this is interview with Martin Riddle, the Leader of the Human Impact (HI) program at the AAD, so Martin can you start by clarifying a little bit about your position here at the AAD and how you fit in with the HI program and so forth

**Martin:** Yep, as you say I am Martin Riddle, Leader of the HI research program at the AAD, the HI program is part of Australia's wider Antarctic program. Until a few years ago... sorry until this year, the program was largely based around disciplines with two issues-driven programs, and the two issues-driven programs were HI research and Antarctic marine living resources. The Australian Program has been restructured recently and it is now structured around four major theme-based programs and those themes are ice-ocean atmosphere, southern ocean ecosystems, adaptation to environmental change, and the impact of Human activities in Antarctic So I am the theme leader for human activities in Antarctic and I am the AAD's program leader of the HI research.

**Elli:** Thank you, Just very quickly, when did those theme areas come in?

**Martin:** The new strategic plan was released about 6 months ago, so it the strategic plan for the next five years and I think it covers the years 2004 to 2009.

**Elli:** And those themes are a part of that...

**Martin:** Yes, they are the new themes, they are referred to as priority-program areas, so if we just run through them, ice-ocean atmosphere is primarily addressing the government's goal of understanding the role of Antarctica in the global climate system, southern ocean ecosystems is responding to the government goal of protecting the Antarctic environment, primarily through developing scientific information is support of the regulation of Antarctic, the regulation of fisheries activities in the Southern ocean, and that information is primarily directed through the CCAMLR process, the Commission for the Conservation for Antarctic Marine Living Resources, adaptation to environmental change is looking at the biological responses to changes in the climate system, and the fourth one, impact of human activities in the Antarctic is looking at the effects of people in the Antarctic on the Antarctic environment. So it's not the global change effects, it's the local effects of the presence of people in the Antarctic However it excludes the one activity where people go down to deliberately

create an impact, which is fishing. So fishing is in the Antarctic marine living resources program, the southern ocean ecosystems

**Elli:** So within the HI program you don't look at ...

**Martin:** We don't look at anything to do with the fishing, we don't look at the by-catch issues, we don't look at the direct fisheries take, that is a very large issue in itself, and it is very sensible that the two are kept separate. If they weren't kept separate, the fisheries issue would almost certainly swamp all the other issues.

**Elli:** And you do look at areas of tourism, and science and recreation and things...

**Martin:** Yep, we look at all aspects of the presence of people in the Antarctic on the environment.

**Elli:** Except for fishing

**Martin:** Except for fishing. Having said that, we do actually, we are focused on some particular environmental issues. In the early days of the program- the program was established in 1994, when I joined this organisation, and at that time it was unclear what issues would benefit most from scientific investigation. I need to perhaps explain that. We are a research group- the HI program is a research group- we are not responsible for environmental policy, we're not responsible for environmental regulation, we are not responsible for applying any of the environmental systems, we are a research group that feeds into the environmental management process, so if we think of a non-Antarctic analogy, we might have a state body such as the Dept of Environment, who has a policy and regulatory authority, you might have a CSIRO organisation doing environmental research that feeds into that policy, and then you might have, perhaps within a mining company with BHP, you might have an environmental group there, which is interpreting the environmental policy and making sure that the company is doing the right thing. The way, if we bring this analogy back to the AAD, the operations branch has an environmental advisor, that's Shaun Walsh, so that's the equivalent of the BHP's environmental advisor. In our policy section we have a section that is now called environmental policy and protection and they are the people responsible for administering Australia's Antarctic policy, they are responsible for developing it and making sure that all the processes are in place. My program is responsible for ensuring that we provide information to support activities that need information on ...better information on how people may impact on the environment, and how to prevent that, how to prevent detrimental impact

**Elli:** So eventually .....you inform these other departments who contribute to policy

**Martin:** Absolutely, yes we certainly contribute to policy, we ...OK, environmental management procedures have been developed where most people live, in the temperate world, and it would be naïve to think that we could just take those off the shelf and apply them in a very different environment such as the Antarctic without some sort of modification and tuning, to make sure that they are appropriate for the environment. And that's basically what we do. So rather than re-inventing things, we look at how to adapt things, and we look at ... perhaps if I describe the structure of the program itself- we have three sub-themes within the program, the first one is fundamentally existing processes- this is just ... it gives us.. it's a vehicle for research into important processes in the Antarctic that are going to have some relevance to environmental management. The second one is environmental risk assessment- this is understanding what the actual environmental risk of various human activities might be, and the third one is environmental remediation, so developing techniques to reduce the risks, or to remove ... to ameliorate past impacts.

**Elli:** Just very quickly, the first part of the program, the processes ... are you speaking about biological processes ...

**Martin:** ... might be biological processes- natural processes ...

**Elli:** ... including human interaction with the environment or...

**Martin:** No, not so much, primarily understanding what it is about the Antarctic that makes it different in important ways from the rest of the world. So, as an example, we're concentrating most of our research effort at the moment on contaminated sights and contaminants in the Antarctic So if we work from the third sub-theme back, the remediation is fairly obvious, it is developing techniques that are going to work in the Antarctic that can be used to remediate contaminated sights. Contamination is basically chemicals that were in the wrong place. So, the techniques that work in the Antarctic for remediation of those sights. The second theme of looking at environmental risk is understanding what levels of contaminants are ... actually create a risk in the Antarctic Can we use environmental guideline levels that have been developed in the temperate world and apply them down there, or do we need to develop new environmental guidelines for the Antarctic? The first theme, looking at

fundamental processes is actually providing the support to those two themes. So its things like in the remediation, for example, one of the problems that we might have is the freeze-thaw process, so we'll be looking at that freeze-thaw process from the winter to the summer, and how that might perhaps drive dispersion from a contaminated sight, and I'm thinking of the environmental risk, the fundamental processes, we might be looking at some characteristic of the biota that drives its sensitivity to contamination. But that model of fundamental processes, environmental risk and remediation is applicable to any of the issues that may be of concern, so if we're concerned about tourist interactions with wildlife we can apply this- we can fit it into that main structure

**Elli:** It kind of his to- it would be difficult to look at two of the areas and not the other one...

**Martin:** Yes,

**Elli:** Well that is a very thorough description of your program, I really appreciate that because the HI program is one area that I want to look at perhaps a little deeper into than the other programs- because it fits with what I'm doing ...

**Martin:** Yes ...

**Elli:** Ready to start the questions?

**Martin:** Yes.

**Elli:** No 1: What inspires or excites you the most about being an Antarctic scientist?

**Martin:** I think I'd like to leave that until later on if I may. I've always had difficulties with that sort of question.

**Elli:** That's fine. We'll move on to Question 3 if you like because one and two are similar, unless you want to go to Question 2.

**Martin:** I can talk about question two – that might lead me to question one actually. My original motivations for becoming an Antarctic scientist. Well I cannot claim to be one of these people who from childhood always wanted to go to the Antarctica – I didn't. I never even thought it was possible. I was eleven when I decided I wanted to be a marine biologist and that is what I am and that's what I do. I am a marine biologist working in an applied field. I decided at eleven and I followed that through. I specifically selected a very applied university, the other university in Edinburgh – there's Edinburgh University and there's Heriot-Watt. Heriot-Watt is very much an applied university. It does a very good marine biology degree but it's primarily directed towards environmental aspects of marine science and the aquaculture aspects of marine science. I selected that university because I've always had a need to see a very direct application for my activities and I spend a lot of time and put a lot of effort into what I do and I need to see a direct link to something that I consider to be worthwhile.

**Elli:** Okay.

**Martin:** ?.....? My PhD was to do with the North Sea oil industry. I applied for ?post-docs? at various places and was offered a position on the Great Barrier Reef, and for somebody who has done marine biology in the UK the Great Barrier Reef – the opportunity to do work there is not something that you'd turn down lightly. I took it up, spent a couple of years as a post-doc there and found it probably the most frustrating period of my career, because I had a complete free rein to do whatever research I wished to. There was a vast hole in the area that I was working in benthic ecology, or particularly soft sediment benthic ecology, and most of the work that I was doing there was very fundamental and had very little direct application at that time. So I didn't get the satisfaction of having that direct link to applied work. Whilst I was working in Townsville at the Australian Institute of Marine Science on the reef a visiting scientist came over from the US, who had worked in the Antarctic for many years and he offered me an opportunity to go down to work with his group one summer. I went down there and fell in love with the place. That was my first experience working in the Antarctic. When I saw the description of this position, the Program Reader of Human Impacts, I saw that it allowed me to combine three of my main interests – one, working in the Antarctic, the second is the marine aspect, and the third is the clear applications side of things, so things worked there. As I say my career up to then, with the exception of a brief period on the Great Barrier Reef, had always been very applied and applied towards the overall issue of environmental protection and environmental management.

**Elli:** Okay, so there's a few things there.

**Martin:** Yes, so it all fitted. I saw the advertisement and thought that one's written for me and though I'd better apply.

**Elli:** So has that led you into ?...?

**Martin:** It probably has. What excites and inspires me about being an Antarctic scientist - what I really do feel that what we're doing is very worthwhile. We do make a difference. Australia is the only country to have established a human impacts research program. It's the only country that has dedicated a significant part of its research effort to the question of reducing people's impact down there.

**Elli:** Is that still ....

**Martin:** Yes. So the field's wide open and we can make a difference in it and we have made a difference. We can make a difference in the Antarctica and in many people's mind the Antarctica is a special place, but we can also actually make a difference in the Arctic and the Arctic is also a very special place, but it's also got some very, very serious environmental problems there.

**Elli:** Is there none of the northern states that have human impacts looking at the Arctic.

**Martin:** Yes. Whether they call them human impacts research. Most of the countries that have a presence in the Arctic direct some of their research and ?D? dollars to environmental problems up there, and there are some major environmental problems there, not just in Russian federation which are probably the most obvious ones, but also across Greenland, Canadian Arctic, Alaska - there are very significant contaminated sites. Some of them developed from mining activities, others developed from military activities.

**Elli:** Yes, and of course you've got most of the lands, or a lot of the Arctic is populated so they would probably have more of those sorts of programs...

**Martin:** They have different drivers possibly. They are populated - the major difference obviously between the Arctic and Antarctic is that there is no indigenous population in the Antarctic. The Arctic does have an indigenous population and the threat to human health from environmental contamination is a very real threat, because many of the indigenous population still have a very close connection to the land and to the food chain and some of the most serious cases of human contamination have occurred in the Arctic, and that's because of the very direct link of people using top predators in their food chain. Basically people killing seals, eating seals.

**Elli:** How is that contaminating the environment.

**Martin:** No this is environmental contamination getting into people and becoming a threat to human health. Persistent contaminants - things like DDT, ?.. the polychlorinated hydrocarbons, Pesticides - persistent contaminants tend to accumulate up the food chain, so small animals might collect a little bit, they get eaten by a larger animal and if it's persistent it collects in the tissues of the larger animal and so on up the food and if you're at the top of the food chain then you're at risk.

**Elli:** Alright, so I want to summarise a little bit, just these last two questions. In Question No 2 you mentioned the Antarctic setting has been a ?motivation? You also mentioned ....

**Martin:** After I was exposed to it ... after I had been there - and I had done nothing to create an opportunity for me to go there - but after I had been exposed to it, the Antarctic setting certainly was a motivator but the prime motivator of my career has been doing something useful environmentally. A second prime motivator has been to do something that I enjoy doing on a daily basis.

**Elli:** You said to apply ?your? science that that's going to be.....? .....?

**Martin:** Yes, absolutely. The criteria I use to work out whether I'm doing something that's worthwhile is to find if I can explain it to a ten year old without them sniggering.

**Elli:** Okay. Then when we moved onto Question 1 you mainly mentioned the conservation aspect that you think we can make a difference.

**Martin:** Conservation wasn't the word that I used. I do believe we can make a difference. We can improve the environment, we can reduce the impacts that are currently happening and will happen in the future, and we can reduce some of the impacts that have already been created.

**Elli:** OK. You wouldn't call that conservation?

**Martin:** It probably is, but I didn't use the word [laughter].

**Elli:** Alright, shall we move onto Question No 3.

**Martin:** Yes.

**Elli:** Can you tell me anything about your own consciousness during your working day. In other words what usually goes through your mind during an ordinary working day.

**Martin:** 'I wish I could clear up all this mess', 'I wish I could set enough time aside to get everything properly filed and organised', and I know I never will. I wish I had more time to spend going into depth in certain tasks and the opposite to that of course is I wish there weren't so many nagging urgent little things that get in the way of doing that.

**Elli:** So time constraint is one thing.

**Martin:** Time constraint is definitely, yes. Balancing – for the sake of the tape, something that I said before the tape went on was that on a daily basis I'm really judged on how well I manage a group. I'm judged as a manager, but at the end of the year it doesn't really matter. What really matters is how much you've produced ....

**Elli:** Publications and ....?

**Martin:** Yes, and those two are very competing. There's potential for major conflicts between those two and publications will take all the time, it will take 150 per cent of the time if you allow it, administration and management can also take a considerable amount of time. Some people in this organization spend all that time managing smaller groups and less complex problems than I do as one of the program leaders, and that is all they have to do.

**Elli:** Can I ask you a question attached to that one. Would you say that things such as time constraint may impact on one's consciousness during one's working day – do you think that that may influence the results of one's work?

**Martin:** Yes, they're bound to. If you're spending your time during some administrative task then you're putting less time and effort into the productive side of the 'work'. It is part of the work. The two are important aspects of the work but they do have the potential for conflict.

**Elli:** OK. Question No 4: In your opinion what role, if any, does qualitative science play in Antarctic science?

**Martin:** You'll have to explain to me this phrase 'qualitative science'.

**Elli:** Well, it's a bit of a wildcard I suppose in one sense. What I'm inferring there is qualitative as we know is something that we can't measure or count or weigh, which is quantitative science. Quantitative science is based on mathematics and my understanding today is that most Antarctic science is based in quantitative science. In other words it has a mathematical basis to it. For example, even with biology, my understanding is that a lot of the biology that is done in Antarctic science is highly quantitative in nature with very little qualitative research being done. For example, qualitative research on seals might be studying the behaviour of seals, how they interact ... and things like that.

**Martin:** No. I am supervising some people who are doing behavioural studies and the interactions with people with seals and if it's of value it will be quantitative. They would not be making assumptions or making interpretations based on a single observation because one wouldn't know where that fitted in the natural range of possible responses that the species might have. Certainly I can't accept that behavioural research looking at the response is necessarily qualitative. I have difficulty with the phrase 'qualitative science'. If you replaced it with qualitative investigation I might be more comfortable with quantitative investigation and qualitative investigation.

**Elli:** I find that that's the same, yes....

**Martin:** Yes.

**Elli:** Shall I elaborate a little bit more on ....

**Martin:** Yes, keep going.

**Elli:** So that example of the seal - what I was particularly getting to there was that if one observes the behaviour of the seal, that is observation and trying to estimate the seal's experience. This of course is not including things such as measuring of the heart rates, which I know is more of a quantitative study because you're measuring the rate, if the heart rate goes up there are some other mechanisms that they use to measure responses in animals. I've forgotten what they are now?... different ones. So if there was qualitative research being one on animals then it would be I suppose, as you say, qualitative investigation where you are observing the animals and how they behave. Another area of qualitative research in Antarctic science is again one aspect of the human impact factor you might say, and that is what role does human influence play on the actual science that is being conducted. I think it's called researcher influence. It's been written that the actual interpretation of data that scientists do, that is actually dependent upon their own judgement and their interpretation, which is not something that we can quantify. So ?again dealing with medium values? and that's something that can be reduced to a mathematical analysis.

**Martin:** I think in the first one, again the behavioural things, it really would not be science if one observed one seal and saw it do one thing, unless it was a most extraordinary thing that had never been seen before and one could then reject the hypothesis that seals didn't walk on water or whatever. That in itself would be science and you would only need one observation that seals walked on water to reject that hypothesis. Generally if one is talking about subtle things you really do need more than one observation. You need to see whether several representatives of that same species, or that same gender of that species, do the same thing under the same circumstances, and it may still be observing but it would still be quantitative for the observations to actually have any meaning.

**Elli:** So as far as the behaviour of seals, for example, would go, I suppose it would really depend on the methodology that the individual researcher is using to try to understand the behaviour of the seals or of the penguins or whatever. So I suppose if the individual researcher would choose to collect data by observing let's say two hundred penguins and how they respond to a specific stimuli, and if that data collection was based on observation, then I would consider that as being ?.. ?qualitative? even though you're using a certain number of seals.

**Martin:** I would say that's quantitative. There are tools, things sitting in boxes here for doing just that and making sure it is quantitative – TV cameras, there are software so that you can turn what could be casual observations into numbers ?... subject to testing. I really don't see the distinction. What do you understand by science?

**Elli:** Well science is very, very broad. I've probably had a broader understanding – I applied in a broader sense than I think most people do. I've done a lot of research into the actual meaning of the word, going back to the Latin meaning of the different ways in which the actual word 'science' itself is used. To give you the answer I have to put in context, are you referring to my question 'quantitative science'?

**Martin:** Yes.

**Elli:** Well perhaps you're right. Perhaps I should have been more specific in that question. The main thing that I wanted to do was to try and understand how scientists view the difference or the interaction between quantitative and qualitative science. We all know that most Antarctic science today is quantitative. It has some quantitative factor to it and my understanding is that if one is going to become qualified as an Antarctic scientist, whether it's a marine biologist or if it's an oceanographer, one studies quantitative methodology in one's undergraduate degree.

**Martin:** As an example to this, for the marine biology course that I did as an undergraduate, biology at high school level wasn't a requirement but maths was.

**Elli:** Maths was, so that's quantitative – something that can be counted, weighed or measured.

**Martin:** Yes.

**Elli:** One thing that I was hoping to get out of these questions, that I haven't specified, and that is the factor of the researcher influence. That's what I was saying before, because whenever you're dealing with science, even if it's just black and white ?data?, the scientist has to try and contextualise that and to try and understand what the implications of it are. Even making judgements about the significance of that data then he or she is relying on judgement, which is qualitative. It's a qualitative area you could say. So that was one thing that I was happy to get out of it. Do you have any thoughts on that.

**Martin:** ... User bias is certainly a very real phenomena and as one gets to areas of science that have greater implications to humans, then awareness of that factor becomes more prominent in experimental design, which is why drug testing has the ...?double blind?... design. So the person who is giving the drug, or the perceiver, doesn't know which one it is and the person receiving it doesn't know which one they're getting, so the person receiving the drug doesn't get any subconscious cues from the person who is running the experiment and ?this? should be analysed without knowing that as well. That is an area which people obviously care a lot about because you could make mistakes there and you making mistakes to human health so a great deal of rigor has been brought into it there. Less rigor is brought into address that same problem elsewhere.

**Elli:** Yes I suppose that's the basis of the empirical method is that the experiment has to be able to be reproduced and at least using the same methodology is not ... the same for it to be accredited as being dependable.

**Martin:** Yes.

**Elli:** I'm a social scientist so social scientists are often dealing with what we call qualitative methodology, which is not always wrong. Certainly the research methods can be repeated if the

circumstances ....? ... quite often you will get different results because circumstances don't always present themselves in the same way.

**Martin:** You will get different results using quantitative methodologies in other sciences but experiments need to be structured in a way to ensure that the results actually mean something and are not just describing a once-off coincidence of events, but are actually telling you something that can be generalised about the world. If an experiment doesn't tell you something that you can generalise then it's of no value at all.

**Elli:** There are of course situations where scenarios will occur only once and the parameters of that occurrence is limited. Say for example if, hypothetically, you have a group of 200 people that were held hostage in a hall and they all experienced something and then later you wanted to enquire something about the experiences of those people then the data sample is already set and it can't be reproduced. You have the 200 people that experienced what they experienced at that time and at that place and you're never going to get another 'sample?', it's never going to happen again, but still if you were to interview those people on tests – put them to some tests or something to find out what they experienced – it would still be 'data'.

**Martin:** Yes, but it depends on what the purpose of doing this is. If it's to document what actually occurred for historic purposes then that's one reason for doing it and the 'data' is good enough. If it's to try and generalise what might happen in other similar circumstances, then one would take a different approach. Could I just give you a similar example. We are working on contaminated sites and we're working on primarily at the Thala Valley tip site at Casey. It's an old waste disposal site that has a melt stream running through it and as a consequence of that contaminants have moved from there into the marine environment and one of our first questions was, 'is this site creating an impact'. So we looked at the biological communities in the receiving environment, the seabed and the .... [We then went to another series of bays, and a series of bays well away from any source of contaminants and looked at those. The bay near the tip is actually very different from the other bays, but the other bays also had differences between them. Now, it is actually the only tip site of that scale in the Casey region so we can say it's different from the other bays, and we can say the other bays do have differences – of course there's natural variability. We can say the tip bay is more different than the other bays are.

**Elli:** More different.

**Martin:** More different yes. What we can't say is that it is more similar to other bays adjacent to tip sites because it's the only one we've got. So we then start looking at processes to try and understand whether the differences that we're seeing could be created by contaminants.

**Elli:** Yes. So some variables you can test and others you can't.

**Martin:** Yes. We can't make generalisations about contaminated bays from our work on Thala Valley and the other bays. If we had ten contaminated bays and we randomly selected three of them to look at and looked at three controls, then we could start making generalisations about the characteristics of contaminated bays.

**Elli:** So you're saying it depends on that information helping to secure ..? and what variables you can test and can't depending on what's available.

**Martin:** Yes.

**Elli:** OK, so shall we move ahead.

**Martin:** Yes.

**Elli:** Alright Question No 5: Do you have any thoughts on the idea that spiritual insight and wisdom should play, or does already play, an active role in contemporary scientific research, such as physics and biology?

**Martin:** Spiritual insight and wisdom. Is that spiritual insight and spiritual wisdom? Or spiritual insight and wisdom. I would hope that there is wisdom ....

**Elli:** I think just wisdom.

**Martin:** I'm not quite sure again what you mean by spiritual in terms of the insight so we'll put that one on hold for a bit. By wisdom I suppose I'm thinking of the intelligent use of the accumulated experience or something like that. To a degree science is based - ....yes it is the intelligent use of accumulated experience so it's hard ....

[END SIDE A]

Comment [MJR3]: I don't know what this means

**Martin:** ..... science progressing with that wisdom. The wisdom to choose the worthwhile questions to ask to extend what is known. Without that wisdom then people can be kept very busy doing a lot of work answering meaningless questions that get us nowhere. I would certainly like to think that wisdom is and does play a role in good science and contemporary scientific research includes a range of science from good science to worthless science.

**Elli:** So can you apply that to Australian Antarctic science then. Do you think that wisdom is playing that role ?...?

**Martin:** Within the Australian program you would have science of a range of quality and the best science would be wisely thought out – would have good questions and would be well directed and the less good science would be muddling along in the way that isn't getting anywhere. They wouldn't be asking meaningful questions and they wouldn't be using designs, investigative designs, that could unambiguously answer those questions. So not only have not got good questions but you're not getting answers, and that will happen and that's a ? thought and I'm afraid that it's the same with any human venture and it's the same as anything. You get a Gaussian or normal curve of any parameter you care to mention and quality of science is one of those things and the system should be in place to push it in a good direction. Spiritual insight – I definitely don't know what you mean by that.

**Elli:** Again I was going to leave it up to interpretation because as we all know probably every one of us has a slightly different understanding of what it is and even if two people have the same spiritual faith you also find some variation. I suppose what I mean is if we are trying to understand what the word spiritual insight means – insight of a bigger picture of how things work but it's not necessarily mundane or something ... – spiritual insight - it's insight into what we do and what happens in this ordinary day-to-day world that we live in that might shed some light on what you're doing from a higher perspective. Some people like to ?add? that spiritual insight as being connected to ethics. In other words, higher principles in life. ...? perceptions on ethics.

**Martin:** Let's put the ethics to one side, but if we're looking at it in terms of are people framing their activities as scientists within some bigger context, I suspect in general not. I suspect that most people are caught up in the nuts and bolts of their particular area of specialist expertise and get involved in the small details and seldom would make the like between some really broader inter-connected clearer ...?

**Elli:** That's interesting. I know there's nothing I've come across within Australian Antarctic science that discusses anything that can be interpreted as spiritual insight and I think that's the same with other environmental scientists ?... they don't seem to ?... mainstream science. OK, so you think generally not.

**Martin:** Generally not, yes.

**Elli:** Okay.

**Martin:** Wisdom yes.

**Elli:** Wisdom yes. Okay, ?we'll move on? What do you think the goals and values are that are most prominent in your work culture at the Australian Antarctic Division, and just before you answer that I wanted to emphasise that this is not referring to the goals and values that are written up in the mission statement. It's really what underpins the association between scientists.

**Martin:** The association between science. So when you saying your work culture are you meaning me, or the place that I work, or?

**Elli:** Yes, well I'm inferring that one's work culture includes one's self and the working environment one could say.

**Martin:** So you're really meaning the people that I interact with on a fairly regular basis. You're not after my opinions of what's driving the goals and the values of most of the people here, and I take your point about me not repeating the Australian public service values or whatever. I could talk about what I think is driving the goals and the values of the organization as a whole, or I could talk about the goals and the values of the people that I interact with.

**Elli:** That's more what I mean. Your working environment day to day.

**Martin:** Well, my group is a new group. I joined in 1994 and when I joined in 1994 the human impacts program was me and since then it's grown and a consequence of that is that I still have a young and enthusiastic – and in some ways a naively enthusiastic – group who, in general, believe in what they're doing, enjoy what they're doing, are not too cynical yet about the constraints of getting things done. There is a degree of cynicism there, and by that I mean that some people have less tolerance for the bureaucratic overheads for example. In general the people that I interact with all have a strong

environmental ethic, and I say that without exception, and that is probably a self-selecting, self-fulfilling thing. Most of them enjoy the outdoors but in a non-destructive way so they're much more likely to be bushwalkers and rock climbers than four-wheel drivers and trail bike riders within the group. They enjoy what they do and it's important – I believe it's important – that we set as a target, as a goal, actually making a pleasant working environment. You spend a lot of time at work and if you're going to be most productive then you need to actually enjoy what you're doing. You need to pace yourself, you need to have time to do other things, you need to have flexibility to go off and do something else if you're not being productive, because you're just not feeling like it today. So are these useful sort of things?

**Elli:** Yes....

**Martin:** Trust. Trust comes down to...you can't have that sort of flexible working environment if you don't have two-way trust. It's a strategy to get the most out of people and it's a long-term strategy for that, so I'm not interested in having people around for a couple of years, burning them out and then replacing them. The sort of work that we do, apart from anything else, takes an investment in time before we're really productive, before we're doing things. We're generating information that is really new and of real value and the only way we're going to get to that point is by having people working with us for an extended period of time.

**Elli:** So you're aware of people's working environment and their level of commitment.

**Martin:** I believe so, yes. I could be better at all those sort of things of course. I could spend more time doing those things. I find myself getting caught up in every day busy work on occasions neglecting aspects of the team. I think in general the team is pretty well?...?

**Elli:** Sounds good. Sounds like you're quite aware of your team members.

**Martin:** Yes, but there are other people in my team that are probably even more aware of that who let me know and nurture me and tell me and say 'you should look after this person, he's feeling a bit left out of some important decision making' or something. It's an environment that allows people to do that.

**Elli:** OK. Question No 7: Do you have any thoughts on the process of peer review as a means by which to ensure rigor in Antarctic scientific research?

**Martin:** I can't see any alternatives to it. I see it as an essential – absolutely essential component of science. Without it, what would you have. You would have the majority of people putting out work that wasn't quite as good as it could be but still pretty reasonable. For those majority you wouldn't get the improvements, the slight incremental improvements, that peer review brings. Then there would be a minority of people putting out stuff that has no basis in anything because there was no constraints on what they were putting out. It seems to me such an essential part of structure that we work within that I can't actually see beyond it. I can't see any alternatives. No, that might just be blindness because I'm too close to it.

**Elli:** So you think it actually does ensure rigor?

**Martin:** It increases rigor. I mean it's only as good as the reviewers that are nominated to each paper...?for our? protection or whatever. The only way you would improve it would be by having more reviewers for each application or for each paper so you have more opinions, which is still peer review. How else can you do it. I mean there has to be some test before something gets out there and has the authority of publication. There has to be some test to determine whether what is being said has any foundation to it. Whether the methods were reliable, whether the interpretation of the results are credible.

**Elli:** Peer review is the only or the best.

**Martin:** As I say, maybe because I'm so close to the system I can't think of another. What is an alternative of peer review – send it to people who don't know anything about the field? Peer review – there are two components to it. One is the 'peers'; that basically means people who actually know something about what you're professing to write about. 'Review' means look at it. If you didn't send it to peers but you sent it to a random selection of people, that would be interesting.

**Elli:** Yes, in ?real? society.

**Martin:** Yes, but if you sent it to peers but asked them to do something else apart from review it - I can't think of what else you're going to do [laughter]. I can't see any alternatives to be honest.

**Elli:** Okay. Question No 8: Have you ever considered giving up your professional position as a scientist for a simpler life, and a simpler life here means renouncing material life for a life of austerity and spiritual self-realisation and can you explain your answer.

**Martin:** Yes and yes.

**Elli:** Okay, so you have considered it.

**Martin:** Yes.

**Elli:** And you can explain your answer.

**Martin:** I could, yes.

**Elli:** Okay, would you like to.

**Martin:** OK. I've interpreted it – it's not necessarily about becoming a monk – so by austerity, which is obviously the renouncing material goods, and spiritual self-realisation, I've interpreted that as going off sailing or spending more time snowboarding or something that I would enjoy doing and get an uplifting feel from. Yes, absolutely. I've thought about doing all those sorts of things.

**Elli:** Okay.

**Martin:** Where were you wanting to go with that?

**Elli:** Well, anywhere. Again it's a question that's open to interpretation because I think the word spiritual is very – people interpret it in different ways. As you were saying, to you that question you've interpreted that in your particular way and to you, you have thought about that concept within the sense of giving up your professional position and going doing something simple in life such as you said snowboarding or something which is not so involved in material complexities. If that's what that means to you then that's what it means. Okay, shall we move forward.

**Martin:** Yes.

**Elli:** Now the last question. As a scientist are you at all interested in whether or not species of Antarctic fauna and flora have, or are, a spiritual soul and can you explain your answer.

**Martin:** Okay. Now the keyword here is Antarctic fauna and flora. Although the Antarctic is a special place I believe it's only a special place because of the way it's perceived. I don't believe that it is intrinsically any more or less special than any other place. We perceive it as a special place because it's over there somewhere and it's a bit different to the every day world that we're familiar with and we're privileged to work there and to go there. But if you take people, or if you take the perceiver out of the equation – I don't think there is anything that makes it and different from anywhere else on the planet or elsewhere. If we extend that I don't think that Antarctic fauna and flora have any higher position in any ranking of spirituality, or anything, than any other biota. So the plants and animals that happen to live on the round-about over there have the same intrinsic value as the plants and animals of the Antarctic however charismatic the Antarctic ones may be.

**Elli:** So in view of what you have said to me now, perhaps if I was to rephrase that question a little bit and ask, as a scientist are you at all interested in whether or not species of fauna and flora have a spiritual soul.

**Martin:** Okay, then I would start saying, well what do you mean by spiritual soul. Do you mean consciousness of their own existence, and awareness of their own existence, or intrinsic value. The reason I would be responding with a question I suppose is because I don't have a spiritual faith as structured. I don't have a structured conventionally based sort of spiritual framework.

**Elli:** Can I say something here ... I know because this question ... one word has been jumped over by other interviewees

**Martin:** Which?

**Elli:** The word *interested*. So I mean really this question is saying...

**Martin:** ?You mean? *Interest*

**Elli:** Yes, would there be an interest there, not so much do you have an understanding of the spirituality of fauna and flora, but would you be interested in whether or not they did. I'm more on the interest level...

**Martin:** If you could prove to me that they did I'd be fascinated. And yes I am interested in that as a general question, otherwise I wouldn't have thought about that other? relative ranking in any sort of spiritual league people? for Antarctic species as opposed to other species. Yes I would be interested but I have difficulty putting a context around spiritual soul. As I say I don't have a religious

framework to hang it against. I think of the spirit as being perhaps self-awareness or consciousness or whatever, so that's one aspect and I don't believe an element of that exists beyond the body - or the existence of the body. If this question comes down to how people make decisions about what is right or wrong in terms of treating organisms, then I don't think you need to invoke – or I don't feel the need to invoke – a spiritual soul, either my own or the animals, I don't have to be made to feel guilty because of a religious framework for me to do things that I consider to be either intrinsically right or intrinsically wrong. I do not harm animals for the fun of it and in fact I don't harm animals if I can help it, but I eat meat and ? and .....? So I don't feel the need to invoke a spirit to – either my own or the animals or the plants – to put constraints on my behaviour in respect to that plant or animal.

**Elli:** OK, I understand that. One last little thing. Do you think that biology today, whether we're talking Antarctic biology or non-Antarctic biology, should try to research if there is such a thing as a non-material, or perhaps even an internal part of animals, do you think that's such ....

**Martin:** I don't think it would be a sensible use of Antarctic resources because you don't need to go to the Antarctic to do that. You can do it from a factory ... a chicken factory farm. No, it would be an unethical and immoral waste of resources to do it in Antarctica.

**Elli:** You mean the Antarctic context.

**Martin:** Yes, absolutely. But clearly, if it could be proven either way, it would be a finding of great importance. It would be bridging other scientific and religious – it would undermine religions because it would take the element of faith out of it, would it not. So where does that leave structured religion? Without faith, what are they if it's proven?

**Elli:** ... might strengthen it

**Martin:** No, actually not. It then doesn't become a religion, it's something else. Without the element of faith in there, if something is proven. If there isn't some blind faith in some un-provable ..

**Elli:** If it's blind faith, I suppose people might have faith because they think their faith is based on fact.

**Martin:** No, no... religion is based on faith because there is no evidence and that's the whole point. Give it the evidence and you take out the element of faith. Faith cannot have proof. If you prove something then you don't believe it because of faith, you believe it because of proof.

**Elli:** OK. I can see your argument there. So you think that perhaps maybe investigating the non-material spiritual soul may be detrimental to the spiritual life of some people in society?

**Martin:** I didn't say that. What I said was that it might undermine established religions which are based on faith. Those ones that are based on faith – the belief in the un-provable. Certainly if you went out and said "look we have it here. X = such and such, and such and such, therefore, there is no soul", then people would still have belief. But if the answer was,".....therefore there is a soul", then you would completely change the whole premise of established religion based on faith.

**Elli:** Yes I'm sure they would be changed. I sure you're right about that. There would be change if science could produce such results.

**Martin:** But would it be worth doing? How would you do it? Is it doable? Probably isn't.

**Elli:** ....? history. Thank you very much for your time.

**Martin:** Pleasure. Hope it's useful.

**Elli:** It was very useful. Very in depth and very detailed - your responses. I appreciate your time very much.

**Martin:** That's alright. Pleasure.

[END OF TAPE]

## 16. RINTOUL, Steve (ACE CRC)

Start of tape:

**Elli:** This is Interview No 12 with Steve Rintoul who's the Program Leader for Climate Change and Variability. Steve would you first of all like to just explain your position a little bit and how it fits within the program that you're working in.

**Steve:** Yes. First of all I'm a physical oceanographer and my own speciality is studying the Southern Ocean and its role in the climate system and ...? CRC, as the name applies, interested in climate and the roles of Southern Ocean and climate and includes what's happening in the ocean, what's happening with the sea ice, how the ocean's interacting with land ice, with the ice shelves, and also the ...? atmosphere is forcing the ocean and how the atmosphere in turn responds to what's happening in the ocean. Finally, we're also interested in past climate history as ...? from ice cores and sediment cores and retreat of glaciers on Herd Island for example. There are four programs in the CRC and our program is really focussed on the physical part of the climate system, so how the ocean and the atmosphere and the ice are interacting. In a way it underpins a lot of the rest of the work in the CRC. The carbon dioxide program for example depends on us to explain how the ocean currents and the ocean structure is changing and how that impacts on carbon uptake by the ocean. The marine ecosystem program relies on us to say how the ocean's changing and where is it relevant to marine organisms. That includes things like changes in sea ice which affects the distribution in numbers of krill and primary production, how much phytoplankton growth there is depends on how much light it's getting and that in turn depends on how things are mixing in the ocean. Finally, the sea level rise program also depends on us to measure and explain how the ocean is changing with time and how that's affecting sea level rise.

**Elli:** So [indecipherable] ... ?with that part of what you do, if I understand correctly, that is for the purpose of the past being able to inform the future, correct.

**Steve:** Yes, that's correct.

**Elli:** That's the purpose of you looking into the past is it?

**Steve:** Yes, that's right. We don't have too many examples of how the climate has changed in the past and if we can understand and explain and even simulate what's happened in the past then we have more faith in our ability to say what's going to happen in the future.

**Elli:** Okay, well just one last little thing. You're heading this program that is situated as a part of the CRC, but you are situated here in the CSIRO. I'm lead to understand that there is a very strong link between the research that is done here and the research that is done at CRC, or at least within this program. I know that there are ties.

**Steve:** The ?population? of the program is there's a large group from the Antarctic Division, some of whom sit at the CRC and some of whom sit at the Antarctic Division. There's also people from CSIRO atmospheric research in Melbourne and the Bureau of Meteorology research centre in Melbourne, as well as the local office of the Bureau of Meteorology, as well as some international ?partners?. So we really are spread out around. The CSIRO marine research does not have the largest percentage contribution to the program, so it wasn't obvious for example that a marine research person should head this program, it just seemed to happen in that way.

**Elli:** Okay. As we were saying before it's a very vast ...? program spread over ...? organizations.

**Steve:** Yes, it involves about forty-five people altogether, but not forty-five full time.

**Elli:** So that's just the climate change variability program.

**Steve:** Yes.

**Elli:** Okay, that's interesting. Is that within Australia or does it go outside Australia as well.

**Steve:** There are a total about five specific people in overseas organizations who are named as kind of official contributors, our overseas partners.

**Elli:** Okay, interesting. Alright shall we start the questions.

**Steve:** Sure.

**Elli:** Okay. Question No 1: What inspires or excites you the most about being an Antarctic scientist?

**Steve:** I guess what really excites me about the kind of science that I do is the fact that the climate system is this amazingly complex and vast system where the ocean and the atmosphere and the ice, plants on land, soils, marine organisms are all interacting with each other to determine the climate that

we experience on land, in our day to day life. That's a fascinating scientific problem for me. I started as a physicist in a department that was very heavily into quantum mechanics and ...? highly theoretical physics. What drew me to ...? or excited? me in the first place was that I was much more drawn to macro scale, natural environment kind of things. What drew me to the Southern Ocean in particular was ...? probably? the fact that it was relatively unexplored and there was, and there still is, a bit of a last frontier aspect to the Southern Ocean. Also that, ocean-graphically, it's a fascinating place. The largest current in the world ...? circles around Antarctica and it's dynamics are entirely different than others elsewhere in the ocean and are poorly understood because it's a miserable place to work so people tend to avoid it rather than go there to measure things, because it's so rough and ...?. Finally, the penguins and icebergs and sea ice and things like that had a lot to do with it as well. If you're going to go spend two to three months on a ship you might as well be going some place where there's something exciting to see in a place where it's remote and different and beautiful and fascinating.

**Elli:** So, to summarise, it's mainly the knowledge, the pursuance of knowledge ...? macro environments, the bigger picture and the Antarctic setting.

**Steve:** Yes, I think that's a good ...?

**Elli:** Okay, now Question No 2, it's actually – well you already kind of mentioned that you started off working as a physicist and ...? quantum scientist ...

**Steve:** Yes.

**Elli:** How is that connected with – you kind of answered it already – your original motivations for becoming an Antarctic scientist. Is it the same as your answer – trying to understand the bigger picture of how things work, or was it something additional to that.

**Steve:** No I think I have mostly answered it. Before I was a physicist I was a geologist and then I realised that I was mostly going into geology because I liked being out on mountains and glaciers and outside. The actual study of geology at that time didn't grab me as much. With what I knew of it then it was too kind of static, so I swung to the other direction and oceanography in a way is in the middle. It's got some of the fieldwork aspects – geology. ...? science where you're spending your time thinking about how the natural world works, but at the same time it involves a bit more quantitative in the mathematical and physics and dynamics side of things, which is something that also really appeals to me.

**Elli:** Can I ask, what are you feeling is the biological component of being an oceanographer? Do you study ...?

**Steve:** Yes. My own personal expertise is understanding the physical part of the system but one of the real attractions of oceanography as well that I could have mentioned before is that it is so much an inter-disciplinary science. So you really can't understand the biology or the chemistry of the oceans without understanding the physics as well. Probably a lot of physicists ...? understand the physics of the ocean fine without studying the biology or chemistry. That's not my own attitude towards it. I really do like that interaction. On my last trip down south there were seventy scientists involved ranging from people watching whales to people doing phytoplankton or krill studies to deep ocean physics. So that is one of the real drives to it is that it is an inter-disciplinary field. Oceanography in general is, it's not particularly that much more so in the Antarctic than it is in other parts of the ocean, but it is one of the attractions for me.

**Elli:** the inter-disciplinary ...?. Okay. Question No 3: Can you tell me anything about your own consciousness during your working day. In other words what usually goes through your mind during an ordinary working day?

**Steve:** Having just said the part of the reason I got into the field was an interest in doing fieldwork, in being outside and so on. One of the things that's taken a little while to come to grips with is the fact that I go out on ships every year or two years or something like that, but most of my time it's an office job and sitting at a computer. In terms of day to day life, maybe the best way to describe it is a good day and a bad day. The bad days have been a bit more prominent in the last two years because I was playing very much a management role. So I was running not only the program at the CRC but also the entire climate group here at CSIRO and a climate initiative in something called the flagship program that involved five or six divisions of the CSIRO. It was largely managing people and budgets and proposals for large groups and that kind of thing, which involved lots of meetings and bureaucratic kind of things. Lots of difficult problem solving, but for problems that interest me I don't find that interesting – they're hard, and they're important but ...? they matter to people. I'd rather find a creative solution to how changes in ocean circulation might affect the climate or penguin numbers than to find a creative solution to how to juggle budgets to allow something to happen. So I've retired from

some of that, so that part is looking up. On a good day it's when I really – the reason I'm an observation oceanographer, somebody who goes to sea and makes measurements, as opposed to a computer modeller is that what I really enjoy is sitting down with a data set getting deeply into observations and trying to come up with a new idea about how the ocean works and how the ocean is interacting with those other aspects of the climate system I mentioned to determine climate. On a good day my day would be spent tapping into lots of different data sets from ships or floats or current meters and trying to put them together in a new way that tells us something new about how the ocean works.

**Elli:** Okay, so task-oriented figures is mainly what fills up your consciousness during your working day.

**Steve:** I guess I haven't answered it so much from the consciousness point of view. I suppose when things are good it's completely absorbing. That kind of level of concentration and being absorbed is really what's required to do it well. I think that's what probably what makes the more management job frustrating because there's a thousand different things happening at once and you never have a bit of time and space to really concentrate on any one thing at a time ?...? So consciousness-wise it leads to a kind of a scattered consciousness, which I don't enjoy.

**Elli:** Okay. Would you say that for example a scattered consciousness, or a consciousness that wasn't so focussed, that that might impinge on the results of work, such as research work?

**Steve:** I think the way it impacts on work is not – I don't think it would bias the conclusions or move things in any particular direction. It just means that it's very inefficient and difficult to get to the next level. With all the science problems that there are out here to do, there are some that are important, there are some that are not so important, but are reasonably important and not that difficult, or at least it may take a lot of work but the path is pretty clean. I think that a scattered consciousness ends up pushing you more towards those problems because you never put in the effort and the time and the concentration to be able to crack the important and harder problems.

**Elli:** Yes, that would take a greater degree of concentration.

**Steve:** ?And all? this and time. ?You get two hours? to concentrate on Monday, you don't get back to it again until Wednesday or you have an hour and a half and then Friday you've got another three hour chunk, it's difficult to make it happen that way.

**Elli:** Yes, I can imagine it would be difficult to make a job ...

**Steve:** I guess one ?other? aspect of doing the work ?and? the consciousness of it, I really enjoy the writing stage of it. I think a lot of people going into science don't realise that what they're doing is becoming a writer because that's really your main job. Not just learn something but conveyed in a way that it gets across to someone else, whether it's in a journal or a public piece of literature but you're really a communicator and primarily you're a written word communicator ?...? So that's an aspect that some scientists I think find either difficult or frustrating or not so enjoyable. It's kind of an unavoidable evil.

**Elli:** That you have to write?

**Steve:** Yes. For me it's actually one of the real positive parts of it.

**Elli:** Okay. Do you find that you have enough time to do that. Do you find there are time constraints on that at all?

**Steve:** Yes, it's always difficult to find the time to do that well and so you have to be pretty ruthless about setting time aside to do that and setting your priorities that you do have time to do that because it's often writing your own papers which don't have specific deadlines that force you to do them in a particular order, or set aside time to do them. I find I need to specify time to do these things which don't necessarily have a firm deadline so you have to impose one yourself if it's going to get done.

**Elli:** Okay. Question No 4: In your opinion what role, if any, does qualitative science play in Antarctic science?

**Steve:** I guess I can only answer it from my own field, my own point of view. I'm not completely sure what you mean about qualitative science.

**Elli:** Okay, do you want me to explain a little bit?

**Steve:** Yes.

**Elli:** Okay. Well there are two main areas that I'm thinking about in this particular question. One is the qualitative science that may be an integral part of for example – well the one that I said – a part of biology. For example, if one is researching the behaviour of certain animals, then there is some –

well it depends on the specific research that is done on the animals. I'm sure that one could do a totally quantitative study on animal behaviour ?...? but there is also a lot of qualitative research that can be done on the behaviour of animals which can contribute to the understanding of how different species behave and how they interact and how they influence other species. So that is one type of qualitative research. The other one that I'm thinking of is the human researcher ?...? I was going to say human impact ?...? but I won't go down that way. There is such a thing known as researcher influence that you might have heard something about. There is a school of thought that says that even within what we call hard sciences such as physics and chemistry and so forth, one can never take away all the variables and all the hidden biases because the researcher will always bring certain values and biases to the research process. That then becomes a part of the research process. That is an area where qualitative science, in one sense, or it can be argued that it becomes an integral part of the quantitative process. So they're the two areas...

**Steve:** I would definitely agree that there's a – I suppose you might argue that much of natural history is qualitative in the sense that many aspects of it are observational and descriptive as opposed to purely quantitative. I wouldn't think there's any doubt that everything we observe about the natural world has a role to play in our efforts to understand it. I think that care is needed. If you're measuring something that's – the length of something or the time that something takes – it's reasonably objective I suppose. For the more qualitative aspects of science it may be more difficult to achieve the – and this gets back to the second example – the objectivity which we – our goal I think, and it may be possible, is to do our science in a way that it's not strongly dependent on the individual who is doing the observing because we're after truths if you like that are bigger than us individually. So the qualitative science ?you? can get doesn't necessarily become – I think it can get more difficult to achieve that objectivity in a way. In terms of my own science, to study ocean currents or to study sea ice distributions or how the two are interacting with each other is closer to that measuring how long something takes. Is there any chance that my own values or experiences influence my science? I'm sure that there are in some ways. One obvious way is in the problems I choose to tackle. That's probably not so much what the researcher thing is about but that's...

**Elli:** That's one of the things.

**Steve:** I know that part of what determines the problems that I tackle is the more scientific side, reading the literature and thinking about not only what I've done but what others are doing and what seem to be the big problems. Also I know it's based in part on my past history back to where I went to after school and what I did there. That was a group that was very focussed on physical processes and at that time very little focus on what those physical processes meant for climate for example. So there's still a part of me that was trained to believe that a piece of work that uncovered some new piece about the processes about how the ocean worked might have more merit than some other piece of work. That's part of it. That is a way in which my science is influenced by the way I am and what my experiences were and so on.

**Elli:** Yes your past experiences.

**Steve:** In terms of how I – I hope it's true, that if any other physical oceanographer came along and used the same instrument in the same place at the time that I put my instrument ?in the water? that we measure the same thing and we came to the same conclusion. If that's not the case we're in trouble I think. Is that ...

**Elli:** Yes it does. Yes, it's one of those questions I suppose that can be looked upon in a number of different ways. I've had a number of different answers to that. Alright thank you very much for that.

**Steve:** How are we going.

**Elli:** Five questions to do. Alright No 5: Do you have any thoughts on the idea that spiritual insight and wisdom should play, or does already play, an active role in contemporary scientific research such as physics and biology?

**Steve:** As I said a second ago, I hope that if two of us made the same measurements at the same time we measured the same thing and that my spiritual beliefs or their spiritual beliefs wouldn't ?...? at that level. I'm not a religious person but part of the reason that I am a scientist is because I do believe there's an order to the world and part of what science is about is uncovering that order and figuring out how it works. At that level my beliefs or my sense that there is an order to the world is behind the fact that I'm a scientist at all. It makes it worth doing for me. Whatever the scientific conclusions that we reach, I don't think I would do my science any differently ?...? but if I was a devout Catholic or a practising Buddhist or ?...? I was a spiritual person in the sense of daily interaction with God in a

mystical sort of way was important to me. I don't think that in the field I'm in that would make any difference.

**Elli:** Alright, ?to have that wisdom? That ...

**Steve:** Wisdom in a sense of ...

**Elli:** ?Not necessarily? spiritually. Do you think that wisdom is a part of the scientific process or management.

**Steve:** I'm just trying to think if I really know what wisdom means now that I think about it. I probably associate wisdom almost with a moral element. If we think of someone who's wise, it's just that they know a lot. There's a value component into that. I'm sure that wisdom comes into science in the same way that it comes into our life as a human and our interactions with other people and so if science were a social activity as well as ?...? interact with people. Whether that's quite getting at the question, the issue of whether wisdom influences science, I'm not quite sure. Is that...

**Elli:** Yes if that's your outlook on life.

**Steve:** Yes.

**Elli:** Alright. Question No 6: What do you think the goals and values are that are most prominent in your work culture at the, well let's say CSIRO or ACRC? I just want to stress here that this is not necessarily the goals and values that are written up in the mission statement, it's more the working culture.

**Steve:** Science is a very personal thing. You're kind of laying yourself on the line often and in different organizations that can bring ...

[END SIDE A]

**Steve:** ...?...? places where it's intensely competitive and you're ?rich? and everyone's trying to figure out how they can kind of get on top of the other person. I don't feel that at all at CSIRO or the ACRC. I think all science is competitive to some extent. You're trying to figure out – it's not all pure ?ability?. I want to understand how the world works. There's an element of wanting to know how the world works and being the one to figure it out first. I think here there is a lot of respect within the group and so people do respect each other both for their science and as people and so it makes it a really enjoyable place to work where you can do science, but without this kind of back-stabbing or disagreeable ?...?. The values of the place in both the CRC and CSIRO are one of the most positive aspects of it, whereas there are other aspects of CSIRO which are not so wonderful.

**Elli:** Okay, interesting. We might get back to that question. Okay No 7: Do you have any thoughts on the process of peer review as a means by which to ensure rigour in Antarctic scientific research?

**Steve:** I'm strongly in favour of it. I think it's probably got some imperfections but I don't know what the alternative is in the sense that I think most scientists when they get something to review take that responsibility extremely seriously. I suppose I don't know for sure because we don't talk about how we review other people's papers because it is supposed to be a confidential thing. Most of us feel that to some extent your credibility is on the line every time you review a paper or a proposal so that you spend a fair amount of time and effort making sure that you're both fair but critical because if we're not critical to each other's work, then the progress of the science is slowed.

**Elli:** Alright, so do you think that it actually does ensure rigour as such?

**Steve:** I'm strongly not of the view that there's any sort of conspiracy or that personalities come into it very often. I know that it does happen sometimes and I think it ensures rigour to the extent that other scientists are in a position to be able to judge the merit of the science by what's in the proposal or the paper. It's not failsafe so it's possible to write a paper in which you confiscate something or you make up data or something like that and there's no guarantee that peer review will catch that. It does have the possibility that it could be abused by personal vendettas or whatever but that's why people go to multiple reviewers. In the US system where there are many more people and it's even more competitive I think national science ?...? and proposals go to fifteen reviewers and they're trying to look for a common ground between those fifteen. I think that largely it works and the papers that I write and that I read – I know that the papers that I write have largely been improved by the peer review process.

**Elli:** And it's correct isn't it that here in Australia the journals that publish in Australia, we use reviewers internationally. It's never been a national endeavour has it, it's always been international?...? Okay. Question No 8: Have you ever considered giving up your professional position as a scientist for a simpler life and a simpler life here means renouncing material life for a life of austerity and spiritual self-realisation and can you explain your answer?

**Steve:** In a small way I have in the sense that I come from the US and some years ago I needed to make a decision, and have had several times since, to make a decision between working here in Australian or moving overseas. Working overseas I would probably have a higher powered scientific career in a way in the sense that my colleagues who I went to graduate school with in the US system for example, most of them have significantly larger research efforts – numbers of 'post ....' students and people working under them and five or six major experiments on the go in different parts of the world. There's a trade-off to that. They tend to spend much more time at work and there's a higher level of stress I think. Part of the reason that I moved here in the first place and have stayed is that in some aspects life is simpler here than it is in the US. Still I've got to work every day and I have a regular salary and it's a long way from the life of renunciation. There's a bit of an attraction there. I have spent time in various places around the world, India and the Middle East and so on and I've kind of toyed with the idea in some ways and in the end I feel like my life I think has a balance now. It really works for me and for my family, because I do have a regular wage coming in. There's some aspects of life for me and my family which are in a sense simpler than they would be if I had renounced more material things.

**Elli:** That's interesting.

**Steve:** One perspective I have on this is my sister lives in Israel and is a very spiritual person and their spiritual life is a major focus of their life, but as a result money is a perennial issue just to survive, so they think about it all the time. So, while on the one hand they've renounced many aspects of material life, attaining the basics of life becomes a more all-consuming aspect of their life than it is for us.

**Elli:** That's a very interesting point and yes I think that that's how it is?...? times with people investing their time in one thing or another.

**Steve:** And how I love doing what I do. If I renounced it to do something else it would not just be giving up on material things, it would be giving up on what I like to do with my life so it would be ...

**Elli:** Okay, we have one more question. As a scientist are you at all interested in whether or not species of Antarctic fauna and flora have, or are, a spiritual soul and can you explain your answer.

**Steve:** My short answer is I guess is I don't know, I'm not sure. I think there's a spirit to the place in general. I think that in issues of – is it appropriate for us to take the life of an Antarctic being. To some extent I think my feeling is that it's in the nature of animals to kill other animals. The lions kill antelopes and the issues of whether the human food production system is entirely ethical is another issue. I think it's appropriate to eat animals, that's the kind of animal we are and it's in our nature to do that. The fact that if I eat a chicken, perhaps I should think more about the chicken – whether the chicken has a soul or not – but I do think it's appropriate that the chicken is eaten by some other animal, as it's probably appropriate for me to get eaten by a crocodile or something if I happen to swim through the water. There's nothing ethically wrong with that, it's in the nature of the animal?.

**Elli:** So when you say it's appropriate for the chicken to be eaten by another animal, you're categorising us as animals.

**Steve:** I'm seeing us as part of the animal kingdom and not just something that's superior in some ways so maybe the answer to the question is that they're as likely to have a soul as we are.

**Elli:** Yes, okay. So you would find it interesting in actually – the question is, are you at all interested in whether or not.

**Steve:** I mentioned it in the nature of consciousness as a whole and it would be the question of how like or unlike humans are to other animals is also an interesting question. For the kind of science that I do, I'm not sure if that has much effect on my science because I don't work with animals basically, and I'm not sure that sea ice has a soul or?...?

**Elli:** Okay, we have two minutes left. There was something you said – we were discussing one of the other questions. I think it was the goals and values one and you were saying that one of the better values in your work culture is that there is a fairly good working culture in the CRC and ACE. There's not so much false ego or something like that. Then you said that there are other areas that are not so perhaps...

**Steve:** Great.

**Elli:** Do you want to say what those are? If you don't that's okay.

**Steve:** Yes I can. The CSIRO is a huge organization and often we seem to try to make things more difficult for ourselves than we need to do in a kind of bureaucratic way. I was trained in the US system, which is largely based on the idea of – at least in the university system – hiring the best people you possibly can, giving them resources or giving them a chance to find resources of their own and then getting out of the way. Having the faith and the ability to choose the science problems that are most important to do and then evaluating them on their success in doing good science, but not directing them as to what to do. We don't work in that mode and CSIRO's role is not – you know we're supposed to be here for our national benefit and not to pay scientists to do whatever they want. I think that sometimes we get the balance wrong and that the best science comes from – you know most scientists don't want to work on unimportant problems I don't think. If we hired the best people we could and gave them more freedom to just get on with it I think the country would be better served by its investment in CSIRO than by this very complicated structures we tend to set up.

**Elli:** Yes okay.

**Steve:** That was my main beef – main way in which the CSIRO can be a frustrating place to work.

**Elli:** Okay, the infrastructure in the way that the programs are structured or that their monitored perhaps?

**Steve:** The way we're organised and the amount of overhead that's involved in setting up that organization. There's something else I was going to say – I guess scientists are pretty independent people by nature I think. They need to be the kind of people that can stand three days in an office by themselves digging away at some piece of data to come up with a new thought. It is common for people to come up with ?...? like ?...? hurting cats? to talk about organising scientists because by nature are not really so interested in being part of some communal, large thing.

**Elli:** I've never heard of that one – hurting cats.

**Steve:** Which, if you think about trying to hurt a bunch of cats, it's not very easy. Scientists, by nature I think tend towards that side of the spectrum rather than – we went through some personality-typing exercises as part of the group once some years ago and one of the – so you run through these ninety questions or something and one of the scales they rated people on was introvert versus extrovert scale and the personal assistant who was going to look after the group was way over on the extrovert ?...? Most of the scientists were down at the pretty introvert ?...? way down the far end of the introversion scale. I think that is common for lots of scientists.

**Elli:** Okay, very interesting. Alright.

[END OF TAPE]

## 17. ROBERTSON, Graham (AAD)

Start of tape:

**Elli:** This is Interview No 5 with Graham Robertson from the Australian Antarctic Research. Just very quickly before I start the questions, would you just like to tell me a little bit about how your research fits in with the ? program at the Division.

**Graham:** OK. Well for the last say five years I've worked on seabird by-catch ?in? fishery in the Southern Hemisphere – that's longline fisheries and trawling, not only in the ?CCAMLR? convention area in the Southern Ocean, but in every fishery where Southern Ocean seabirds range to, which means if you were to take a hemisphere wide approach, Antarctic birds fly up to the far north of Queensland and they migrate across the Indian Ocean and around the world. So that's what I do. It's basically trying to work on three different fronts. I do so-called mitigation research on fishing vessels, working with the fishing industry to try to reduce mortality; the techniques and practices, and working on fishery vulnerable seabirds themselves. The ecological studies, satellite tracking, fisheries ?...?

those kind of things, migration pathways and ?thirdly? and importantly the administrative and political processes that take science findings into? management? – that’s crucial. ? ...working groups, a lot of working groups. That’s where all the stakeholders come together and decisions are made that will affect seabird mortality in these fisheries ...?

**Elli:** ....? OK, we’ll ....? Question No 1: What inspires or excites you the most about being an Antarctic scientist?

**Graham:** What inspires me. ...When I started – I started here right at the end of the 1980s and ...? didn’t have a ...wintering? program ...? penguins and that was an inspiration to join the Antarctic Division and go south. I was totally over the moon by the thought of doing ecological studies on a species like the ?emperor? in the middle of the Antarctic winter because of the originality of the research. I suppose looking back on it, it was a fair while ago now, it was sort of on the edge and you could produce new findings for a species. There were incredible scientific and technical challenges, and logistical challenges, trying to make standard methods if you like work in that environment. I knew what the aesthetics would be like and that’s certainly part of it. It’s always in the background or the front-ground depending on what it is... the aesthetics were going to be really powerful ?...? wilderness area in the past experiences and I really had my eyes open for that. I knew what the potential would be and I was ready for it. It wasn’t going to be an afterthought. Birds breeding in winter in that environment, out in the sea ice, was going to be fantastic so I was very inspired by that. Coming forward to the present time since 1998 I’ve been working on this mortality stuff in fisheries ...? flying birds and penguins. First of all I like working on birds and I like working off the sea bird island domain ... the isolation and the environment and the daily changes in whether and what the birds do, the wilderness aspect of that. I like working on fishing boats with fishermen ...?because it’s? working on the interface between conservation and management and there’s a ?friction? line, like a fault line, between the two. When any form of primary industry and conservation come together whether it’s agriculture or forestry or mining or fishing or whatever, it’s all the same, and when it comes up against conservation there’s always a difficult mid-line down the centre. All the work we do is try to find that ?sweet spot? that’s a compromise really, so that primary can function and birds aren’t suffering. It’s really challenging that side of it. ...? Doing the science work ...? actually go straight into management. When I’m actually in the field or on a boat doing the science work, I can visualise, at least theorise. It’s not just a matter of producing a scientific paper and a journal and forgetting about it. I don’t really think about that so much any more. It’s trying to take what we’re doing ...? visualise it’s application and management two years later. How it’s going to get through certain working groups. How certain people in the working groups might respond to it, and trying to ? and dodge around that. It’s like playing chess. ?...? statement is that it’s meaningful work. ... If I carried on doing penguin stuff it would be exciting but it’s not my style. ? find? other people who would do it, but ?...? want to keep doing science papers that were really interesting and exciting perhaps but that’s it. ?...? Do work that’s related to management, so that’s the critical part of it.

**Elli:** So would you say, to try to summaries what you’ve said, you ?...? passion for birds ?...? or you care about them ?...? and also you were saying that the Antarctic setting is an interesting place to work in ?...? and you also feel that you have a dedication to deliver something ?...? at the end work well. On that last point, when you said you ?...? down the line, how is the result of your work going to be implemented ?into management?. What are you hoping to achieve in that because it sounds like you want to be careful with how your work, in the end, ends up being used. Do you have any specific goals ?...?

**Graham:** Well, just to back up just a little bit. I think just to summarise my attitude to things. I reached a point several years ago where I didn’t want to keep doing general science. I wanted to work in science and management, this ? between fishing and conservation. Otherwise I may not have stayed in this area, so when the ?AMLR? program developed, it ?split? off from biology, I was really ready for AMLRs applied focus. So in terms of coming back to the specifics of your question just then – the work we’re trying to do, whether it’s working on fisheries, vulnerable seabirds on islands or on immigrations or migrations, or actually working on fishing boats during experiments and trials, ultimately we’re trying to maintain a co-existence between the fishing industry - which we’re collaborating with, we’re not enemies of them – when you form a working group usually the fishing industry is involved in it. So you take a collaborative approach to try to find a reasonable compromise. That’s usually what happens. So it’s trying to have the fishing industry still operate and be profitable but apply seabird, say fishing practices, in a way that it doesn’t effect the long term viability of the effected seabird populations.

**Elli:** So you’re trying to balance all these different ?...? marine environment including?...?

**Graham:** Yes, all the stakeholders. There are several government departments in these groups, depending on whether it's a CCAMLR group or a local Australian group. They're all around the world these groups. The fishing industry's there, the ? NGOs? Humane Society, ?...? Greenpeace and several government departments as you can imagine from Australia, and they all sit there and everybody's got certain objectives or processes they've got to follow and some people ?have? a commercial imperative, ... the industry obviously has a commercial imperative and we just try to come up with what I summarised a minute ago about having ecologically sustainable fisheries. That's one of the key objectives of the CCAMLR which we abide by and at the same time not affecting the seabird species. You can't get seabird mortality down to zero – it's almost impossible. You can get it close but you can't get it right down to zero because when you're going to be putting hooks into the water or putting big nets out the back of trawlers. The seabirds come into a frenzy and like picking fish out of the net and can kill themselves by getting caught in the net or whatever. You can't get mortality down to zero. To get it to a level of sustainable, the species won't tip off the edge – go from a ?...? status from threatened to endangered or something. The idea is to get them down the status list.

**Elli:** So trying to achieve that is what ?...? goal

**Graham:** Yes, in terms of getting satisfaction. It's not easy to get a win in this kind of domain but some of the research we've done here with certain fishing boats in New Zealand, which are fishing right now at Herd Island. ?...? ?fish at Ross Sea?, fish at South Georgia, it's all going international. We've spent two years working on a particular mitigation technique and it's worked very well and the fishing industry's been fantastic, very co-operative - and they have been - and you can get something that's doesn't really affect them, doesn't affect their catch rate of fish, ?there's a particular technique? And really with the birds, it's terrific when that happens. It's not easy to happen though.

**Elli:** No. OK, Question No 2

**Graham:** How many more?

**Elli:** Well, the second question is very similar to the first one. Can you tell me about your original motivations for becoming an Antarctic scientist? ?...?So if you have anything to add on to what you've just said...?

**Graham:** The original – with the Emperor penguin stuff?

**Elli:** Yes. ?...?

**Graham:** Yes, that was the original. Yes I was working in Canberra when I saw an ad. for a ?...wintering? biologist with Emperor penguins and when I saw that job I would have walked over burning coals to get it I reckon. ?Because of thing's? outlined. It's an inspirational species of bird to work on, and the experience that goes with it.

**Elli:** So the Antarctic setting, and working with Emperor penguins.

**Graham:** Yes Emperor penguins are such a remarkable bird that lives right on the edge of existence in that extreme cold and it's got to have a lot of very interesting ways, adaptations, behaviour physiologies, things that are going on. If you have to list all of the species of vertebrate and animals in the world on their – if you have to have a hit parade, you know the top ten of ?...? how peculiar their behavioural and physiological adaptations were - anatomical adaptations – Emperor penguin would have to be in the top five, if not the top one, two or three. They're just such an extraordinary bird.

**Elli:** OK, I'll move ahead because ?...? OK, No 3: Can you tell me anything about your own consciousness during your working day. In other words what usually goes through your mind during an ordinary working day?

**Graham:** You mean sitting here at the desk?

**Elli:** Yes.

**Graham:** With this big blue ball.

**Elli:** Yes, if that's a normal working day.

**Graham:** It's a bit of an inditement to say it's a normal working day sitting at a desk staring at a computer screen.

**Elli:** No, that's fine.

**Graham:** That's the way it is these days. What were the key parts to that, the inspiration?

**Elli:** ... Can you tell me anything about your unconsciousness during your working day. In other words what usually goes through your mind during an ordinary working day?

**Graham:** That's a bit of a penetrating question. I don't think I can answer that without deliberation. How have people gone answering that.

**Elli:** One person said, no they can't tell me anything about their unconsciousness during their working day. Some other people wanted me to elaborate a little bit, which I've done. Do you want me to give a scenario or a bit more insight into what I'm hoping to get.

**Graham:** Yes, I suppose so. What's in the back of your mind just a little bit.

**Elli:** Yes, that's what I was going to say. Some people might be thinking about some particular thing while ?...? ?...? little to do with what they're actually doing, or somebody else might be thinking specifically about the work that they're doing, and if so what is going on in the back of their mind.

**Graham:** I'd say that things I ?...? in the first question, they're not really part of it. I'd become totally overwhelmed with or over-saturated with the mechanics of the nuts and bolts and details and ?...? of doing the job – a vast array of stuff is going on. From the left field, right field and it's not all down the centre. There's a lot of different components and aspects to do the job – a lot of things involved in what I just described and you've just got to deal with that. Often we try to take it somewhere to an objective ?... I eluded to in the first part. I suppose to summarise it a ?...? It's trying to deal with things, get trials and experiments going, doing the paperwork and writing stuff up. The mechanical process from inside of doing the job that will ultimately will lead to actual research work and manifestation of that according to the main objective.

**Elli:** ?...? (*indecipherable*)

**Graham:** Nothing ?...? your philosophical, not at all.

**Elli:** None. Alright ?...? ...everyone's consciousness ?...? such a different ?...? (*indecipherable*)

**Graham:** Definitely, and ?...? timetables. When I'm going to get things done, how to get things done by a certain time when there's too much going on. ?When the other end will finish writing up the backlog? And there's a front-log coming in all over the top of it. Spending two hours a day doing emails on the international stuff, there's no time to ?...?

**Elli:** So if time constraint is one or working to schedule is something your conscious of.

**Graham:** Yes. I suppose the key thing would be the lack of satisfaction of having not written up yesterday's work, so to speak. Often that applies because there's so much other stuff to do that you often don't – like, if you're a PhD student ?...? they have a real peaceful life. When you're in the middle of a PhD you don't think that I suppose, particularly in the last part because you're revving it and going hard and you can't wait for it to end. It's a bit of a luxury, sort of like a holiday compared to when you get in jobs with responsibility and a lot of things happening. You just don't get time to do the things you would really like to do. Sit down and focus on writing a paper and just focus on it for half an hour let alone eight hours a day or something. Without having to stop doing it for three days because something else has come along and you've got to deal with it. The broken plate – the fractured way of moving forward. I'm talking about frustrations in ?normal life? ...?

**Elli:** ?...? I consider those part of consciousness...those sorts of limitations ?...? working day. Just one question attached to that one. Would you say that your consciousness of these ?...? can have an effect on ?...?

**Graham:** On their output?

**Elli:** Yes. On the results ...

**Graham:** Consciousness, meaning in what direction.

**Elli:** For example, just ?say a hypothetical? scenario have one scientist ?...? 'Oh, I've really got to get this work done because at the end of the day I've got these plans ?...?', and we have another scientist who might be thinking, 'Oh, this work is really important and I've really got to focus on it'. So ?...? the difference in consciousness of those two scientists is going to somehow impact on the results of what they're doing.

**Graham:** Well, yes. When you say results you mean the production of research findings, or the quality, or you're talking here about an output. Production of a document.

**Elli:** Yes, the results of what they do, whether it's writing up a report or writing an article or collecting data ...?

**Graham:** Consciousness. I'm having a bit of trouble with that. It that the right word ...

**Elli:** Yes, consciousness. Yes.

**Graham:** Being conscious of ...

**Elli:** Of what ?...? is doing. Yes. For example, what is the approach or the attitude of the person when they're actually working. Is that going to make a difference if they're really ?...?, they're 'serious' about what they're doing, as compared to really just doing what they're doing either just to get it done, or they might have some ulterior motive to doing what they're doing.

**Graham:** Well I think, judging what the human ?...? is like, a lot of the incentive for getting things are to do with self-centredness - you say self-indulgence. Self-indulgence is being pragmatic. If you ?...? research and don't publish it - it probably stays in the back of their mind for years if they're regular people ?...?, and they're also aware that they have to do a ?...appraisal? and ?...? asked how many papers they've published in the last year, or how many working groups they attended, or conferences, or contributions ?...? You don't want to be empty on your spread-sheet and you want to get a budget next year, you want to apply for fresh grants and you see these pretty 'bloody' thin. I would say a lot of it ?...? back to keeping ?...? survival probably. Loosely, you know. I think it's like human characteristics. I don't know if there's anything ?...? assessment in there in terms of the word consciousness.

**Elli:** (*indecipherable*) ...and it may not always come forward ?...?

**Graham:** Yes, we're on a bit of treadmill where you've got to keep money coming in and outputs going out and they're sort of linked, and if you spin out of that after a period you'll start to have negative feedback. I suppose in a way scientists like seeing the product of their science paper come out or report that's used and quoted or something. We get feedback from that. It's like the equivalent of you're cherry grower ?...? cherries and you get \$2.50 in your hand and you feel good about yourself. A bit like that I suppose.

**Elli:** Yes. So you think that is an incentive to be able to produce good results...

**Graham:** Yes, otherwise you might end up not doing anything. You're just in limbo, and it's like not having an agenda and not having a project in life. You've got to have a project - you've got to be doing something, otherwise you're moping.

**Elli:** OK.

**Graham:** No moping.

**Elli:** No. OK, ?...? In your opinion what role, if any, does qualitative science play in Antarctic science?

**Graham:** Qualitative. If I can get what you mean by it - you'd probably better be clearer.

**Elli:** OK. For example, one of the sayings is that most old Antarctic scientists (*indecipherable*) ... of that biology is based ?...? ... What I mean by qualitative science ?...? discusses the quality of things and particularly, for example, in biology qualitative science ?...? investigate the aspect of ?...? weighed or measured. For example the behaviour of animals, that would be like qualitative science, or ?...? other dimension where ?...? study the behaviour of scientists themselves ?...? ... researcher influence or scientist influence in the scientific process. ?...? Science that goes beyond the hard science ?...?

**Graham:** I agree with you. Hard science - when I hear that I think biology 'is' a hard science, but ecology certainly isn't. I always think ecology is certainly not hard at all. A French friend of mine who is on the French Academy of Science, there's about 150 people in that country on the Academy, and he's one of only two biologists and all the rest are physicists and whatever, and I think they look down on him as if he's a leper because he comes from a 'discipline that's floppy'. If you work in ecology you often never know what the truth is.

**Elli:** That's how they see it.

**Graham:** That's my description but I think ... if you work in an area where there's so many uncontrolled variables, like factors are compounding a conclusion, you never really know the truth. When you work in physiology ?...? ... I understand 'the body temperature of a human being - ... you only might have to measure two or three or four. If they're healthy then you know what it is and you say the temperature is 98.4 degrees Fahrenheit and that's what it is. In ecology it's not like that. You end up with ?...? circumstantial, strongly circumstantial, weakly, influential, strongly influential. So the question I'd say - I work in area that's probably not that common, I don't think, in the Antarctic sciences. There are a lot of people I know that work in similar things, like in the International Whaling Commission, where you might be doing a science program that's got to go somewhere in management. The end product isn't just produced to produce a scientific paper, so the key thing I'd say is that the

data we produce, it's going to get put under pressure – pragmatic economic pressure – by a commercial industry. Potentially if our methods aren't robust they can be dumped on and I suppose you could say '...? if the information is qualitative it would be hard to take that into the interface between say primary industry and conservation and argue a strong case. I'm trying to use my imagination '...? but if you've got some strong scientific information '...? 'because if you've done a? manipulative experiment ... - I'll give you another example. '... ... '...? There's two approaches. You can do the 'suck it and see' approach, and use a scientific method and I've done both. The 'suck it and see' approach – when you go onto a fishing boat like a Japanese tuna boat and they won't let you do anything with their gear. If you want to say 'Oh, would you halve your settings please. Instead of setting it at ten knots, would you mind setting it at five knots so we can see the 'sinks faster? '...? ... they don't want to do that because it's going to bugger up their fishing operation for that day and they're catching Southern blue fin tuna. Each blue fin tuna they catch might be worth five thousand dollars and they don't want to do anything that will stop catching one fish, so "Go away!" Doing '...? manipulations like that. If you want to ask the question – does the halving or doubling of settings 'be to? the tuna boat increase the sink '...? of a long line, or doesn't it, you have to manipulate it. You have to compare 'a cat with a dog?...? ... If you think the sea conditions are going to affect that – going to 'confound? it – you should really '...? sea conditions, replicate it. Then you can produce some data and say, here it is, and most people think 'Oh yes. That's pretty convincing'. But if you can't do any of that then all you're really doing is measure things- what they're doing and that's the 'suck it and see' approach. You draw inferences from it and you don't really know. The stuff where you can really go forward '...? is the scientific method where you ask a question of something and you manipulate something. That's what we've done in New Zealand. We've just manipulated one thing and we've measured, in a balanced sort of 'design? – we've measured how watching petrels respond to it and how they die and don't die basically. When you get the results and take it to a working group everyone just says, that's it and they go straight through to into management. I'll use that as an example I think.

[END SIDE A]

**Graham:** ... rough and tumble of the real world.

**Elli:** OK. Do you have any thoughts on the idea that spiritual insight and wisdom should play, or does already play, an active role in contemporary scientific research such as physics and biology.

**Graham:** I don't know about physics. I don't know anything about that. Biology – spiritual insight meaning what. I suppose I can answer that by saying people are meant to be objective and when someone does a research project, when someone sits here and works on either penguins or albatrosses, they're not working on geckos in Darwin, they're doing it for a reason. They particularly want to work on something here and usually it's '...? about what they want to work on. If they want to work on Emperor penguins and they got told to work on rabbits, they'll probably just shrivel up and not be any good. So when you look at the directions someone might choose to take in their research, it's meant to be objective but I don't think it is. Right at the point source at the beginning it's not, it's highly subjective. People have a preference. If they outline it – they never do. When you write a research proposal, it's full of '...? and it's fair enough because it might meet the government goals, well it always will meet the government goals for some degree and be defensible. But it's really pursuing what they particularly like to do and a whole range of things are covered there. The environment they like to work in, the species etc. All that stuff's fairly close to the surface but it's never really outlined. Did you say spirituality?

**Elli:** No, spiritual insight and wisdom.

**Graham:** Wisdom. Wisdom ... whether you might get wisdom from going through a particular experience?

**Elli:** The question is, do you have any thoughts on the idea that spiritual insight and wisdom should play, or does already play an active role in contemporary science.

**Graham:** Should play. I don't know about should play, but I think it does. I don't know about should, I'll have to think about that – hear some arguments and be prompted.

**Elli:** Can I go back to what you were saying about 'subjectives...? ....one thing I wanted to ask you. I thought that was quite interesting. You were saying how that the reality of the situation is that scientists will be working, or a lot '...? will be working on a particular project '...? that has a subjective meaning to them. That's what I gather from what you were saying, so are you inferring that

that choice, or that subjectivity on behalf of scientists, is something which is either spiritually based or at leans towards that direction for the individual ?...?, that it has some deep-rooted meaning ?...?

**Graham:** Well I think I'm probably alluding to try to think on the run. People usually gravitate towards things they're good at or that they like and 99.9 per cent of the time people who are doing something and are reasonably good at it to some degree and vice versa. They don't go towards things they're not good at because they don't get any positive feedback, they don't get any satisfaction. That's part of it. That's like being personally aware of your own strengths and weaknesses I guess. In terms of the spiritual insight stuff, it would be impossible for a person to talk about anyone other than themselves wouldn't it, in that question.

**Elli:** Right, yes.

**Graham:** I would say certainly for me it's certainly a factor. If I go somewhere-?...? ...?like going? wintering with the Emperors. I knew that would be a one-off ?...? project. I thought that it's closest to being on another planet without actually leaving Earth and it's the quality of ?...? in winter and icebergs and when it's dark all those things that are on the edge of existence. A bit like going to the moon. When people come back they're not the same since. Someone's gone and been religious, and this guy's become an alcoholic. It throws you out on the edge and spirituality's always a strong part of that, un-quantifiably in the back of your mind I think, or mine – I couldn't speak for anyone else. All of it I think is a blur – all of may not be able to be articulated but people would sense it, like an instinct in animals that would sense something, earthquakes or something is going to happen. Human beings will have a sense for that, or maybe it's such a strong part of the human condition, some allusion to the greater being. It's all characterises our species and you could say that nature is like a outdoor church. You ?don't? have to go to a church, you can go to nature and you can get your spirituality from that, which I would agree with, rather than going to some abstract domain. People would sense that unless they were inert, they would sense that in any area where they go, particularly in the wilderness. It's like a wilderness argument – all these ?catch ...? phrases that come along, they're all going in the same direction that you're alluding to. I don't know if that's answering your question, but I would certainly give an affirmation on that.

**Elli:** Well I have discussed with other people involved in Antarctic science that Antarctica does seem to have that other worldly nature about it because it takes the scientists out of the ordinary mundane kind of existence. So I know that that is an attraction for some people that it takes them out of their normal ...

**Graham:** Yes definitely. When you generalise on that I guess.

**Elli:** OK. No 6: What do you think the goals and values are that are most prominent in your work culture at the Australian Antarctic Division. So here goals and values – with this question I'm not looking for particular goals and values that are mentioned in the mission statement or anything like that. It's more what is the interaction amongst colleagues and what sort of goals and values are prominent amongst the scientists.

**Graham:** What are they?

**Elli:** Yes. Are there any in particular that stand out to you?

**Graham:** Goals and values. What motivates people without actually asking them.

**Elli:** Yes. What do they talk about, or can you see that there are any specific motivators amongst scientists.

**Graham:** They do a good job – I don't know whether to say anything loftier than that. They have to be professional with their work and do a good job and be satisfied with outputs and all of that. Some people here do a lot of fisheries management stuff but I couldn't speculate. I suppose you could say well where's your satisfaction come ?from?. The fact that you've been managing a fishery ?doing? ?...? and mathematics and doing a fairly inexact science if you like. Fisheries management is hard and if seven years later the fishery still hasn't collapsed, which is a bit unusual for fisheries, do you get satisfaction from that. I mean the fact that you've seemed to have done a good job or you would be really intrinsically sad that the fishery collapsed and all those fish went to commercial extinction in the absoluteness of it. I don't know. Would anyone ?...? care. Would I care if a species of bird went extinct when we were trying to stop it - I certainly would but when I'm dealing with such an extreme case. I think professionalism and work satisfaction, doing a good job maintaining the status quo. If you had to generalise, people here would probably get some element of satisfaction. I don't know how much but out of the sustainable stewardship of the Southern Ocean in it's entirety – what's going on there, cruel fishing, toothfish, mackerel icefish. The status quo isn't fractured and bugged, it persists

– the management of it. That would have to be an objective of the people here otherwise they probably wouldn't be that keen on working ?...? Work in biology say and do a whole range of other things that aren't related to that at all.

**Elli:** So you feel there's a dedication to preserving the environment.

**Graham:** I think so, but it's not overt. I don't know, it would be a bit crazy if you didn't have that and you worked here, in this section ?...? I would have thought that that would be right but I couldn't stand up in a court of law and say yes that's true because I haven't asked other people – you'll have to ask them directly. But certainly I would get satisfaction out of having that – seeing nature carry on through the generation of your life rather than go (blat). It does that with natural events any way but humans can push it right down and keep it down to manage the ?oscillation?

**Elli:** ?...? ...or you anyway ?...?

**Graham:** I reckon so. Yes

**Elli:** OK, next question. Do you have any thoughts on the process of peer review as a means by which to ensure rigor in Antarctic scientific research?

**Graham:** I haven't thought about it too much but I'm not sure how else you could do it. Peer review's good. I don't have any problem with that at all. It's like science ?...? what else would you have. Are you leading to something else I'm missing?

**Elli:** Well, I'm mainly curious just to find out how scientists look on the process because throughout our lives, from when we start school and then we go to university we always have a supervisor and then finally we come to ?...? somewhere around there and then all of a sudden we don't have anyone to oversee our work any more. Really the scientific community runs on peers at that level so we're assuming that once a person reaches that level, then that is the best level of knowledge that anyone can get as far as how we investigate the environment and the decisions that we make according to the environment. It's just interesting because we kind of stop at that level.

**Graham:** So why have anyone review your work?

**Elli:** Well, I'll tell you one little thought that I've had that came up with this question was, there's a quote that goes 'the blind leading the blind'. Now I'm not assuming that that is what's happening with the scientific community but it was brought up and it's an interesting query because the scientific community rely on each other, which are basically peers at the same level of knowledge.

**Graham:** That could be like ?...? Well, that's possible. I don't know what you'd replace it with, and you're right. Having peer review can create more objectivity I guess and scrutinise methodologies and interpretations and it's like getting other people's opinion and it's often a lot better, in terms of being a closed loop sort of thing. I often think of that too how if you put some of the papers that you publish in this discipline, into another discipline completely how they would stand up because some disciplines in biology or ecology, there're almost intractable. It's really hard to get decent information. Even down south people often and I think well you've really got to understand the scientific method. It's best not to go down to Antarctica and do them, it's best to go onto a rock platform and work on limpets, or in an agricultural system where everything's retractable. You can manipulate things and handle things and use proper experimental designs and use the scientific method properly. That's what ?...? in my area at least is use the scientific method - understand what it means – so you end up be ruthlessly objective in the way you interpret data and you're transparent in what's wrong with it and all of that. If you put the information out to some other group of people entirely they might have a totally different view of it. I guess people who read your papers, they're also doing similar things and they're aware of the constraints of you adding new methods or the animal you couldn't catch or something and they can have a different way of evaluating it. If you took it to some clinical scientist who works in a lab and ?...everything? they might say, well I think your data hasn't really supported your interpretation. Whereas someone in this field might think, Oh (s---) it's virtually impossible what he's done and he's done it in ...I often think ?...? management ?...? I alluded to if the fishing industry ?...? if they're getting their commercial industry ?...? – their capacity to make a living – if they could employ consultants who are trained in science but also think like lawyers, then they could take us apart on some issues. ?...? what you're alluding to, they could take us apart, if they make literal interpretations because we often gloss over those things sometimes. So I think I agree what you're alluding to.

**Elli:** This is why I'm looking at ?...? Now, I've noticed that we're running probably a little over time so I'm going to have to move ahead to the next question. This is the second last one and you can ?...? Have you ever considered giving up your professional position as a scientist for a simpler life,

and a simpler life here means renouncing material life for a life of austerity and spiritual self-realisation and can you explain your answer.

**Graham:** Self-realisation. Not giving it up to that extreme – to that level. That sounds like going into the Himalayas and living in a cave. But to some degree, yes. To do something else that's different, like building a house of something and getting satisfaction of using your hands and creating something. Something like that. I certainly have but I'm so involved in stuff that's got no clear ending. It would be just too much to walk away from, and I can't break my income stream because I've got dependants and it's academic anyway. If I was completely single on my own – I'd even do that now, I'd be thinking in a few years maybe ?...? I'd do something else, but it's just dreaming. What are you alluding to, ?...? getting away from the humdrum.

**Elli:** Yes. Well mostly the shift to a simpler lifestyle which is ?...? out of our ordinary worldly ?...? and perhaps for the purposes of focussing more on the inner self more than on society and so forth.

**Graham:** No not too much. I've done that inner self stuff a fair bit down the years anyway I reckon, but maybe you're alluding to a much higher level of it. I don't think I need to go more into introspection and self-assessment and stuff. I've been there to some extent. I've read a lot about it. But getting away from this – getting away from the lifestyle sitting at a desk, ?stand on one of them?. I reckon it's a real indictment on humanity. They're a curse, but they're essential. ?...? in the world doesn't but you read about obesity epidemics ?...? people and the reasons are fast food probably – these things – TV and lack of exercise, sitting here like this. I wouldn't mind a lifestyle that doesn't involve computers, except to get things off the mat sometimes which are really good, and maybe email if it's ?...?.

**Elli:** ?...? ...Okay, last one. As a scientist are you at all interested in whether or not species of Antarctic fauna and flora have, or are, a spiritual soul and can you explain your answer.

**Graham:** You're very spiritual ?half end of? your questions – back end of your series of questions. If they've got a spiritual soul? I probably should ask Barbara in the next room that question. Whether they've got a spiritual soul. Does that imply awareness of self?

**Elli:** Yes. That is what a lot of people say is the symptom of having a soul, that they have self-awareness and that they have the capacity to experience life. Of course you could take it also to another level. I mean spiritual ?...? part of ...?

**Graham:** I wouldn't have thought – whether I have an awareness of that do you mean?

**Elli:** Beg your pardon.

**Graham:** Is your question, do they have an awareness of that?

**Elli:** Well, yes. I suppose different people interpret spiritual soul in different ways. Some people would interpret spiritual soul as meaning that they have self-awareness and other people might interpret it as meaning that they the capacity to experience in a similar way to we do, and other people might interpret it as being that they have a part of them that is internal. Sometimes in a religious sense we speak of the spiritual soul as being eternal ?...? You can interpret in ?...? I suppose.

**Graham:** Well, the answer to that is I don't know. I'd say that's impossible to know, but I would be surprised if they did have a spiritual after-life or whatever. I'd be really surprised if that was the true case.

**Elli:** The way that I've actually phrased this question is; are you at all interested in whether or not they have this ?...?

**Graham:** Oh, definitely. I've never been asked that before or thought about it, but certainly I'd be interested, and ?also have? self-awareness, and if they didn't they'd be dead. They have what's intrinsically dangerous and most animals I reckon are aware of their physicality on earth, and if they're little or big they can behave in a certain way. They know they're vulnerable or not vulnerable depending on their size. Human beings are the same I reckon. Often their mental attitudes are driven by an assessment of how they think they feel. If they're physically robust or infirm that can affect their mind and you certainly see that in animals. They can be fearful or not fearful and often they're big or little – just thinking of a few examples. You'd say that's instinct, it's instinct honed out of natural selection and survival. Whether it goes beyond that, I wouldn't have a clue. It's impossible to observe any of that.

**Elli:** Do you find that that is an ...

**Graham:** Interesting area

**Elli:** ...interesting area to some degree.

**Graham:** Yes, definitely. I think incredibly interesting if you could find out. Put this microphone onto an Emperor penguin [laughter].

**Elli:** Very interesting, yes. OK, thank you very much ?...? and I really appreciate the time that you have given me.

**Graham:** That's OK.

[END OF TAPE]

## 18. SOUTHWELL, Colin (AAD)

Start of tape:

**Elli:** This is interview No. 15 with Colin Southwell. So Colin, would you like to start by describing how your research fits within the AMLR program, within the broader umbrella of Antarctic research?

**Colin:** OK, I've got a number of hats that I wear right now, I came into the AAD and AMLR to run a project that was aiming to estimate the abundance of pack-ice seals in the pack-ice, it was a big-scale project that covered about a quarter of the continent and was focused out in the pack-ice, so I did most of the work on the ship, based from the ship, rather than the continent. And that ran for about six years, a lot of preparation and I did a survey back in about 2000. Since then I've been analysing that. The basis of that work is to ... was to try and get some better estimates as to pack-ice seal abundance, so that those kind of estimates could fit into ecosystem models- those ecosystem could be used to predict sustainable harvest of krill. So that was where I came into the AAD, I'm still wearing a hat in relation to that because I'm trying to finish off that work. I then moved from that project into CCAMLR ecosystem monitoring project which is ... has similar aims, those aims being to try and monitor aspects of the ecosystem that would be responsive to krill availability, so that in the event of krill harvesting depleting krill, and therefore effecting the species dependent on krill, we'll be able to detect any changes and implement some kind of management practices that would result in a decline the quota, so that was all... both of those aim towards management of the krill fisheries in a sustainable way. And, that monitoring program is ongoing, but I've come in to review that program. The other hat I've got on is having done the crab-eater seal survey, attention is now focused on all the other predators of the krill, and just how many there are, so we can estimate their krill consumption, so I'm trying to figure out in my head how you might go out and in a very big scale, a circumpolar type scale, estimate the abundance, of those critters. So, my expertise is in population assessment, and its in the context of harvested species, or ecosystems. And my experience before the AAD was the same. I was involved in kangaroo harvesting management at continental scales.

**Elli:** Before you came to the AAD?

**Colin:** Yes

**Elli:** OK, so can I ask you a couple of questions? Quick ones?

**Colin:** Yes

**Elli:** Is all your current work, when you say you're focusing on harvested species, does it all come down to the krill? Is that like the common denominator in all your research?

**Colin:** For my work it is, not for AMLR's work. But, for my work, I'm not focusing on, not krill themselves, but predators of krill, as indicators of the status of krill.

**Elli:** OK, and just one other very quick question, what is the main difference between someone who's working in the AMLR program, and someone who's working within the biology program, or for example the HI program? Because my understanding is that it's all kind of ... quite closely linked.

**Colin:** AMLR works directly to CCAMLR. That's the distinguishing feature. CCAMLR is an international convention for regulating fishing, and our program works very, very directly to that. So, I represent the AAD at working group meetings, and if necessary at the scientific committee meetings here, and we feed directly into CCAMLR. Biology doesn't feed directly into CCAMLR. And HI doesn't feed directly into CCAMLR. That's the main difference in the driver of the programs. Biology used to encompass AMLR activities, and then it split into biology and AMLR.

**Elli:** But you actually work for the AAD, you don't work for CCAMLR?

**Colin:** No, no, we don't work for CCAMLR. We ... I and others represent the AAD in the Australian delegation to CCAMLR. Or, I represent the AAD on working groups as part of the Australian delegation.

**Elli:** Thank you very much for that. Are we ready to start?

**Colin:** Guess so, yes

**Elli:** Question No 1: What inspires or excites you the most about being an Antarctic scientist?

**Collin:** I guess, and whether this still inspires and excites me I've been questioning, but the sheer difficulty of the projects I've had to take on, which were big scale, and working in such a remote area as Antarctica, but not just Antarctica, the pack-ice of Antarctica meant that anything at that scale that you try to do is really difficult and that is challenging and that does excite me. It depresses me sometimes as well because it's so difficult to do things. I spent six years just planning for one survey and the first year I had one ?day's? ?...? time to do whatever experimental work I wanted to do and that was it for the year. I had to go away and think for the other 364 days a year about what you'd do next time. The amount of time you had to do your work was very limited, that means you had to put a lot of thought into how it was done. You had to have backup plans to backup plans to backup plans. You had to accept that, with a lot of effort and thought, maybe things mightn't work out and you'd come away with nothing, but that was the thrill of it to some extent. If you could pull it off it was really exciting. If you couldn't, it wasn't exciting at all. Now, having been involved for ten years, sometimes I find that it's still exciting but it's a hard grind too to try and do work at the scale that I'm being asked to work at because there are so many difficulties involved. I've always been drawn to remote areas so that's part of it as well, probably less so now. As time goes on it harder to maintain that commitment to that much time away. There's no doubt that that's been something that's excited me. I've been drawn to remote areas, outdoor activities so in some ways it combines my professional and the recreational interests as well.

**Elli:** What's the attraction with the remote environment? Is it the aesthetics or the challenge of surviving there?

**Collin:** I guess it's a bit of both. I've always been attracted to remote areas for reasons that maybe I don't understand but to visit them occasionally is something I've always wanted to do and has done me good somehow. It's harder to do it now – you can't keep on doing that for the kinds of periods I have to spend away – several months of the year. It's not something you can do forever.

**Elli:** Okay, now the next question is a little bit similar to the first one. It asks what your original motivations were for becoming an Antarctic scientist.

**Collin:** Well, some of the things I've just talked about and some plain hard facts of life in that I had an interest in this kind of work in a general way as a young adult. I remember buying some books on Antarctica and reading them and I've still got them in my bookshelf, so I had an interest then but the opportunity never came up and I guess I thought it would pass me by until ten years ago when I had a job in Canberra for ten years – it was a great job for a while until they restructured the department and I became a bureaucrat rather than a scientist, very reluctantly. I'm not a very good bureaucrat so ...

**Elli:** Was this working ?...?

**Collin:** Well I had to move on from that to a ?...? ?pest? program but rather than working in the capacity of a scientist I was working in the capacity of a bureaucrat where I turned the handle to turn the wheels to get money out to scientists doing the work. I wanted to be out there being a scientist and I was stuck in the office being a bureaucrat. This was when I was about forty, and probably been in one place too long as well, and I took five months off to consider my future and the week I turned forty, the first week I took five months a job came up in the paper for a contract position down here and it was as if someone was looking after me and said 'well if you want something else to go to, here it is'. It wasn't so easy, however, because it was a contract – four years – and my wife was settled back in Canberra and my kids were going to school and all of that, so I've commuted for ten years between here and Canberra – nine and a half actually – and everyone's finally moved down. We're building a house – well my son's not with us anymore, he's left home – but four years turned into six years, six years turned into a decision of whether I was going to continue this kind of work or go back and be a bureaucrat, which was a fairly unthinkable prospect for me. Eventually, after another three years of permanency here but the family situation not quite being right, everyone's down here. It's been a *long* road. That's why this office is still, like I said, a transition zone because my office from Canberra has been packed up just recently ready for the house to be finished down here. It made me wonder when

you talked about motivations and commitments and things like that why I would be so committed to doing this kind of work. It's not just working in Antarctica. In fact probably the motivation is changed now from what it was originally. Maybe it's the motivation not to be a bureaucrat again, that's strong enough in the knowing what I do well and don't do well and what I like and don't like, to realise that if I was doing that I would be really unhappy. Anyway we muddled our way through and here we are.

**Elli:** Okay, well that is quite a story and I can understand, as you say, there's a balance of commitments there.

**Collin:** My motivations were two-fold really. The motivation to some extent was already there if the opportunity had come up but I felt that it had passed me by at that stage of life. The kids were about ten and twelve and it's not so easy to just suddenly change your whole life, but it was important at that time and it was more than 'I want to do this', it was almost 'I have to consider something from what I have in front of me right now'.

**Elli:** Yes sure. It's an interesting one and presents itself to you like that ?when it came to you in the first week?...

**Collin:** Oh yes. It was like a sign in a way and it's been difficult because I've spent a lot of time away from home. I think I've done over a hundred and fifty return flights between here and Canberra over that time so it's a lot of flying. I've spent forty thousand dollars of my own money on flights in the first several years so I must be motivated mustn't I.

**Elli:** Yes, and now it's all worked out well. They're all down here and you can ...

**Collin:** It's worked out well provided they're settled down here too. They're just settling in. My wife's trying to find work. She really needs to be out working, it's important to her, and that's part of the reason for not moving down straight away.

**Elli:** My understanding is that the unemployment rate in Tasmania has dropped. Unemployment has dropped over the last few years. It's quite close to the national average now.

**Collin:** Well, I think she'll get work, she'll be fine.

**Elli:** Okay. Question No 3, something different: Can you tell me anything about your own consciousness during your working day. In other words what usually goes through your mind during an ordinary working day?

**Collin:** What usually goes through my mind. I guess I'm fairly driven in a way, internally, and I'm constantly setting myself goals and deadlines and things like that and that's often what I'm thinking about. I'm not thinking of just about doing that ?...? right now, I'm thinking of trying to get it done so it fits into this bigger picture of trying to get things done. That's probably what's going through my mind most of the time, trying to piece all of that together in a planning sense, in most senses I guess. That's what structures my day when I'm here. I don't need that to come from outside, it's something that's internal all the time. I'm just thinking about other things in my own consciousness. That would be the easiest way I can describe it I guess.

**Elli:** Do you find the time constraints a big issue or something that is on your mind a lot?

**Collin:** Time constraints. I'm always finding it frustrating I can't get things done as quickly as I'd like to and frustrated that other things happen that take your time away from what you see as your primary goals, but that's just a fact of life. You've just got to learn to deal with that and try and manage it as best you can. I'm probably more time driven than what's maybe good for me. It's just the way I work. Not good for other people perhaps but I guess I need it.

**Elli:** Okay, while we're on this topic, would you say that the consciousness of scientists can influence the results of their work. For example, if you've got two scientists who have a different ?...?

**Collin:** Yes, absolutely, yes – completely. Science does try and – it's philosophy is to try and be unconscious in a way or move away from people's personal consciousness or points of view or perspectives or ideologies or whatever but in reality different scientists bring completely different philosophies in a way to their own science. So you can have two people working on exactly the same concept who would create a completely different project and way of working through it. I believe very strongly that scientists bring their own consciousness to science. We should be trying to overcome that. Science is trying to strive towards some kind of truth that's independent of people's consciousness and ideas.

**Elli:** ?...?

**Collin:** That's the way I see science is working but scientists are people and people are individuals and probably that's one reason why science has evolved the way it is. If you put two different people

together with the same concept, they will approach it in different ways. Science should impose some kind of standardised process or procedure but it doesn't work that way. It should but it doesn't and there are lots of different reasons for that – different philosophies but also different amounts of training. So if you've got someone who's very strongly trained on experimentation and quantitative work, and someone who's not so well trained, and that's very relevant in biology because often people come into biology not because they're interested in the experimental design and scientific method but they're interested in the things that they would have the chance to study. They're interested in not the process but the objects perhaps. So you have quite a few of people come into biology from that perspective and don't have a strong training in experimental design or maths and probably one of my regrets in my training is that I didn't have a good mathematical background, or I've gotten into quantitative areas and I haven't got the foundations but I could do with now. So I need to collaborate with other people and those foundations. Some people come into biology with a strong quantitative background and they might impose a completely different procedure in looking at the same problem as someone who doesn't have a strong quantitative background. That's just one dimension of how different people can approach science in different way.

**Elli:** Okay thank you very much for that. Question No 4: In your opinion what role, if any, does qualitative science play in Antarctic science? This is kind of what we just touched on then – the interaction between qualitative and quantitative science.

**Collin:** Just a point while I'm thinking of it, I'm not quite sure you're focussing on Antarctic science – you probably don't want to be asked questions but ...

**Elli:** No, you can ask questions.

**Collin:** Okay. ... but most of these answers I would see as general science rather than Antarctic science. I don't see any difference between Antarctic science or Australian science. Science is science, or it should be anyway. So in relation to any science, and also Antarctic science, I think there is a role for qualitative or for part of the process to be non-quantitative but that might be the very beginning. You might develop some hypotheses based on no quantification at all. It might be general observation so you look around and you develop some kind of idea as to how a system might be working, through observation, through talking to other people, other people's ideas and that process of drawing on information in a qualitative way might generate some kind of hypothesis test and you might go about testing that. I would go about testing that with some kind of quantified process, but the initial process is almost never quantified. It's probably always qualitative in a sense that until you get – even if you've collected some data you must have had a reason for collecting it so there must have been some kind of seed in your mind as to why to collect that initial data, even if it's not the full-blown experiment. That could be through your own observations, through reading other people's work or a hunch or whatever. All of that I guess I would see as qualitative. So I see a role for that but I wouldn't see a role for it in isolation from a quantitative aspect.

**Elli:** What about quantitative science within biology. I know that within human impacts here their researching the influences of humans on species such as seals and penguins and their monitoring heart rates to try and understand the impacts on these animals. There is another way in which the study of impacts on different species and that is through observation and description of the behaviour of different species, and that is also a qualitative science. Do you think that that is something that should perhaps be, or can be used in Antarctic science or certainly within ?human? ?...? I know that's not your area.

**Collin:** It depends on its use. If it's going to be used for some kind management objective, then it's hard not to put some kind of quantification on it. Okay, you see a response – or when do you see a response. Is it when you get a certain distance from the animal; is it when you do some kind of activity. To understand when or how a response is elicited so that you can take some kind of action, it's hard to imagine for me that being done in a non-quantified way, because the management action might be set in some distance that people can come to them. Well that's a ?number?. It might be in not undertaking certain kinds of activities, but there's got to be a qualification on that in terms of closeness for instance. You could undertake some kind of activity and it would be disturbing right next to a seal that has no impact at all at some distance. If there is a management outcome that's desired from that work then I would have some difficulty seeing how qualitative work be of value to that. I guess in another sense, and I'm talking from someone who I've already admitted hasn't got a strong quantitative foundation but I work in quantitative areas and I tend to think quantitatively, or I think in ways and work in ways that mean if I don't quantify it somehow I classify it – that's the way science works. Every case isn't unique. If every case is unique then that's not the nature of science. Traditional science tries to impose some kind of structure on your observations. It needs some kind of

basis to impose a structure so if it's qualitative, in terms of a description, then if you're going to impose a structure over that then you might have to be looking at frequencies of different kinds of descriptions. Maybe there's a place for, say, in describing a behaviour. There's a place for that in that that description might form a category and that category might lead to recording the frequency of that category and that leads to quantification. So taking a quantitative stance I can see how a qualitative aspect can be useful. Just writing a series of descriptions that has no structure at all, I can't see it as being very useful.

**Elli:** Yes. So perhaps what you're saying is that quantitative science within that scenario could be worked in with qualitative science but not on its own.

**Collin:** I guess I'd come back to the context again. If – yes, I'd probably agree. I'd probably agree that qualitative science, on its own, has its limitations because every observation is unique and if you don't impose some kind of structure over that then how could you move from every observation being unique to generating some kind of generality to your observations, and that's what science tries to do in my mind anyway. It tries to look for some kind of overarching or unifying principles to ?...? out there.

**Elli:** Yes, because that's ?when it...? forms policy. There has to be a ?trend? for policy to really be implemented. That's my ?...? ... policy anyway. Policy ?...? individual occurrence ?...? ?...?

**Collin:** No, no. Policy would need to be based on – well, say if we talk about ?AMLR? for instance and if this ?AMLR? program here made some recommendation about some kind of catch limit then we'd have to be certain and be able to attach some kind of relevant probability to our certainty. It wouldn't be, 'Oh we just think it's right', because that's not going to be good enough for government policy. I've been in situations before in Canberra, where I was an expert witness, and there was a dispute over a kangaroo management program and we were in court and I had provide an expert opinion. An expert opinion from a scientist in that policy legal context is not good enough if its not quantified. So you can't say 'well I think this', because you'll be asked 'well how certain are you'. As scientists we should be striving to say 'well, we're ninety per cent certain' or 'we're ninety-five per cent certain' or 'we're not very certain at all' or 'we're less than fifty per cent certain'. The policy doesn't ask for those probabilities initially but if it's ever tested in those circumstances, as it was then, as it can be with fisheries where ?...? are appealed against and there's a debate over it, then a scientist in making a recommendation really has to be able to be precise about the certainty of their recommendation. That's what's expected of scientists I think. Well sometimes a lot of people in the public expect absolute certainty but the real job of science is not certainty because there is no certainty. It's to be able to say, well we think it's this certain.

**Elli:** I think as far as the public goes they look upon the scientific community as the ?...? of certainty.

**Collin:** They do, but scientists can't provide certainty because even the best scientific theory, every other scientist is trying to shoot it down. That's the way science works in its traditional sense. So under traditional science philosophy what the public considers as truth, the scientist should be considering as the best hypothesis that is available right now, but maybe a better one's going to come up. In that sense the current accepted hypothesis may not be true, it's just the best right now.

**Elli:** Do you think that part of the reason why the public does think that science is one hundred per cent certain, or that it's supposed to be able to deliver a hundred per cent certainty, is because some scientists themselves actually think that.

**Collin:** Yes, sure. There's that scenario. There's also a scenario that scientists either do think that or they present their information to the public because they know that's what the public would want, because the public probably think 'Oh this scientists says, well I'm eighty-five per cent sure' and they probably think 'well they're not doing their job very well are they'. It's hard for the public who aren't trained to think in the way traditionally scientists are trained to accept that there's a lot of uncertainty that we'll never get on top of a hundred per cent. But yet some scientists no doubt about it will work in a way where they will treat their favourite hypothesis as truth. That's just human nature because when I've written papers and developed conclusions, there's a certain ego attached to it I guess, and we like to think we've got truth, or we've got best and the best will stay the best. So it will forever be considered to be the best and therefore the truth. If our theory gets criticised I think most scientists to varying degrees will find it difficult to not take it personally and just say 'well this is the scientific process, yes he's got a better idea than me that's great, I'll go with his idea now it is better'.

**Elli:** Do you think that's difficult for some ?scientists?

**Collin:** I think it probably is difficult, yes. It would take a little while for most scientists probably to accept that their favourite hypothesis might have to be ditched, even by themselves, let alone someone else and pick up a new one and run with that.

**Elli:** The other thing of course I think that one thing that 'feeds' this as well is that the public themselves want certainty. Most people want something that they can say this is certain, so I think the '...? scientific 'part' of the public are also responsible for creating amongst themselves this idea that science today should be able to deliver a hundred per cent certainty because '...?'

**Collin:** Yes, and also in areas of science that are highly debated, and say government ministers become involved, they don't want to know anything about uncertainty from their advisers. They want a yes or no and so often the science, in transposing to policy, can be turned from degrees of uncertainty into certainty because of the politicians need to present to the public, certainty. They'll feel as though they're seen to be weak and poorly informed or incompetent if they can't say definitely one way or the other.

**Elli:** That's right.

**Collin:** It should be the job of science to be arguing levels of certainty rather than absolute certainty. That should be the job but it's not so easy to do that within the kind of environment we have to work in.

**Elli:** Sure, okay. Question No 5: Do you have any thoughts on the idea that spiritual insight and wisdom should play, or does already play, an active role in contemporary scientific research such as physics and biology?

**Collin:** Insight and wisdom - I've thought about those words. Spiritual insight I'm not quite so sure about that. I can see how insight and wisdom could play a part. Insight probably at the beginning of the scientific process to be able to make observations of systems around you or processes around you and to integrate all of the work that has been done before from other scientists and try and sift through all of that information and to sort out the wheat from the chaff to come to some kind of insight I guess on what the most critical issue is. Then that can involve a lot of insight and maybe there's no training on that. Maybe it's just a talent or an ability. Whether it's a spiritual insight, that's another matter - I'm not too sure about that. Wisdom to me more or less comes at the other end perhaps of the scientific process and that may be turning some kind of scientific result into - or interpreting that result - and then 'facing' the broader picture again perhaps. There's a fair bit of debate or discussion around some aspects of the scientific process that could involve wisdom. Like some of stuff I've been reading at present, there's a debate about some scientists - I guess this includes both insight and wisdom - who just go out and collect as much data as they can ...

[END SIDE A]

**Collin:** ...they hope that the modelling will somehow provide the insight and the wisdom through some kind of modelling process you throw out the variables that don't seem to be contributing any information and you're left with this '...? of other variables. Say you're measuring the affect of environment perimeters on survival, so you go out and measure a hundred different variables and you throw all of them into a model and twenty of them come out. Now if you haven't used some insight and probably wisdom maybe too at the beginning, then you could be collecting data on some completely irrelevant perimeters and it could be having an effect on the modelling that provides very serious results. So I think there's a lot of insight and I guess there's wisdom as well in going through the thought process at the very beginning and deciding well what is important to measure here. Not only that but once I've measured those things, what do I do with that data because there's different ways you can analyse data and you can actually get the same sets of data to several different analysts and come up with a whole bunch of different answers. I just read a paper last night about 'spirit' results and it was just about this topic and the author was talking about the different ways that 'spirit' results can happen. One of them is that an analyst will search and search until they get the answer they want This goes back to something we were talking about before about the scientist's consciousness influencing, and that can happen. People will, either for their own reasons - they've got a favourite hypothesis, or say they want a significant result because they know if they don't get a significant result they can't publish it. Editors like significant results. So this is the example gave in this paper. An analyst might actively make sure that they get a significant result by fiddling the books in a way, fiddling with the data. There's a lot of wisdom and insight that is needed in the beginning, and also at the end I guess in turning a statistical result into something that can then be - because with the scientific process we tend to start at the very broad, in a broad context, we narrow it down to some kind of fairly

narrow hypothesis, we get to a fairly narrow result and then we need to try and broaden it again and put it in a broader context. That's another place where a lot of wisdom or knowledge is really needed to place it back into that broader context again.

**Elli:** Okay so as far as spiritual goes, you're not so sure about that.

**Collin:** Yes, not so sure about that. I can see how a spiritual insight could lead to a certain hypothesis. It would be different if someone had an insight through some kind of different means. So okay, a spiritual insight could lead to different starting points. Presumably a scientific process should treat that, along with another bunch of hypotheses and you'd sort out whether that spiritual insight was actually true or not.

**Elli:** Yes okay. So on the macro scale, the bigger picture plays a part.

**Collin:** Yes, just like non-quantitative. In some ways that's before the scientific process.

**Elli:** Yes okay. Question No 6: What do you think the goals and values are that are most prominent in your work culture at the Division, and I want to emphasise here that this question asks not necessarily that the goals and values that are written up in the mission statement, but more the goals and values that are part of the actual working culture - what exists in the association of scientists, what are the most ...

**Collin:** Is this in the science work culture?

**Elli:** Yes, in the science work culture.

**Collin:** Goals and values. Within AMLR probably, and certainly more broadly than AMLR, yes certainly more broadly, I guess that the main goal would be sustainability in whatever impacts humans have on the Southern Ocean and Antarctica, sustainability through ?...? impacts program, through environmental management, through AMLR. They're all trying to, and this is in the mission statement as well, but I think there's a genuine underlying ethos I guess that most of us are trying to achieve sustainability in activities, in impacts.

**Elli:** Okay. Anything else that you can think of ?...?

**Collin:** Goals and values. I guess there would be a goal and values. Can I say a scientific process or anything like this is highly valuable...?...? aspects of the scientific process. There are a whole range of different approaches that people take and I guess they reflect different values. We have a whole range of people here with a range of - in my view there's a fairly common goal but the way that that might be approached is going to vary a lot according to maybe different values. On the value side of things, no I'm not answering that one very well.

**Elli:** No, that's fine. Okay. Question No 7: Do you have any thoughts on the process of peer review as a means by which to ensure rigour in Antarctic scientific research?

**Collin:** This one struck me as an odd question. It seems very different from the others.

**Elli:** It is. I put it in there, I'd already written out the other questions and then I realised that I'd left ?...? I'm actually doing separate ?chapters? within my thesis specifically looking at the process of peer review, so I put that question in last because I was curious to see how scientists themselves have any ideas on peer review.

**Collin:** Well, it will be interesting to see what other scientists think. I would have thought - all scientists would think that it's essential, I would have thought. I don't know. I see it as a replacement for what we should be doing to ourselves. We should be reviewing ourselves all the time but in reality we can't do it objectively because we are doing our own work, we can't see beyond our own work. I think to keep us as honest to ourselves as possible that peer review is really critical. It doesn't necessarily mean that peer review is successful because you have three reviewers, sometimes two, and you can three reviewers and get three different answers, or reviews you can get three similar reviews but that doesn't necessarily mean that those three people are right. You could have got the fourth one, it could've been very different. I think it is really essential as a check.

**Elli:** So do you think that it actually does ensure rigour in science?

**Collin:** No it doesn't ensure it a hundred per cent, it helps. Just going back to one of your earlier questions about a scientist bringing their own consciousness into their work, then a reviewer will bring their own consciousness into their review, and you have three different people, they could have three different philosophical backgrounds to how science is undertaken, or three different types of training, set of experiences. Even with the same training you can probably have two people with the same training that have a different set of experiences thereafter and they will form different views on how things could be done. It's not perfect in any sense. There's no way you could come up with any

perfect system. There's no doubt from my experience that well I'll get back reviews and probably secretly curse them because it involves work and you've got to go back and re-think things and nobody, once you've reached a point of view and written it up, I don't think anyone would honestly say they'd look forward to reviewing it or writing it again. In my experience I've been pulled up for things that in retrospect I think, 'yes okay it could have been done better, I didn't see that point of view, this was written poorly'. All those kinds of things that can come up in a review. Not necessarily everything. As a scientist you should have the right, and you do, to defend a position and an editor may have to take some kind of adjudicating role if there's a difference of opinion that can't be resolved. I think the philosophy of peer review is really important and peer review doesn't stop just at submission and acceptance of a paper. Again, the paper I was reading last night about 'spirits' results was a reply to another paper, so that's effectively a peer review after publication. I guess when we write a paper and we set it in a context and we're doing a literature review and you look at all the previous work that's been done, in some ways you're peer reviewing that work after that work has been published in trying to see if there are any deficiencies in the work or not, or misinterpretations or whatever.

**Elli:** ...? to think that in what they call ...? sciences, peer review for general articles it's sometimes anonymous and sometimes not.

**Collin:** Yes, well in my experience there's generally no place for you to say who you are as a reviewer.

**Elli:** As a reviewer.

**Collin:** Yes, you can do but you don't have to sign your name. There's no place for you to say 'Oh, gee I have to tell them who I am here'. There's no requirement placed on the reviewer to say who they are, generally.

**Elli:** What about the author, is that always kept anonymous or is that ...

**Collin:** No, the author's always there.

**Elli:** So ...?

**Collin:** ...? the reviewer. You always know who the author is but the author usually not, probably, know who the reviewers are.

**Elli:** Okay, that's different from the social science

**Collin:** Is it?

**Elli:** Yes. ...? published but I think most social science journals don't know who the person is who has written the article and that is, from my understanding, to ensure that the reviewers down to ...? ...?

**Collin:** That's a good idea I think.

**Elli:** Yes. If they get one paper and it's by a Professor 'so and so' and they get another one that's from an undergraduate student for example, they might favour the other ...?

**Collin:** Yes, absolutely.

**Elli:** Even though the content ...?

**Collin:** I'd never thought of that because I've only worked in hard sciences and that's the way it works. I've never thought about it.

**Elli:** Yes, I'm not sure about that but I know that it is at least to some extent that way 'within social? sciences.

**Collin:** Because when you review an article, often you'll know that person because they're working in your field and you've met them at a conference or whatever. Often you could have some kind of professional or personal relationship, whatever it is, and you may or may not want to influence that in one way or another, subconsciously, or maybe consciously. If you know the authors then you have that opportunity to go beyond your job as a reviewer whether you mean to or not.

**Elli:** Yes.

**Collin:** So I don't know. For some reason I've never thought of it operating that way but it does make sense.

**Elli:** Well, like I said, it's definitely that way at least to some extent within social sciences, I don't know to what extent.

**Collin:** Okay.

**Elli:** Okay, anything more on that topic before we move on?

**Collin:** Not that I can think of off hand, no.

**Elli:** Question No 8: Have you ever considered giving up your professional position as a scientist for a simpler life and a simpler life here means renouncing material life for a life of austerity and spiritual self-realisation and can you explain your answer?

**Collin:** It flashes past my mind occasionally. Sometimes I think I'd just like to go off surfing somewhere because that's my escape. I know from when I was a young surfer I'd go off and do that early in the morning and that was it. I didn't need any more of that for the rest of the day and I needed something that was I guess intellectually stimulating rather than physically, and surfing I could say was a spiritual kind of thing as well. Sometimes when it all gets too hard you just think, 'Oh wouldn't it be great to just go away and surf for a while'. In reality that wouldn't be enough and surfing is just the analogy. It wouldn't be enough for me and I think I'd need to be more involved in life beyond an inner life I guess.

**Elli:** Beyond an inner life.

**Collin:** Yes. The context that I ?..? it doesn't have to be isolated life the way you've written it there.

**Elli:** No it doesn't.

**Collin:** It could be quite the other way, it could be quite original. Yes, occasionally but I know it wouldn't suit me. Sometimes I don't wish it could be true but sometimes I'd probably think, 'Oh wouldn't it be great just to opt out for a year and just see if it could work for me'. But in reality I'd probably get a month or two down the track and think, 'no it's not working'. I think through experimentation to some extent at that time. Before I started this job and I'd taken those five months off and I'd ?applied? for this job in the first week and after that I didn't know if I had the job for four or five months. I went off and climbed some mountains and went surfing and did those alternative things, and those things I still do or still feel the need to do, but it's just one part of my life. I think I need that part and I need another part, I need several elements to my life. I'm not saying that's one dimensional because that's unfair but if it reduced some other elements of my life and expanded another one, which has been dormant or not addressed very much, then I don't think that would be the balance that would suit me.

**Elli:** Okay. If you were to change the way it is now ?...? ?...?

**Collin:** Sometimes I wish I could. Sometimes I think I get caught up in this circle here and I need to step aside pretty soon because it's been ten years since I stepped aside and it's probably time to do that again. It's a bit like taking a holiday, it's stepping aside but it's not stepping outside and it's emptying your mind of those kind of things for a while so you can refresh yourself in other ways.

**Elli:** Okay, last question. As a scientist are you at all interested in whether or not species of Antarctic fauna and flora have, or are, spiritual soul and can you explain your answer?

**Collin:** I have had an interest and I explored that kind of interest around about ten years ago. It was that kind of stage where I was asking some of those kind of questions and read a bit. There was a guy called Charles Birch, he was a lecturer of mine and he's moved in his retirement from being a scientist to being almost a theologian really and he straddled those two really different kinds of areas. He wrote a book on that kind of issue about rather than talking about a soul he might have talked within the context of senses, but it was a similar kind of thing. So I've had an interest in the past to explore that kind of thinking, but as a population and ecologists that kind of thinking doesn't have a part in a way in that even thinking of individuals, you don't think of them – let's say seals for instance. If we're doing a survey of seals then I'm thinking about the population and how that fits into an ecosystem and if I'm thinking of individuals it's just them as age classes, or some component of a population. If I get down to thinking about individuals then I've got chaos again and I've got individuals and there's no structure there, they're all different. From a population ecologist's point of view there's no way forward, in the way I work anyway, in dealing with six million independent individual cases, because I'm trying to make some sense beyond that level. It's a different level of working and thinking and to maintain the connection to the individual level I don't see that there's a way forward in that sense. A spiritual soul – am I interested. All I can say is I have been interested and I've explored that area at a certain time and stage when it was important for me, but it's not something that I would say I'm actively seeking better understanding of now.

**Elli:** Do you think that there may be a place for researching such issues within Antarctic biology or other biological studies. Do you think it's something that would be valuable research?

**Elli:** How you would test it.

**Elli:** It's quantitative.

**Elli:** Yes, you'd probably have to take a different approach to science but then it would depend on if biologists would consider such science as science.

**Elli:** Yes, for example, paranormally run science ?their? physical studies...

**Elli:** Well that concludes the questions. Do you have any thoughts on anything we've gone over, anything you want to add?

**Ellie:** Well these questions, perhaps not the peer review one, but the rest of the questions are all based on a specific methodology that I'm working with. The methodology I'm working with draws both from certain contemporary theories on conservation psychology and it also draws on some very ancient theories on conservation psychology. The specific framework that I'm working with looks at qualitative differences in consciousness and it's based on the premise that from consciousness comes both attitude and behaviour, or outlook and behaviour. So again this particular framework, that's what these questions are based on, so the person who doesn't know the framework, how is she going to process that and certainly how to quantify it, but I know exactly where these questions fit according to my framework. I won't reveal too much at this stage ...

**Elli:** Nitty-gritty.

**Elli:** Yes, within social sciences, psychology and sociology and things like that. Just getting back to our discussion on qualitative and quantitative science, there is a very large degree of mixing of qualitative and quantitative science, both within sociology and psychology ?...? ?...? ... I'm working with for example, it does employ quantitative processing of these responses but the quantitative factor is very minimal. The qualitative takes up most of the methodology but all of that qualitative mix fits within the ?...? bits of quantitateness, if that's one way to explain it. Perhaps if one wants to draw a scale of the pure quantitative sciences such as mathematics all the way up to the very qualitative ones such as philosophy or psychology, I think perhaps the ratio of quantitateness and qualitateness actually does stretch fairly evenly out as it changes from very quantitative to very qualitative. That is my understanding of it because when you were talking about the qualitative and the quantitative, you were saying that if there was going to be qualitative science there would have to be some component of quantitateness in it, at least within biology, and certainly within psychology and sociology. My

understanding is that most of the time there is some quantitative component but a lot of the time it is quite minimal and it doesn't play a bigger role as what it does in what they call 'home' sciences.

**Collin:** Interesting.

**Elli:** Alright, well thank you very much for your time Collin. It's very, very much appreciated.

[END OF TAPE]

## 19. TRULL, Tom (ACE CRC)

Start of tape:

**Elli:** ....a little bit more about what your position is, what you do and how your research programs that fits within the CRC ?...?

**Tom:** Sure, I'm the Program Leader for the ?...? Climate and Ecosystems Program on the ocean control of carbon dioxide. So the goal of that program is to understand how the ocean affects the level of atmosphere CO<sub>2</sub> and it does that through several different processes and many time scales from millions of years to seasonal time scales. So I lead a group of about five ?...? scientists in the program spread between the Australian and Arctic division and CSIRO here. There are probably ten people total but most people have a fraction of their time ?...? We have four themes of research. They're largely focused on the open southern ocean. Some work in the sea-ice zone, basically no work on land in Antarctica, and my own work is using stable isotopes of compositions of neutro-elements like carbon and nitrogen and oxygen to assess the magnitude of carbon transfer within the sea to link into this how the ocean affects carbon dioxide levels, and then that links to the issues of climate through greenhouse gas force in the climate. And that's pretty much my main role. I'm also at the moment the acting CEO for the CRC, so I have a somewhat larger responsibility occasionally.

**Elli:** That's the ACRC?

**Tom:** That's the ACRC, right. My formal position is I'm Associate Professor jointly appointed between the University of Tasmania and CSIRO Marine Research.

**Elli:** Alright, so are you ready to start with our questions?

**Tom:** Yes.

**Elli:** OK, so question No. 1. What inspires or excites you the most about being on a project team?

**Tom:** I guess probably the idea that the southern ocean and other processes have global impacts are the main thing.

**Elli:** So...

**Tom:** The region itself is not so much fascinating to me as the idea that the region remote from other parts of the world has such a large effect on the globe as a whole.

**Elli:** OK, so you find that interesting from the perspective of science?

**Tom:** Yeah, interesting from the perspective of science and I came to this field 10 years ago from working on ?...? chemistry, which is the evolution of ?...? in the atmosphere and this was more about the dynamics and at the time I thought it might have some greater social relevance within climate science than working in planetary evolution?...?. I think in the end that I would like to rank things in terms of social relevance but it's exciting science.

**Elli:** OK, so it's ?...? science?

**Tom:** Yes, it's ?...? science that is the reason I'm in there.

**Elli:** ?...? similar to ?...? Can you tell me about your original model ?...?

**Tom:** Probably because I was outside the field of climate science and ocean science and primary metabolism problems and from the outside looking in it seemed like a few of which there was an unusual amount of effort to link across many disciplines and I thought that was pretty exciting, so there's always physicists and plancton biologists trying to work together in other fields but it seemed

like some of the large questions, such as what does control climate and are we having an affect on it to our own actions, or do ...? already have an affect on it to their actions. So it seemed like that such over?...? questions that they are producing a lot of good in their actions, and so it's pretty much the same answer as the first question. I got into what looked like a stimulating field with science.

**Elli:** How long have you been involved?

**Tom:** I started here in 1993 and before that I was not in Antarctic or southern ocean or climate science.

**Elli:** Can you tell me anything about ...?. In other words what future does ...?

**Tom:** Pretty mundane as probably assesses the list of tasks that I'm working on. I often have a voice in the back of my head saying you really got to get behind these little mundane things and consider where your science is going. It's pretty much work today kind of thing.

**Elli:** In reference to your first comment, do you find that you try to do the ...? on your work...?

**Tom:** It's probably, there's some of that of course in the program that you kind of ensure that everybody is working together towards some larger goal and I think the CRC's particularly good at keeping people thinking up at that level and not becoming focussed completely on small problems in their discipline area but I probably have a lot of little tasks in an average day from writing up a proposal for ship time to reviewing an article for a journal to writing some correspondence looking for money, and probably a part of me is trying to think about, more about what's the most innovative approach that I could be trying to work towards in my own science. So I think I probably try to keep a little bit of thought about what's my own intellectual contribution, and try to work that into my day. I am very pleased with my day if I actually get time to work on that.

**Elli:** ...?

**Tom:** What, with my day? If I actually get time to work on making a personal intellectual contribution to the way that we think about marine science.

**Elli:** ...?

**Tom:** Yes, that's when I've had a great day – if I've actually done some calculations and made a measurement, or had a new idea, then that's a great day. If it's a day where it's just be sort of organising logistics – I do a lot of logistics, ship ? I buy that, then those days are just ?

**Elli:** Just a further question in relation to this question. Would you say that you ? consciousness of scientists ...? cautioned ...?

**Tom:** I guess I really don't know what that means, but a consciousness you mean their prospective or something?

**Elli:** Well I'm thinking a little bit ? task not totally finished and ? mind ...? perhaps ? further consciousness of the background of our conscious state. For example, one side ? ? and another side that's ...? ...? So ...? produced different roles ...?

**Tom:** Yes, absolutely and I think that without some sort of larger view or passion it's just too grinding?. And so you do just sort of ?? or something. But I don't know too many scientists like that. If think with added motivation some people want to save the earth or something like that. Other people want to get the glory that comes from recognition from the ...? really innovative. I think the idea of being innovative sometimes is even more important than being import Antarctic The ? importance a scientist recognises having had new thoughts and done new things than having done things that weren't necessarily import Antarctic So some areas of science where people are doing the same things ...? still really important, but they don't get a lot of ...? excitement, I don't mean advertising campaigns ?? new, new, new. And so I'm driven a bit by that. I could be recognised for having done something new, as opposed with not always something import Antarctic

**Elli:** ...? recognised by ...? strong element within ...?

**Tom:** I hope so. Because I do believe that ...? ?perieu? is a process that brings out the best in people to a large degree. So whether it is or not, for others I can't really comment but I certainly think that recognition of my colleagues for a job well done is valuable to me.

**Elli:** In your opinion what role is ...?

**Tom:** I think it's really hard to do qualitative science well on its own. So I guess it's not about ? I making my own mind very much ? but I do think that often what's useful is a (pause). In the end what you want to do is extract some kind of wisdom out of all these studies, right. Some wisdom about how the Antarctic ecosystem works, how the climate system works, and that can be quite qualitative in the

sense that you might want to know that overall there is an upgoing circulation and it brings heat to the surface of the ocean. So sometimes a qualitative understanding can be all you need, but I think it's extremely rare to get there by doing qualitative science. It's almost always the argument for environmental science ?...? otherwise there are generally many possible hypotheses for how the system might be working, and you're trying to sort amongst them and almost any measurement you made tends to raise something, fifty-five percent in one direction and forty-five percent in the other. It's rarely definitive on its own, so you need a lot of measurements - different aspects of the system to really decide how it works, and so what can be a difficult distinction you can really only make by doing very careful quantitative science. It's very hard to build up from qualitative blocks? And yet in the end all we might need is the qualitative understanding, but you can't get there without extremely quantitative efforts in the blocks that you put together. So I think that in general I'm opposed to qualitative science at the building block level for the big picture. I'm positive about qualitative science in terms of people writing papers that aren't quantitative but there qualitative ?that they've summarised how things work based on quantitative block. So I guess ?...? estimate after a while.

**Elli:** ?...? qualitative science ?? (*indecipherable*) ... when they draw conclusions (*indecipherable*)

**Tom:** I think the best judgements are made on a quantitative basis ?...? statistical tests ??? The qualitative bit comes in to some degree in scientists putting together a picture that non-scientists can readily assimilate, and it's almost at that level where I think the qualitative bits...

**Elli:** (*indecipherable*)

**Tom:** Yes. People like to hear what their overall conclusions are and often that doesn't require a quantitative presentation, but the judgements should be ?...? quantitative prospective.

**Elli:** I know myself ... (*indecipherable*)

**Tom:** [Is that better, OK. I'll sit up]

**Elli:** Actually (*indecipherable*)

**Tom:** [That's good, OK]

**Elli:** OK. No 5: Do you have any thoughts on the idea that spiritual insight and wisdom should play, or does already play, an active role in contemporary scientific research, such as physics and biology?

**Tom:** ?...? I don't really know what spiritual insights are. I guess people have intuitions. I can think of those as some kind of subconscious assessment of how things are likely to work and then projecting them onto their physical environment. I'm certainly an agnostic and close to being an atheist and I don't really think that there's any intuition that comes to us from some more powerful being or greater force. So it's hard for me to think that - ?...? I don't believe in ?this? spiritual. I do believe in the ability to use other aspects of your own brain, ?and? some people might call it - people who meditate and people who focus their minds on their thoughts in other ways, whether it's through the science they do or the prayers they say or whatever, they do manage to focus their minds in a way that can produce an interesting result. I wouldn't describe that as spiritual I guess. I would just describe that as techniques for clear thinking, or subconscious insights - you may not know where they come from - but they may be right. They're not going to be useful are they if you have to demonstrate that they're right and that usually means that ?...? ?...? materials ?...? agree to. So from that sense I don't see any spiritual input to Antarctic or other science, but I do recognise that people's mindsets ?...? is influenced by their own beliefs in spirits or gods or higher consciousness or greater powers, that affects their minds. Certainly it affects their (*indecipherable*) . I just think it's all ?internal in? people's minds. (*indecipherable*)

**Elli:** ?If you don't mind me asking? Just listening to what you're saying (*indecipherable*) ... call that a (*indecipherable*)

**Tom:** To me it's not ?different...? fundamental nature than anything else I might do. It's just another thought in a sense. It's just that sometimes the thought comes from some more or less a clear place in your mind ?...? Sometimes your thoughts are very clear. You read this paper and you read that paper and you put an idea together, it's very clear where that came from. Sometimes you're maybe sitting in the shower or at the beach and have some thought and have no idea where it came from but it strikes you as very valuable and you use it. It just means that you don't understand your own brain's way of putting things together.

**Elli:** (*indecipherable*)

**Tom:** Yes. I have no problem calling it that and I've tried to do things like imaging and programming my own subconscious to let go of thoughts and things like that so I'm not completely ignorant of that possible interaction between the various levels of your consciousness. For me, that's what it is. It's your ??? of consciousness rather than some aspect of – to me I guess spirituality means ??? something outside your own consciousness – some other realm. Certainly (I've) seen no demonstration out of my own life and suspect that it doesn't exist but probably ??? ...to remain agnostic rather than a ?clear? atheist.

**Elli:** OK. I appreciate that. ??? ... second half of the question. ??? Do you think that *(indecipherable)*

**Tom:** I think wisdom is just a wiser ??? of experiences. ??? makes it wise is that it meets ??? good outcomes ?in? future decisions. Whether it comes from experience – experience comes from bad decisions. I do think that in science there is a much greater need to attempt to extract wisdom from science rather than knowledge. Far too much science stops at the extraction of knowledge ??? and what we really need ?to deliver? is wisdom.

**Elli:** ??? So you would ?in your own understanding? say wisdom is a little bit of both ??? It's knowing what to do ???

**Tom:** Absolutely.

**Elli:** OK. Question No 6: What do you think the goals and values are that are most prominent in your work culture – I might say just for you, ??? Antarctic scientist ??? involved in a number of ?science? studies.

**Tom:** The goals and values.

**Elli:** *(indecipherable)* ... work culture. Not necessarily the goals and values that are ??? mission statement.

**Tom:** I would say generally ?new? knowledge is certainly one of the top goals of myself and my colleagues. It was the goals and values wasn't it. I think another goal that I find that I'm interested in and many other people seem to, too, is to show that there is some great, to a degree of connectiveness between environmental systems on the planet and that is generally recognised. When we say generally recognised we mean that probably that the political world likes to ??? so people tend to think about their national economy and national territories, but the view that our actions here impact on others, ?through? the atmosphere or ??? climate ??? I think that many of us are motivated to show that clearly through good science, because it somehow fascinates us. It's hard for you to speak about what fascinates others but for myself certainly. We have a small here who works on iron ?inputs in? the ocean from ??? on land and it sort of links man and management on a continent to very remote impact on the ocean and the planetary climate. I think those things are common goals, they show that we have some growing understanding of large scale impacts on the planet. ??? ??? There's certainly also, ??? ?doing? science because it ?does? ?employ? us. It's not all as exciting as ... one day you do enough science that you have a job, ??? get the next grant, get the next contract and often that tends to scare you back into some(thing). It's a fun job. A lot of people would like to be able to do this job and enjoy going to Antarctica and going to sea and essentially doing anything you like as long as you can convince others that it has value. So that's a pretty big value too. Probably I would say those things, ?general new? Knowledge, showing some kind of ?? and connectivity of planetary metabolism, as I like to call it, and keeping the fun times going. ??? ??? biggest motivations as opposed to say the day to day basis at least naturally trying to save the planet or something like that ??? ?...degree? scientists kind of give a ??? response scale available to the public to decide if they want to do something, not in an advocacy position. Some people who want that build from ?their? science to have credibility ??? advocacy but most scientists don't I think. Most scientists want to show how it works and then let the rest of the community decide whether they want to act on that or not. I'm pretty much ??? ??? response – you do this, this might happen.

**Elli:** *(indecipherable)* ... holistic view ??? ?...? as a whole ?but? then I'm thinking scientists, as far as I know, they don't use that term 'holistic'.

**Tom:** No, no. Because we try to think of it more like it's connected like the cuckoo clock's connected - you know you turn this and it turns that better and a weight falls down and the bird comes out.

**Elli:** *(indecipherable)*

**Tom:** Yes, very much so. You know in some ??? ??? ... recognised as very complex, you know the whole thing. The butterfly flapping its wings and ??? ??? physical system has strong

sensitivity, initial condition and ...? responses and all these things but we still view it as just complications and understanding the mechanism as opposed to it being part of some conscious ...? ...?

**Elli:** Question No 7: Do you have any thoughts on the process of peer review as a means by which to ensure rigor in Antarctic scientific research?

**Tom:** I'm positive about peer review. I think its good that it remains anonymous. I think it would be even better if the work that was submitted could be anonymous, so you didn't even know who was writing the paper. I think science is one of the best regulated endeavours on the planet and it kind of makes me laugh when somebody ...? will say we want you to use a business model for corporate governments, and I'm thinking well to be honest science ...? are very detailed and no other field that I know of do you have so much oversight of what you do. Is it ?stifling? to innovation and things like that? It certainly doesn't allow you to leap and do something that you're not well trained to do probably, although I think in Australia there's a greater trust in scientists ...? ... try new things and then the crunch comes for the scientists themselves ...? can get their work published. There's two stages in peer review - there's proposals and there's papers. I find the proposal process, which is completely ...? dominates North American science funding, it means it's very hard ...? ...? done before. In Australia it's less so - it's becoming more so but to some degree, you know I came to this position and I'd never done any marine science before and they gave me a job. Probably it was a bit of a risk but it seems to have worked out OK. To me, to make my answer shorter, peer review - I think it's a good thing.

**Elli:** I heard a quote the other day - you can tell me what you think.

**Tom:** Okay.

**Elli:** There's a quote that goes 'the blind leading the blind'. I was wondering about this in terms of peer review because in one sense if the highest quality that you can get on something if somebody's ...? peer then what is to say that that level is ...well, I mean when we go through the schooling system you have a supervisor, somebody in an authoritative position to supervise you until you reach the level where you are now at a doctorate level, so do you feel - I suppose in relation to that ...

[END SIDE A]

**Elli:** ... when one obtains the highest academic level that is available through our schooling system or our tertiary system, that that is an adequate level, because that is really the level that peer review exists on.

**Tom:** Well, if anything I'd just argue that we ought to get to peer review sooner and ?the passages of? people through the system, I think the goal of education is to get to the point where you can think for yourself. In alternative views there are chief scientists, national chief scientists, and I guess I feel that the real purpose of peer review is to make sure that the work done is not flawed in some way that makes that bit of work not useful as a building block, to build a ...? of science. That is probably best done by people who are peers rather than superiors because they're close to it. It really hard to have someone who ...? is this brick well formed. Probably where the peer review process is weakest is what do we ...?. It's very good ...? brick well formed but now what should we do with them. If you leave that to peer review ... [laughter]. And that actually is were the input from outside science is absolutely essential and it's where scientists have ... of course nobody likes to be told what to do, so they resist that, but it is sort of a social process where people are saying, what have you've done with my tax money.

**Elli:** That's really the role that the government, I know has taken upon itself, and governments are supposed to be representative of the people. It doesn't always work in that way but that's how it is ...?

**Tom:** Yes, that's how it works and I don't think we're likely to get away from a system like that. There seems to be a lot greater role of chance or ...? People seem to rise in politics not necessarily because they're wise. It's hard to rise in science without being a good scientist. You need to be more than a good scientist to rise very far but at least you have to be a good scientist, but the politicians whose basic job is to obtain consensus and act on it, ?It seems? like you to get in there without necessarily being particularly wise about that and that's probably the process of how you get there. So peer review in politics seem to need more improvement than peer review in science at the building block stage so we would only get truly great leaders at the top. I really think it's rare for me to have encountered a highly placed scientist who wasn't actually a really good scientist. I just haven't. I met

chief scientists of different nations ... sometimes they're not the *very* best but they're usually pretty damn good. So I think peer review works both in terms of selecting building blocks that are solid enough that we should retain them in the structure and identify people who are skilled in science. So pretty much I'm positive about it. I have had stuff rejected too! [laughter] That's important, right. If you've never had anything rejected you think 'Oh the system works well' – but I have had stuff or I've got stuff that I couldn't get published and I actually think it's some the best science I've done and never got it published.

**Elli:** Maybe the time wasn't right.

**Tom:** Yes, maybe the time wasn't right or maybe it wasn't as good as you think it was or maybe ?...? proved correct in a long time, but I'm still pretty positive about peer review.

**Elli:** OK. (*indecipherable*) ...[ just seeing if this is still...] Question No 8: Have you ever considered giving up your professional position as a scientist for a simpler life, and a simpler life here means renouncing material life for a life of austerity and spiritual self-realisation and can you explain your answer.

**Tom:** No I like my life. I like my life in science. I occasionally would like to have shorter hours, more time with my kids, but I would be giving it up just for ease of life and time with my family. I wouldn't be giving it up for austerity or spirituality. I've tried one ?...? ...spirituality once and I fell asleep. So I'm pretty much pretty happy.

**Elli:** OK, the last one. As a scientist are you at all interested in whether or not species of Antarctic fauna and flora have, or are, a spiritual soul and can you explain your answer.

**Tom:** I don't have any interest in that. I guess I do want to qualify that by saying that I like my dog, and I believe that animals have social behaviours, they have social norms, they have moments of joy and moments of sorrow. So I recognise that animals at least - I don't know about plants - but animals at least have consciousness and ?...? . I've always thought that was some of the stupidest bits of science I've ever heard of. So sure. I'm sure that penguins have good days and ?...?, and I like that. When I see a penguin I think 'Wow! What a beautiful animal, and I hope he's having a good day', but I don't think of them as being a spiritual entity ?...? having perspective that there such a thing as spirituality, I guess.

**Elli:** OK. ?...? I was going to ask you – do you think that animals have emotions ?...?

**Tom:** Sure. Absolutely.

**Elli:** OK.

**Tom:** And it's certainly important to me. For instance, I was approached and asked to be a co-signer of a ?...? proposal to put a satellite tracking device on the back of seals and I declined because I thought that the photo of the seal with it on its back looked to me like it was going to be unpleasant for the seal, and I was told that no it definitely doesn't affect them. I looked at 'it' and thought, well I don't know. If I were a seal I wouldn't want that thing on my back, so I declined to be involved in the thing. I do have some sense of an animal having a sense of happiness with its state and what we do might affect that and as such I didn't think it was such a good idea to put the trackers on the seals. The ?...? ones is the one that these guys want ?...? If you put a little microchip on my arm it wouldn't bother me a bit but you put some big radio pack on my back I'd get tired of it.

**Elli:** I've seen one of the big ones that they put on the seals 'head'? It was about this big ?...? and it was pretty big.

**Tom:** So I'm not comfortable doing that. I wouldn't do that. I wouldn't do that to my dog or a cow.

**Elli:** So it seems that you...

**Tom:** I guess I don't think – and this is an important aspect to me of environmental science ?...? is that I do not think that we should make judgements about our impacts based on the effects of our species alone. I think that all the other species on the planet deserve some moral obligation to give them some say, essentially, to keep their interest at mind, so that's all that is but I don't think ?...? the spiritual.

**Elli:** OK. Thank you very much. That was very kind of you. I hope I didn't take up too much of your time [my watch broke]

**Tom:** That's about what you said it would take.

[END OF TAPE]

## 20. WOEHLE, Eric (AAD/ IASOS)

### Start of tape:

**Elli:** This is Interview No 16 with Eric Woehler. Eric could you please start with explaining what your exact position is as a scientist ?...?

**Eric:** Okay. I'm an Honorary Research Association with IASOS. I conduct two long-term research programs on Antarctic sea birds and those studies have been conducted now for almost twenty years.

**Elli:** Okay great, thank you. So the questions. No 1: What inspires or excites you the most about being an Antarctic scientist?

**Eric:** My role and my thoughts of being a scientist aren't confined to the Antarctic. The same things that excite me about doing science in Tasmania or science anywhere else in Australia. The same things that excite me about being an Antarctic scientist, there's the potential for discovery and to learn something about the way the system works and in many ways to do the science that we need for management purposes or for conservation. The research ?...? involved in the questions that I'm asking of the research and that my students are involved in also is science with a conservation and/or management flavour to it. The long-term studies are looking at the way the sea bird populations are responding to things like human disturbance, climate change. We need to know what the natural patterns are before we can start pointing the finger at one thing or another. Be it aircraft operations or ?...?, and I'm asking similar questions of birds in Australia as well. I've got students working on human disturbance on birds in Tasmania, so the drive or the motivation for me and the excitement is something that's shared across all my science, it's not just confined to my Antarctic research or my Antarctic activities. There is as I said the potential for discovery and the potential for learning more about the system, and by better understanding the system you've got a better chance of conserving it and/or managing it so that it is protected into the future. That's where I'm coming from. It's from a conservation and management perspective but it's very focussed to that end.

**Elli:** Okay, thank you very much. Question No 2: Can you tell me about your original motivations for becoming an Antarctic scientist, or becoming involved in Antarctic science?

**Eric:** It sound almost humorous but I went all the way through my undergraduate degree without really having a clue of what I wanted to do. I was doing computer science and life sciences and didn't really have a clear idea of which direction or which to follow. It was literally that I was given a slide show by one of my lecturers who was involved in Antarctic research back in the 1970s who did a trip down to the ice and gave a slide show one lunchtime or something as a seminar – a pretty slide show of the Antarctic and it was almost like the light bulb going off over my head. I just had an instant recognition and connection with that direction or ?...? and that then lead to my doing an honours degree working on birds on Macquarie Island and then slowly ?...? and becoming involved both at the national level through the Antarctic program here in Australia. Also my involvement at international levels on various committees and organizations. It was really was literally a slide show of pretty pictures and giving me a personal connection with the Antarctic.

**Elli:** So the Antarctic setting added to the science, that was the thing ?...? direction.

**Eric:** Yes. I don't know if it was particularly the Antarctic or whether it was the opportunity to do research or whether it was a combination of those and something else, I don't know. The slide show was a pretty picture show. It wasn't geared up around necessarily wildlife or research or whatever. It was one person's trip down south and visiting the stations and showing some of the landscape and the wildlife and by that stage I had all but finished an undergraduate degree in science anyway and it was just what to do with the next step. Was I going to do an honours degree, was I just going to go off and get a job and it was just a case of being in the right place at the right time and seeing the right thing. That was in itself enough to motivate me, or steer me, into doing a honours degree in zoology and its picked up since then.

**Elli:** When you saw that slide show, did you feel that Antarctic science could take you further into science, or not particularly?

**Eric:** No. I think in those days I was too young. I was probably was only twenty or twenty-one or something like that and I was too young to really have in my mind any thoughts of becoming a researcher or a scientist or whatever. I was a science degree student and I was in my third year of doing a science degree, so I don't recall having these ideas about becoming a researcher or anything like that. I think it was just simply some sort of formative mechanism that simply said something I'd connected with and that I could see myself doing and was in a position through the zoology department to undertake an honours degree and start in the first steps of a research career.

**Elli:** What do you think in the Antarctic environment itself was the attraction? ?...? simulation ?...?

**Eric:** I don't know. As I said that was twenty-five years ago. Whether I got bitten by the Antarctic bug through the slide show I don't know. Whether it was just the novelty of working in the Antarctica as opposed to working in Australia. I had a very strong interest in wildlife when I was doing zoology. In fact I was doing almost a double major in zoology as well as a major in computer science and perhaps my involvement had already leaned me towards some sort of life sciences approach. I had grown up with animals and always had an interest in animals so whether again it was the one thing that needed to push me over I have no idea. A long time ago, it was a different millennium.

**Elli:** Yes it was. Okay, now something a bit different. Question No 3: Can you tell me anything about your own consciousness during your working day. In other words what usually goes through your mind during an ordinary working day?

**Eric:** There's two types of ordinary working days. One is when I'm in the field in the Antarctic and the other is when I'm back here. The mindset is completely different obviously between the two and the two balance each other. I need the time in the field to undo the time sitting in front of a computer screen working here, and vice versa. I need to do the work in the field to justify my existence as a researcher. My time here when I'm in the office is basically a function just dealing with the day to day commitments, deadlines, writing proposals, filling reports and providing advice of whatever for meetings or people needing information. It's just the ongoing interaction with colleagues and the system in all aspects of work. There is an overhead, an administrative and bureaucratic overhead, as well as doing the science in terms of analysing data and writing papers to being a researcher and it seems that overhead is increasing with time. Conversely, when I'm in the field I can almost, but not entirely, put all that stuff to one side simply because I'm on station somewhere or on a ship somewhere and not nearly as approachable or able to be involved in meetings or anything like that. It's two very completely different mindsets and the routines are completely different.

**Elli:** When you're in an Antarctic environment you're focussing on the project you're involved in?

**Eric:** Sure, and multiple projects typically. It depends on even as much as the time of day. There are some things that we do during the day, there are some things we do in the evening. Some birds come back at night rather than during the day. It will depend on what the weather has been doing. If you're behind schedule, if you've missed counts because of the bad weather, or if we're going out on the boats rather than going out in vehicles, if we're planning on going out for the day and back that evening, or whether we're going out for an overnight or something like that. That determines what gear we've got to take, what preparations are required for just stepping out of the Red Shed or stepping out of the tent to do any field work. It's very much ?...? in terms of where I am, what I'm about to do, that's obviously geared up around collecting the data, working to make sure that all the data that are required from a season, from different projects ?...? done, if I've got students with me, looking after their interests, making sure that they're collecting the data that they need for their degrees or whatever, and just dealing with other issues on the station that might come up where my expertise or advice is required or requested.

**Elli:** Are time constraints an issue in either of the settings, like working collecting the data in the field or doing the paperwork.

**Eric:** Doing the paperwork certainly is. There's just a greater demand on my time in terms of requirements for reporting and because I deal with animals I've got ethics reporting to do, I've got applications for next season as well as reporting from previous seasons. Every year there's more and more requirements on people who are running projects to satisfy two systems.

**Elli:** Do you feel that time constraints *could* impact on the quality of either report ?...? ?...? article ?...?

**Eric:** Not for me. For better or worse I'm a perfectionist and the paper doesn't go out the door until I'm happy with, so I'm not prepared to compromise my written report, or papers or whatever else until I'm happy I'm lucky enough that I'm generally well organised so that if there is a deadline the paper or

report or whatever are typically prepared in time. For example, I've just come back from four weeks overseas from the SCAR meetings and the system recognises the time commitment for the SCAR meetings, so I've actually got an extension on for example, applications. The system's not so inflexible that it generates artificial deadlines or arbitrary deadlines. As I said, to some extent it helps because I'm a well organised person and so I'm able to structure my time, so I don't think so far as I'm concerned that time constraints have an impact on either the work that I do or the way it's analysed or written up. That's me, I might be lucky.

**Elli:** Okay, question No 4: In your opinion what role, if any, does qualitative science play in Antarctic science?

**Eric:** ?...? qualitative science.

**Elli:** Okay, it's a little bit open for interpretation but two areas that I can of. One is qualitative research within biology where you might be describing animal behaviour, as opposed to counting or weighing ?...?. The other one is – well you may be aware that there are a number of publications today on what they call researcher influence and it is hidden biases and ?...? values that the researcher brings to the research process. Some people say that you can never really separate those, not one hundred per cent because people, scientists, are people and we are not ?...? so we bring a certain amount of qualitateness to the quantitative methods.

**Eric:** Sure, and I would agree with that general philosophy that you can't divorce yourself from your work no matter how effective you become and in some ways the work that I'm doing in terms of long-term population trends, it would be less easy for me to be biased by my perceptions because I'm dealing with fifty-year data sets. If the population goes from one hundred to a thousand over that fifty-year period, it's pretty hard to argue with. Let's say a physiologist doing some sort of experimental work that is less precise, or smaller sample sizes or something, it may be easier for those biases to manifest themselves in either the researcher or the writing up of the reporting. So I agree with the idea that you can't separate out those biases. We all like to think that everyone else might be but not me, but I think that's somewhat artificial as well. I would like to think, and I've not had any reason to doubt, that I've been able to be as objective as I can be in the analysis and reporting of my data. To some extent that would be reinforced by the peer review process in terms of I write something well at least two if not three other people who know something about the discipline see it before the editor says yes okay, we'll publish this. That in itself isn't necessarily a complete safety check. At the same time it would make it difficult to get any overly biased interpretations through the system.

**Elli:** Yes, it ensures that you have been objective.

**Eric:** ?...? the scientific process, when you write a paper or whatever, is that you document your methodology in such a way that somebody else can pick it up, almost like a recipe and theoretically - more so perhaps in chemistry, physics they would go through the exact same mechanism and process, that you have and get exactly the same results. That's not as easily achievable in biology simply because you're going to get life systems rather than a test tube - it's ?not one thing? if you had XY you're going to get something else. In biology it doesn't quite work that way. You're dealing with ?...? nature ?...? much more dynamic and ?...? system in biology than you are in a test tube.

**Elli:** That was one of the things that I was referring to when ?I was saying can? you describe the behaviour of animals because you could have a scientist, a biologist, observing some really bazaar behaviour of a colony of penguins and it may never happen again, hypothetically, most likely it will. Are those observations of that scientist then discredited because it can't be repeated.

**Eric:** No I think most people who have any knowledge of biological systems would recognise the fact, and would admit, that one of the hardest disciplines within biology, ?within life sciences?, is the behaviour of ecology simply because it's so difficult to quantify behaviour per se. There are so many different methods of recording behaviour and reducing what is a very complex interaction between an organism, other organisms, and its environment down to something that we can manage in terms of reporting. I think it would be difficult to dismiss on the other hand just because one person saw it and somebody else didn't, or the fact that it might not be repeatable. If something happens only once, the next question is 'is it biologically relevant' as opposed to just simply a quirky behaviour.

**Elli:** Perhaps also then a question that would also come in is, 'is it relevant as far as policy goes', because my understanding is that policy relies on trends rather than behaviour ?...?

**Eric:** Well it depends. If you're talking about policy when it comes to management and implementation of some sort of management regime, policy would depend on all aspects of science and the best available information. Going back to your question about subjective, or the qualitative science, in some ways you could almost argue that the application of the principle would be a

qualitative approach in the sense that, 'well we don't have enough information at the moment to say no, but let's just err on the side of caution and say no, until we're shown that you don't in fact need to do this for whatever reason'. I think there's already within the system a recognition of the role or the contribution of qualitative science, however you want to define it into some sort of application of the precautionary principle.

**Elli:** I think that is a good example because also, I don't know the actual fine print of the definition of that principle, but my understanding is that while it's nature saying to scientists, use your common sense and be careful. That is not something that is necessarily – it's something that will depend on ?...? ?...?

**Eric:** Sure, and it's not just applicable to scientists, it's applicable to anyone who wishes to incorporate it – be a manager, an operator of a tourist operation, be it an operator or an aircraft, or whatever. It's easy enough to get you the exact wording of the precautionary principle but essentially it says that 'don't let the absence of information about future impact or something stop you from allowing it to go through'. So you err on the side of caution and just say 'don't include it', up until such time as you've got better information, and it may be that you never get that information that you need to answer a question unequivocally. In the meantime you can apply the precautionary principle, which in many ways is probably just a gut hunch / common sense in terms of the contribution it can make to, as I said, not just to scientists but management policy or any aspect.

**Elli:** It would be interesting to see what role that principle is going to play in the future.

**Eric:** I think it's still there. When you look at the various treaty instruments, the various papers and protocols that exist now within the Antarctic treaty system, there's still a relatively robust manifestation of the precautionary principle both at a formal level in terms of the wording of the documents. It's been around long enough now in the Antarctic treaty system that most countries probably have some sort of incorporation of the precautionary principle built into their own system anyway.

**Elli:** Okay, question No 5: Do you have any thoughts on the idea that spiritual insight and wisdom should play, or does already play, an active role in contemporary scientific research such as physics and biology?

**Eric:** As far as I'm concerned it plays no role in my work whatsoever. One of the lessons I learnt when I was in the States doing my PhD was that if you can argue successfully in terms of conservation or some sort of concern, then you have to have the best possible scientific information. That's the thing that's going to stand up to scrutiny. If you've got a forty-year data set that shows such and such a trend or not or whatever as the case may be, it's very difficult to argue with a forty-year data set. Whatever motivation it is that drives people is fine in terms of the motivation ensuring that people maintain an interest or an involvement in but for me there is no role for the spiritual or any sort of, if you like, non-scientific component. At the same time I recognise that it's there and I suppose, to some extent, you ask just a hundred people if they go to the Antarctic for the first time, what their motivation was or what drove them to do it.

**Elli:** Yes okay. Just very quickly, some people say I should have put wisdom ?...? because it's ?...? spiritual insight but not necessarily spiritual wisdom – wisdom on its own. Do you think that wisdom on its own plays a part?

**Eric:** It's hard to know because you could almost guarantee that if you ask a hundred people you'd end up with a hundred different reasons for going down and it may be that you might get a more interesting or more diverse response from the people who have gone down to the Antarctic as part of the humanities program for example. Some of the writers and the painters and the sculptors and whatever who are coming at it from a completely different perspective and somebody like me who you might think of as a scientist who's going down there simply to collect numbers or samples or something like that. It may be that their motivation is either broader or has a more complex makeup to their motivation than somebody who's going down there to collect scientific information.

**Elli:** So you don't see wisdom as being part of your scientific process?

**Eric:** No, for me I'm trying to remain clinical in what I'm doing. There is a potential for somebody who's got experience in another system and comes in sideways into the Antarctic and the insight from somewhere else is a useful contribution to advancing science in the Antarctic, or it may be that they'd worked in another part of the Antarctic and they've come to work with the Australians of some ?...? like that. There is potential there for – and sometimes, yes you have those light bulbs overhead flashes of insight that come from life experiences. I suppose you have to put that under the heading of wisdom as well. I don't know how often something like that happens so whether it's an abstract concept or whether it's a real potential, I don't know.

**Elli:** Yes, and I imagine that people define the way wisdom is ?...?

**Eric:** Indeed. I agree, yes. Getting back to the spiritual insight, I don't know. For me I suppose my wisdom in the sense that I try read and be aware of what else is being done around the Antarctic so that if something has happened somewhere else and the same thing is mirrored say in my work I might say, 'well okay there's a parallel here', so then I suppose in that sense you've got that element of wisdom as well – broad information base or some such wordage, I don't know.

**Elli:** Yes, well I've heard that word defined ?...?

**Eric:** Okay.

**Elli:** Question No 6: What do you think the goals and values are that are most prominent in your work culture at the Australian Antarctic Division?

**Eric:** . Obviously, as a research organization at the University of Tasmania, there are very high goals in terms of the quality of the research, the quality of the work that's produced and the reporting and things like that. In that sense, because I am an affiliate of the University, I subscribe to those goals in the sense of the quality of my work,.

**Elli:** With respect to what you've said at the beginning of the interview that you can only answer for yourself, you can't really answer for other people, so what I'm going to ask you now you may wish to ?...? I was going to say, do you think that there are goals and values that are prominent amongst Antarctic scientists that are *not* for example written up in the mission statements or official ?...? of the organization.

**Eric:** Again, I think this would be a function of the people that I interact with on ?...? trips and the people that I work with in the course of my work. I am a biologist and a sea bird ecologist and the people that I interact with are other biologists and to some extent biology, and particularly the birds, are among the most ?prominent? parts of the landscape in the Antarctic. Obviously the ice and the ocean ?is? but in terms of the biota of the Antarctic birds would be amongst the prominent and the most widely distributed. So the people that I interact with are people who have shared common interests and involvement in ?bird? research. I think for the most part, with very, very few exceptions, there is very strong feeling of conservation ethic in the work of these people. Birds are recognised as a very good indicators of the state of health of their environment and globally twenty per cent of the species of birds on the planet have a conservation status, so we're getting a very strong message that things are not well with planet earth and we're getting the message through the birds. I think, partly by the nature of the people working on birds and partly because, at a personal as well as a professional level, there is a very strong conservation ethic in the research that's done by ?others? in the Antarctic. I don't think that that's necessarily something that's scripted into ?staying? in their host organization institution, I think it's something that is that little bit extra of a personal commitment above and beyond the professional involvement. It may simply be that that perception is a result of my interactions with the people that I interact with but it's something that has been reinforced now on and off for the best part of twenty years in terms of the meetings that I go to, the informal discussions I have at these meetings and knowing these people at a personal level, not just at a professional level, as Joe Blow giving a talk at an international meeting, but I also know that Joe Blow has a very strong research interest and conservation flavour to his or her work and that's manifested through their students.

**Elli:** You're saying it's been reinforced for the last twenty years means it's encouraged in scientists.

**Eric:** No, my perception has been reinforced by ongoing interaction with these people and interaction with their students, interaction with other colleagues, so all the time it is a reinforcement of my perception that there is this conservation ethos.

**Elli:** Alright, I'll ask you another question later ?...?. Question No 7: do you have any thoughts on the process of peer review as a means by which to ensure rigour in Antarctic scientific research?

**Eric:** I mentioned already before in the interview about the role of peer review in terms of ...

[END SIDE A]

**Eric:** ... the work is deemed to be legitimate. If I was going to be a little bit more cynical I'd say that it's not a hundred per cent foolproof system obviously and I think anyone who pretends that it is, is denying reality to some extent. In the most extreme example somebody could potentially nominate five of their best friends to be referees for a research proposal or for writing a paper or something. They know full well that they're going to get sympathetic reviews from their mates when the thing

goes out for review, be it a research proposal or a paper that's been submitted to a journal. I think the reality is, in most cases, the peer review process is working reasonably well. When there are the odd well advertised instances of scientific fraud or plagiarism or whatever, that they are relatively high profile and that they are sufficient, I would like to think, to discourage most other people from trying similar things, be it forgery or plagiarism or whatever, or fraud. I don't think it's a hundred per cent absolute but the fact that when there is instances of somebody claiming somebody else has perjured them or plagiarised them or stolen data, the system is pretty quick in responding. Simply because I think at the moment it is something that people are sensitive to and I think it's something that institutions have to be seen to be free of any question about the work. It doesn't have to be necessarily scientific research it can be humanities or whatever else ?...? whole question of research. I think in the absence of anything else I think it's probably the best system that we've got available to us to ensure some degree of checking.

**Elli:** Rigour?

**Eric:** It's not just rigour but it's also just – it's possible. Let's say the scenario ?that's? not far removed from reality. The discovery of the ozone hole only came about because somebody didn't believe the satellite information. The satellite data that showed the ozone hole but it then dismissed as a sense of error as opposed to being a real gap in the ozone layer. Conversely if somebody tried to publish something that was too far from the accepted mainstream I suppose there is potential that it won't get through the scientific peer review process. ?...? absolute but as I said it's the best process that we have available to us at the moment.

**Elli:** So would you say that it prevents really radical ideas or it filters them but it also allows a little bit of diversion from the mainstream for the purpose of ?...? so that science can grow and develop ...

**Eric:** Sure, peer review has two purposes. One is that it has to be sufficiently new to be worthwhile publishing. There's no point in publishing something that's already out there all over the place, except in some cases when we had things like review or synthesis articles where you just need to actually review/summarise a wide body of data into a single focal paper. Yes, it also has the role of making sure that when Joe Blow puts out a paper it ?...? ?...? that there is some way of checking that there is an element of truth in what's been written. There's plenty of examples where people have forwarded scientific hypotheses and theories that were shot down at the time but later proved to be correct. Is that an example of the peer review process being too rigorous? I don't know. The boundaries are fuzzy and you can't set hard and fast rules about what constitutes the peer review process and what is deemed to be acceptable or not. That's where the editor of whoever – let's say we're talking about a scientific paper, that's where the editor relies on the advice from two, three, four or five reviewers who say, 'is Joe Blow using illegal substances or is it something that we should publish'.

**Elli:** Yes, the lines are fuzzy. Okay. Question No 8: Have you ever considered giving up your professional position as a scientist for a simpler life and a simpler life here means renouncing material life for a life of austerity and spiritual self-realisation?

**Eric:** The answer is no. In answer to your question, because ...(sic). One of the rewards that I have of the work that I'm doing is that I'm seeing a tangible improvement in what I perceive to be the conservation status in the way the Antarctic is managed, under whatever ?...? ?...? The information I've collected, the advice that I've provided, the interactions with managers and policy-makers and whatever else, there has been an improvement or change in the way that we operate ?...? our activities down south. I would like to think that I could continue to have an influence in the way we do things. Similarly, some of the results of the work that I've done in Australia and in other parts of the world have seen changes in the government or landowners or whatever. There are changes in the way things are done, things are handled, things are considered and so there are tangible improvements or decreases in detriment as a compliment to various ?...? or birds or species out there. I see my contribution in the broad scheme of things to be one that I can provide advice that is having a positive impact on the environment around the place.

**Elli:** So ?...? ?...? do you then feel that it would – you're going to have to correct me if I'm wrong, ?...? putting words in your mouth – be counter-productive to renounce your position for the sake of taking on a spiritual ...

**Eric:** Not so much that it's counter-productive but I would not be able to achieve what I'm doing now if I wasn't involved as part of the system. Again, one of the lessons that I've learnt with time is that it's much easier to have an influence on the system from within rather than from without. If I were somebody who was not formally or informally part of the system but simply out there disconnected and having a perspective or a view or an opinion. I would have far less chance of having that considered or

implemented or even recognised. As I said right at the beginning that my research has a strong conservation flavour to it, but from a scientific perspective, by continuing my role as a scientist and conducting the research and writing it up that I am having, what I perceive and my feedback is, that it's a positive influence on the conservation status of management or whatever, not just the Antarctic environment, but as I said also for Australia.

**Elli:** Would it be correct to say that your work 'reflects' on '...?' deeper meaning ...or work in '...?' conservation [*indecipherable*] ... because you're using it as a '...?' against renouncing material '...?'

**Eric:** Indeed.

**Elli:** Not going into the spiritual but meaning within '...?' purpose perhaps.

**Eric:** True. Again I'm lucky in a sense that I'm able to do what I'm doing and have the ability to influence or to contribute to the decision-making process along the way. The line between my work and my non-work component is very blurred and so my students have similar interests and similar involvement and the work that I'm doing both here in Australia and down south, just internationally generally, has a very strong conservation flavour to it and trying to provide the best possible advice, the best possible information, so that we can make these decisions. Whether I would see that as a second layer on top of everything else to reinforce it or to add value, I've never consciously thought about it or made that sort of determination. I'm not sure that that's something that I would want to say '...?' ... to it 'but minimal? Even a few day's notice. It's the sort of thing that – I don't want to say yes or no, I don't know that not having that added layer, added meaning, would necessarily be detrimental to what I'm doing, or to my evaluation of what I'm doing anyway. At the same time '...?' I'm not particularly fussed if it is either. I'm relatively neutral on the idea without being too fussed one side or the other.

**Elli:** Alright, last question. As a scientist are you at all interested in whether or not species of Antarctic fauna and flora have, or are, a spiritual soul and can you explain your answer?

**Eric:** Okay, the question is 'am I interested' as opposed to 'do I believe'?

**Elli:** Yes. A number of people have jumped over the word 'interested' '...?' do you have an interest...

**Eric:** And I have no interest in flora or fauna having a spiritual soul. Again, do I answer that as a researcher or is it me as a person.

**Elli:** You as a researcher.

**Eric:** Me as a researcher. It's one of these intangibles that I have no way of being able to incorporate into a research program or anything like that. Whether I believe in it or not, or whether anyone else believes in it or not is – it's so hard to answer 'the?' question. The whole potential thing about a spiritual soul is an intangible and how it incorporates something that's as intangible as that into a research program or into a management plan or anything else and that makes it very difficult to deal with. I can see why people have jumped over the 'interest' and 'do you believe in' as the way that they read the question. I'm not interested in whether they have a soul or not, or any sort of spiritual 'entity?' awareness. It's not on my radar and when it comes to me thinking about the work that I'm doing because for me whether they do or not is immaterial to the work that I'm doing. It wouldn't change the work that I'm doing or my approach to the work that I'm doing.

**Elli:** So you think that a program within Antarctic biology '...?' set out to discover it, if Antarctic fauna do have a spiritual soul, do you think that would be not a good investment '...?'

**Eric:** It would be hard for me to see any system, be it a research organization such as a university or a government department, funding any such program and I think partly due to just public perception that it would be a hard program to justify.

**Elli:** One last little question before we finish up. It's actually in relation to question No 3 regarding consciousness during your working day. Would you say that the mode or that the condition of a scientist's consciousness can influence the results of physical work?

**Eric:** In terms of...?

**Elli:** In terms of, well [*indecipherable*] '...?'two different scientists? One scientist's consciousness was one hundred per cent focussed on what he was doing and he was motivated by using good science and doing it according to ethics and so forth, and scientist number two might be thinking 'Oh I've really got to get this work 'out of the way? I've got plans for this evening and as long as I get this project done I'm going to get a pay rise'. So you have a different what you might call a quality of

consciousness, a different mode of consciousness. Do you think that that might impact on the scientist's work.

**Eric:** I think it's impossible to say that it doesn't simply because we are humans. Whether it's as overt as that or as extreme as that or whether it's just simply the fact that so many people really work long hours down south and it's really easy to ?...? just because the days are potentially twenty-four ?daylight? so there's no queues to go to bed, to stop working. Very few people work to the clock when they're down south and so it's very easy for people to really push themselves to the limit and beyond. So consciously or unconsciously if something like that were to happen where you have a different mindset to the work that's being done I think it's more likely to be an unconscious manifestation or result of effort that's gone in rather than somebody looking at the clock and saying, 'I've done ?a lot of? hours for the day and I'm off to the bar to have a few drinks'. Again, my experience is limited only to Australian stations and it may be that it's different on other stations. My experience on Australian, Norwegian and American ships going down and back is that the work ethic is the same. People put in very long hours to make sure that the work gets done, they're conscious of the fact that you might have a bad weather day tomorrow or whatever else and that every effort is made all the time to get the best quality data that's possible from the ship or the researchers or whatever else. Within the limits of experience my feeling is that it's likely that sort of mindset would be a by-product of previous over-exertion and over-effort to get the best done.

**Elli:** Do you think that perhaps ?...? ?...? itself could result in ?a mode? of consciousness ?...? ?...?

**Eric:** People generally when they go south really work their butts off. They really put in the effort. I suppose the phrase is they work hard and they play hard. They work really, really hard and work stupid hours. People put in long days, day after day of sustained effort. Then when you get a bad weather day or something else happens, they might ?party out? but they need to vent, because they build up so much pressure. Humans and the Antarctic is really one of the real – there's a ?...? pressure there. Not only are you a small community working in ?difficult? circumstances but there's just that other added layer, it's just that much harder to do anything. Here in Tasmania for example if you want to go out fishing it takes you ten minutes to launch a boat and get in the water and off you go. Down south it takes an hour and a half by the time you get all the gear together, the boats are okay, everyone's got all the right gear and everything else. Even the most routine, mundane tasks that you take for granted here, it's an order of magnitude and more difficult down south. A day out in the field collecting data - you might only need to be out there for three or four hours - it might take you eight hours by the time you step out of the red shed and get back into the red shed. So there's that added level of pressure, simply just from working down there.

**Elli:** So it's more demanding.

**Eric:** Oh, there's far more pressure on people. Not just the scientists, there's the support crews, everybody on the station is really, really working their hardest to make sure that everyone gets as much out of their time down south. That's from the station leader to the doctor to the guys working in the kitchen to the radio operators. Everyone's putting their one hundred per cent and to pretend that the mindset – you know people are going to be tired as they work long hours, of course at some point in time they're going to walk away but they are trying their hardest. As you say we're not robots, we can't just keep on going through the mechanics.

**Elli:** I'm aware that they try to ?...? out as much as they can any ?...? in scientists. I know this question is that people [*indcipherable*]

**Eric:** The ?...? yes.

**Elli:** [*indcipherable*] ... to try and see if people [*indcipherable*]

**Eric:** Yes and the ?scientists? ?...? to some extent. I mean they're not an absolute ?...? and again it would be easier ?...? if people – there's certainly instances of people who perhaps shouldn't have gone down or have gone down one too many times or whatever, but again you don't know that at the time and it's easy in hindsight to say well it was obviously one too many summers or one too many winters. You don't know, that's just it. People are people and what might be a good small group ?...? just ?falls over? the next year, or somebody who was able to get away with ?...? in one year ?...? going to work the next year. There's an element of continuity and repeatability, but there's also an element of ?...? every year, simply because you've got a new combination of people at a location who have never been together before. Even if there's a commonality in previous experiences, the experiences that they're going to have that year is unique.

**Elli:** And also ?it obviously? involves ?...? expectations of people down there ?...? the working culture would also change. ?I know? looking back through the decades how ?...? people behave in the Antarctic [*indecipherable*]

**Eric:** Sure, but at the same time also those changes that are happening down south are also reflective of the changes that are happening in society here. In western societies now there's a far higher degree of environmental awareness than there was even twenty years ago and so that is paralleled with a greater level of environmental awareness down south. We're much more conscious of the potential impact of ?...? in the environment than we were twenty years ago. In that sense there is an element of parallel going on between what's happening in society in Australia and what's happening down south. I know that people have talked about stations being a ?micro....? down south and to some extent that analogy is true but to some extent it's not. You don't have the gender balance, you don't have the background ?...? that you do in Australia and you can find the ?...? You can ?go walking? so far before you have to stop and turn around and come back, whereas here at least you can keep going until you choose to stop. There's obvious parallels, there's obvious contrasts where the analogy just falls over because it just doesn't work. That's the fun thing about the whole lot of it.

**Elli:** Thank you very much.

**Eric:** A pleasure.

[END OF TAPE]

## 21. Wright, Simon (AAD)

start of tape:

**Elli:** This is interview No 15 with Simon Wright, biologist at the Australian Antarctic Division. Simon, can you start by explaining how your research fits within the broader umbrella of Antarctic research and how your position within the program fits.

**Simon:** Okay. I'm a Senior Research Scientist in the marine microbial ecology group within the biology section and I'm mainly looking at distribution and abundance of phytoplankton in the Southern Ocean. I've been doing it for more than twenty years. The emphasis of the Southern Ocean work has changed somewhat. When I started the main interest was in how much food was available for krill and other zooplankton. Then it was greenhouse related. Then there was interest in the UV impact from the ozone hole. These days, because we recently joined the ACE CRC as staff members, we're a hundred per cent focussed on the goals of the ACE CRC. I'm seventy-five per cent in CO<sub>2</sub> flux program and twenty-five per cent in the Antarctic marine ecosystem program. Throughout all that we've been doing pretty much the same sort of thing - that is defining the abundance of phytoplankton populations and what controls their abundance - looking at control by nutrients, light and oceanographic conditions. We're also interested in control by grazing by zooplankton and microheterotrophs. All of this is done in collaboration with other groups of course.

**Elli:** Okay, thank you very much. So you're actually working for the ACE CRC but you're situated in the Antarctic Division.

**Simon:** Well, both. I'm an Antarctic Division staff member, but as part of the ACE CRC, certain of us here were nominated as staff for that as well, so we're paid by the Antarctic Division but on the books up there as well.

**Elli:** Okay, thank you very much for that. I was talking to someone the other day - it would be good have a ?...? ?...? how all the different organizations fit in with all the different programs. I know that within Hobart there's a ?lot? of organizations that have programs that inter-link with ?...? scientists.

**Simon:** Indeed. [*indecipherable*] . I should mention also, as part of that, we've got a collaborative program with CSIRO and the French program. We're doing repeat monitoring of the ocean, the plankton and carbon dioxide between Hobart and Dumont d'Urville along the same cruise path, getting up to eight crossings per year, sampling from the French ship *Astrolabe*. It's something that we've never been able to do from the *Aurora Australis*.

**Elli:** Why?

**Simon:** Because they don't go the same route. When the *Aurora* leaves Hobart it goes basically anywhere around the Southern Ocean whereas the *Astrolabe* does the same cruise path there and back several times each year.

**Elli:** Okay, so that allows you to do that ?...?. Alright so it's quite a ?...? people and facilities.

**Simon:** Yes.

**Elli:** Alright, are you ready to start the questions?

**Simon:** Yes.

**Elli:** Okay. Question No 1: What inspires or excites you the most about being an Antarctic scientist?

**Simon:** Well, I guess the main thing is the feeling that I'm able to do something useful ?...? [interruption by phone call] . I got into Antarctic work by chance, it wasn't deliberately. I was interested in photosynthesis. Well, in fact going back a step, I started off in agricultural science because I didn't want to end up in a lab like my dad, but then I got seduced by biochemistry along the way and chose a project working on marine algae which seemed interesting. From that there was another easy sidestep into the Antarctic program when a job came up. I didn't choose to start in the Antarctic Division but I really enjoy working at sea and I think we're doing something globally significant. I'm quite happy to stay here.

**Elli:** So when you say global significant you mean the contribution of the science you do can make in terms of ...

**Simon:** Well I suppose the main significance is through understanding the carbon flux in the Southern Ocean. It's working towards, or providing data, for other people to do the modelling for ocean CO<sub>2</sub> flux and also the food availability for the ecosystem, that's the other side of the program.

**Elli:** With that knowledge, when you accumulate all those different parts of knowledge and put them all together, what's the purpose of it. Where does it fit into the bigger picture in Antarctic science?

**Simon:** Well, one half is providing information about the Southern Ocean food web. I should point out that the microbial components of the food web are about ninety-five per cent of the biomass, with whales – I forget what the figure is, it's certainly less than one per cent. Krill's only 1.2 per cent or something. The biomass of both phytoplankton and protozoan bacteria is so huge that their metabolism affects global climate and CO<sub>2</sub>, so understanding that is very important for understanding the world CO<sub>2</sub> budget. Also in terms of proposed fishing, well whatever fishing there is in the Southern Ocean, ?...? ?...?.

**Elli:** There isn't that much?

**Simon:** Well, apart from the toothfish, which I understand are being hammered. They're talking about a hundred million tons of krill...total stock. The biggest ever catch I think has been half a million tons a year. These days it's about a hundred thousand tons

**Elli:** Okay, so all this data ?...? ?...? policy.

**Simon:** Should do. My work isn't directly related to fishing policy like that. The microbial ecosystem is so complex that it's pretty much impossible to describe exactly. For instance, the phytoplankton alone there's more than four hundred species so there's no way you'd be able to describe them individually and their interactions. The approach we're taking is to try and define what type of communities that occur under what conditions and then to measure the bulk properties of those populations. We still need to identify the species to work out which population we've got in the first place. So the *Astrolabe* work is focussed on defining the changes in the populations and then the *Aurora* cruises will target the specific populations directly to measure the things like their primary production, their respiration and with other people their CO<sub>2</sub> flux and grazeability if you like.

**Elli:** Okay, well we sort of went a little bit off the question there. I think that's Question No 2 you've already answered. It's, can you tell me about your original motivations for becoming an Antarctic scientist?

**Simon:** Oh, yes.

**Elli:** I can't remember exactly what you were saying exactly ?...? You started off ?...?

**Simon:** Agricultural science and biochemistry. The job at the Antarctic Division was completely unexpected and out of the blue and I had no thoughts about working in the Antarctic before it came up.

**Elli:** Then it was 'there?'. Just quickly returning to Question 1. I assume you've been down to Antarctica.

**Simon:** Yes, eleven times or twelve, something like that.

**Elli:** So now that you've been down there and done the work, have you got other inspirations, apart from those that you had as a scientist before you got involved in the Antarctic program?

**Simon:** Well, it's a wonderful place to work. I don't actually get ashore that much mind you. I've spent two years at sea in total with only perhaps ten weeks ashore. That was fantastic, being in the marine microbial program, but there's not much opportunity for walking around the back blocks of the continent. You see a lot of fantastic stuff from a ship, wildlife and icebergs and scenery and I've taken a lot of photos.

**Elli:** Okay. Question No 3 – it's '...?' different one. Can you tell me anything about your own consciousness during your working day. In other words what usually goes through your mind during an ordinary working day?

**Simon:** Yes, that is a bit different. I suppose a lot of the time I'd just be concentrating on what I'm reading or doing without much background thoughts at all. Often there's time pressures and how to achieve these things that are required and frustrations of wasting time on administrative stuff. From time to time an odd inspiration about things that might be happening in the ecosystem and re-checking that or ideas of better ways of analysing things.

**Elli:** More challenging scientific things?

**Simon:** I suppose I've made a lot of my reputation on method development. I'm always thinking about ways of getting more information more easily. It takes a huge amount of time for me and the people I work with to get the data together.

**Elli:** So time constraints is one thing and the inspiration '...?' developing the methods.

**Simon:** I don't get that much time for actual contemplation while I'm at work. I suppose those sorts of things sometimes happen at weekends or in the middle of the night or whatever.

**Elli:** Just while we're on this question. Would you say that the consciousness of a researcher – say if you had two researchers and they had quite different consciousness, that that could produce different results in scientific research?

**Simon:** Yes for sure. Choosing the questions, interpreting the data is always subjective – not so much in the interpretation of specific data but certainly choosing the questions to be addressed and it refers both to different personalities but also depending on backgrounds. I've been trained in biochemistry and have a reasonably good ecological background from my agricultural science. Other people come in with a more straight zoological or botany background and they have a different way of looking at things and together we tend to get a diverse approach to looking at particular problems. I think that's one of the good things about collaborating with people - more than one mind on the job.

**Elli:** Yes, of course these days there's quite a bit that's been written on what they call researcher influence, which is '...?' '...?' that says that the researcher always '...?' '...?' hidden biases and subtle values to the scientific process that you can never really separate from that scientific process.

**Simon:** No. Having said that you can attempt to minimise that

**Elli:** Okay. Question No 4: In your opinion what role, if any, does qualitative science play in Antarctic science?

**Simon:** I'm not sure what you mean by that question.

**Elli:** Okay. Well two areas that I was thinking of when I wrote that question. One is that, for example, within biology – again it depends on the type of biology one is doing – but if one for example is trying to collect data on seal populations and penguin populations, one might observe the behaviour of seals or penguins and record that behaviour. '...?' something like monitoring the heart rates, which is quantitative. Then when it comes down to the behaviour of animals a part of that is definitely qualitative in observing the behaviour.

**Simon:** You mean a presence/absence of the behaviour - presence or absence of the behaviour.

**Elli:** It could be that or it could be descriptive. Again it would depend on the research design and there may be a quantitative factor involved within the qualitative research. Things like behaviour that are descriptive, that is one area - qualitative science. The other one I was thinking of was actually what I'd mentioned at the end of the last question where we had the qualitative researcher influence that becomes an integral part, or some people claim that it becomes an integral part of quantitative science,

because the scientist will always have some subjectivity. He or she can't separate him or herself from that subjectivity.

**Simon:** Of course a physicist would say the observer was part of the system

**Elli:** So do you have any thoughts on either of those two scenarios.

**Simon:** I'm still not sure exactly what you mean by qualitative. I mean descriptive I think, if that's what you mean, is always the first step before quantitative. Probably thirty years ago most of the stuff done by this group was mostly descriptive. Go into an area and say what types of things are there and what they're up to. Since then the approach has deepened I guess to measure things quantitatively.

**Elli:** I can give you one other scenario, one other thing that I've thought of. This is actually something that was brought up by one of my previous interviewees. He was saying that – and he's a scientist – he was saying that qualitative science actually underpins quantitative science because whatever quantitative science we do in Antarctic science, it has to be based on some hypothesis, or some research query, which has to be at least partially 'quantitative?'. We pose questions – how does the environment work, or what's the big picture here, or what makes this function. One could even take that to a deeper 'element? and say well what '...? philosophical underpin of current Australian Antarctic science or international Antarctic science. Of course a philosopher will argue that the whole thing is based on a particular philosophy and if we go into philosophy then we're definitely doing something that's qualitative. These are just my ideas on this. You might have your own understanding of a qualitative science 'as a qualitative? factors within research.

**Simon:** Well I mean if you're talking at the level of processes, yes for sure. It's important to know what processes are there before one can measure them. I agree wholeheartedly with that.

**Elli:** Okay, any more thoughts on that or shall we ...

**Simon:** No, leave that one.

**Elli:** Question No 5: Do you have any thoughts on the idea that spiritual insight and wisdom should play, or does already play, an active role in contemporary scientific research such as physics and biology?

**Simon:** It should. I'm not sure that it always does. I mean a purely material view would say that it's not necessary. I would say it's not actually not necessary for most of the work that we're doing. I think it operates more at the interface between the scientist and his work rather than the conduct of the work per se. In the approach to the work and motivation and interpretation I think, rather than the doing of it.

**Elli:** Right. So you think that if these things do play a part it shouldn't be necessarily part of the scientific process itself, but more the approach to science. Is that you mean?

**Simon:** Yes, well in fact I think it can't be an explicit part of the process because they're not measurable.

**Elli:** Well it can't be part of quantitative ...

**Simon:** Not even qualitative I think. It's hard. It would depend on which way you're looking at it of course. If you're dealing in ecosystem processes as I am it doesn't matter whether it's there or not any more than human population dynamics per se or individuals if you want to think a bit deeper. All the individuals have their own subjective view of things but that's unmeasurable and outside our frame of reference. That's not an appropriate level of understanding.

**Elli:** Do you think that that is because everyone does have their own individual subjectivity that that would make it too difficult to introduce it on another '...? level.

**Simon:** Well, on a scientific basis because it's not measurable. Anything you can say about it is subjective and two people looking at the same data can come up with widely different interpretations by means of differences between them and unverifiable so they're outside the scientific process.

**Elli:** If they're '...? '...? interpreted from that level.

**Simon:** Yes. Well I mean if you show a geologist and a creationist a fossil they'll come up with a completely different explanation for the same thing, not ultimately verifiable.

**Elli:** Interesting aspect. Alright, anything else on that.

**Simon:** I could go on for hours but '...?

**Elli:** Alright, we'll move on. We can come back to that if you think '...? Question No 6: What do you think the goals and values are that are most prominent in your work culture at the Australian

Antarctic Division, or scientists that you might associate with through ACE CRC or CSIRO? I should mention here, when I ask which goals and values are the most prominent I'm not specifically referring to the mission statement goals and values. That can sometimes ?...?

**Simon:** I suppose the main ones that we focus on day to day are the actual scientific goals that we've put forward to ARAC and through the ACE CRC. We've put together a program that addresses the sorts of areas that we think we can make a contribution ...

[END SIDE A]

**Simon:** ...and ?like I say? I'm pretty excited about those in a professional way. That's certainly the main driver. Personally I'm not driven by ambition for personal career path. I'm fairly happy doing the sort of thing I'm doing. I don't want to take on higher roles. As well as that there's the desire to doing quality work, make sure that anything I put into literature is correct. I suppose the higher level, which I mentioned earlier, is that what we're doing here is actually going to be useful in terms of making the world better in the long run to understanding the processes and hopefully making that knowledge available in time to stop the worst damage that might occur.

**Elli:** That particular last point that you mentioned, do you think that that is fairly prominent among scientists that they are thinking on that level that what they're doing may directly contribute to, what were your words ... making the world a better place?

**Simon:** I think so. I think there's probably two main drivers. One is that – making the world a better place – and then the other is following personal curiosity and interest, which is the main driver for a lot of people. You wouldn't do it for the money or the lifestyle.

**Elli:** You wouldn't?

**Simon:** Well, it's a standard line I suppose. Especially for younger, talented people. If you're after money you'd make a lot more in private industry than working for the government.

**Elli:** Okay. Question No 7: Do you have any thoughts on the process of peer review as a means by which to ensure rigour in Antarctic scientific research?

**Simon:** Oh, I think it's essential. Not only in Antarctic research, in all research ?...? Peer review, transparency. It's very easy to make mistakes or hang onto an idea that other people may disagree with or be able to put a different perspective on it. It's an essential part of the whole process.

**Elli:** Okay. So do you think it actually does ensure rigour or ...

**Simon:** I think it improves the quality. It certainly doesn't stop the bad stuff getting through and – I mean everyone knows about cronyism – people preferring colleague's work and I'm sure there's a lot of discrimination against third world researchers

**Elli:** So it's not perfect.

**Simon:** No, by no means but it's a good system in principle.

**Elli:** Okay. Question No 8: Have you ever considered giving up your professional position as a scientist for a simpler life and a simpler life here means renouncing material life for a life of austerity and spiritual self-realisation?

**Simon:** That's two questions anyway.

**Elli:** Well you can answer in two ?...?

**Simon:** Depends on whether it's been a good week or a bad week. I think the role of the scientist is actually impossible to do to the level one would like.

**Elli:** ?...? science ?...? level

**Simon:** Well, keeping up the literature is a full-time job, doing the research is a full-time job, having a family is a full-time job. There are not enough hours in a lifetime to do everything that's required. There's always a feeling of struggling to keep up with workloads and whatever. I often look at some friends who stop at 5pm and go home and forget about everything until the next day. By the same token I sometimes go home and *[indecipherable - interruption by telephone]* . So where was I up to, oh yes. I keep toying with the idea of a simpler life, but by the same token when the idea of retiring comes up I find that very difficult to deal with.

**Elli:** Why is that?

**Simon:** Oh well, I like what I'm doing. I mean, I would certainly like more leisure time, and I don't seem to take holidays either.

**Elli:** What about the actual factor in this of ...

**Simon:** Spiritual life.

**Elli:** Or renouncing, or should we say reducing material life, which I suppose would come – I mean if one was to give up one's position – then the income would either cut out altogether or drop significantly, so material would perhaps change.

**Simon:** ?...? ?stupid? I don't know what I want to do.

**Elli:** You don't know what you'd do if you were to give up your position.

**Simon:** I'd play music all day probably, I don't know. When I was a bit younger, I was inspired by the idea of spiritual development and all of that. At the moment there doesn't seem to be a time slot.

**Elli:** Okay, but it was earlier in your life ?...?

**Simon:** Yes.

**Elli:** Okay, alright. And austerity?

**Simon:** Well I'm all for reducing my ecological footprint if you use those terms. I try to live simply and recycle and eat ecologically sustainable food and all that.

**Elli:** So you could see yourself doing that but at the moment by the sounds of it you like to engage yourself in your activities, as you were saying before.

**Simon:** I've been a musician all my life, as well as a scientist and I've played in bands and I have toyed with the idea of being a professional musician instead of a scientist, but I don't think it would actually be stimulating enough – which is strange but by the same token I couldn't be a scientist a hundred per cent and give up music. I think there needs to be balances – more balanced than I am.

**Elli:** *[indecipherable]*

**Simon:** Yes.

**Elli:** Okay, the last question. As a scientist are you at all interested in whether or not species of Antarctic fauna and flora have, or are, a spiritual soul?

**Simon:** I'm certainly interested. I've thought a lot about this in earlier times. In fact when I got into biochemistry in the first place, one of the reasons I started on plants was I hated killing animals.

**Elli:** You hated killing animals.

**Simon:** Yes. I don't often think too much about killing single cell algae but sometimes I'm aware of it at least, when you see them under the microscope you're aware that they are living things trying to do their thing. I certainly don't believe that humans are qualitatively different from other animals and that we are unique in having a soul whatever that means. Several years ago I read two books in close proximity that made a profound effect on me at the time. One was by Pierre Teilhard de Chardin and he made a really good argument. He said that humans are conscious and creative and self aware, but humans are made of the same type of matter as the rest of the universe and therefore consciousness and creativity is an attribute of matter just as radioactivity is an attribute of matter. Not all elements are radioactive but the fact that some of them are radioactive shows you something about all of them.

**Elli:** So he was saying that consciousness and creativity – did he discuss whether the thought that they come from matter or that they are a part of the physical realm, physical ?...? – can you remember?

**Simon:** I don't know that he went into that, but anyway just making the point that it is an attribute of matter. The other book that I read at a similar time was by Fritjof Kapra and his idea was nothing in the universe existed as an isolated entity, it was all part of connected whole. If you put two ideas together, therefore consciousness is part of an inter-connective universe, and it puts some perspective on whether individual critters have souls or a consciousness. Whether that extends to the fact that rocks are sitting there thinking I'm a rock, I don't know. But I wouldn't dismiss it anyway.

**Elli:** Okay. Well that actually concludes that.

**Simon:** Okay.

**Elli:** Is there anything else that you can think of that you wanted to add to any of this?

**Simon:** No, I think I've probably said most of what ...

**Elli:** And you will get the opportunity to add something if you want to. I want to go to one thing. The very first question – what inspires or excites you the most about being an Antarctic scientist? – we kind of went more into the second question about the original motivation, so can I ask you to just summarise what you're main inspirations are about being an Antarctic scientist now.

**Simon:** In the present situation, feeling that I'm actually doing something significant, help the world in a wider sense, as well as working in an interesting part of the world with interesting, motivated people.

**Elli:** Okay, in that order or are they in no order, those two things.

**Simon:** Probably the order changes and I suppose at the highest level it would be feeling that I'm doing something significant or worthwhile. When we're actually going away there's a huge excitement in actually being out there and seeing stuff. On the day to day level a lot of it is just working with good people, being stimulated and supported.

**Elli:** Okay. Thank you very much for that. Sorry I had to go back there. Thank you very much.

**Simon:** My pleasure.

**[END OF TAPE]**

## APPENDIX N: Guna Designation of Responses to Interview Questions 1, 2, 3 and 9

TABLE N1: Demonstration of the Quantifiability of Responses to Interview Questions Using the Triguna

- The following responses represent a high degree of similarity with other interviewees' responses to the same questions.
- *Quantifiable* here refers to the capacity of responses to be clearly designated to a specific guna (or to a combination of specific gunas) for the purpose of later being totaled.

QUESTION NO.	RESPONSES	COMMENT
1. What inspires/excites you the most about being an Antarctic scientist?	I guess the place itself – the size and the unspoilt nature of a lot of it. I never get sick of being in the Antarctic. I never get bored by new surprises, new things you see there (Allison Appendix M, 10).	Attraction to material designations such as a specific geographical location is endemic to rajas guna. Being inspired by such phenomena is indicative of the desire for (extended) <i>sense gratification</i> . This response, clearly representing one of the three gunas, is therefore quantifiable.
2. Can you tell me about your original motivations for becoming an Antarctic scientist?	Personal achievement as well as – yes, personal achievement primarily. I mean obviously you need to have something to show for yourself in your life. It's where my life is heading and I was not totally happy with what I'd been doing before, essentially completely applied science to the point it was almost not science (Bowman Appendix M, 33).	<i>Ambition</i> and <i>career-mindedness</i> are both characteristic of rajas guna. This response is therefore easy to quantify.
3. Can you tell me anything about your own consciousness during your working day i.e. what usually	Well, it's more trying to get things done. We generally have a list, you never run out of things to do as a scientist. You are always thinking of something else and that's probably true of almost every job in its own way, particularly if you're motivated to work in it, and	Empirical scientific activities, as well as mundane materially orientated work activities, carried out with great endeavor, are all endemic to rajas guna. Work that leads to <i>stress</i> , <i>anxiety</i> and <i>frustration</i> is also endemic to rajas guna. This response is quantifiable.

goes through your mind during an ordinary working day?	sometimes it's the frustration of something that just has to be done (Burns Appendix M, 39).	
4. In your opinion, what role, if any, does qualitative science play in Antarctic science?	I think so. It's only because often the science is reviewed scientifically and so a view that you have to be supported by concrete data or some sort statistically verified data that you feel confident about. I guess that comes down to competence. It all depends on the field of science. In some areas researchers probably have to rely more on qualitative data than others. Microbiology is one that mostly relies on quantitative data (Bowman Appendix M, 35).	This response, as with most of the responses to this question, does not commit the interviewee to a particular standpoint on the relevant issue. Nor does the interviewee give any additional information that clearly represents one of the three modes. Therefore, this response, as with most other responses to this question, is not quantifiable.
5. Do you have any thoughts on the idea that spiritual insight and wisdom should play, or do already play, an active role in contemporary scientific research such as physics and biology?	To a certain extent by the time you come to publish something you hope you've reached that point in wisdom in it. You've analysed it and you've been through and you've thought about it for a long, long time... Spiritual insight for me doesn't play a part in the physics... Certainly in the work I do, no it's not a spiritual thing. There's a certain amount of spiritual feelings being in Antarctica. It's one of those places that actually does make you sit and think, but that's a personal thing not a scientific thing (Adams Appendix M, 5).	Whilst responding to this question in a fairly concise manner, the interviewee does not provide any information that is clearly representative of one of the three gunas. This type of response typifies most of the responses to this question. Responses to this question will therefore not be quantified.
6. What do you think the goals and values are that are most prominent in your work culture at the Australian	So I think the goals are the way that I expressed it for myself. I mean I see people that aren't actually doing science and wouldn't say they want to do science. I see people like Lloyd Simmonds who's the engineer. He puts tremendous effort in trying to get these boffins organised so we've actually got a system that's going to produce	This type of response to Question No. 6 is typical of other scientists' responses to this question. No clear answer is given to the actual question being asked, making it difficult to designate within the triguna. Responses to this question will not be quantified.

Antarctic Division?	more outcomes for the boffins, and we all admire him for his efforts there (Burns, Appendix M, 44).	
8. Have you ever considered giving up your professional position as a scientist for a simpler life ( <i>simpler life</i> here means renouncing material life for a life of austerity and spiritual self-realisation). Can you explain your answer?	Yes and yes. ... OK. I've interpreted it – it's not necessarily about becoming a monk - so by austerity, which is obviously the renouncing material goods, and spiritual self-realisation, I've interpreted that as going off sailing or spending more time snowboarding or something that I would enjoy doing and get an uplifting feel from. Yes, absolutely. I've thought about doing all those sorts of things (Riddle, Appendix M, 108).	Whilst the interviewee here gives a concise response, the response itself contradicts the meaning of the question being asked i.e. that a 'simpler life' here means renouncing material life and taking up austerity and spiritual self-realisation. Instead, the interviewee has interpreted the question in his own way. Renunciation of material comforts for spiritual pursuits is endemic to sattva guna, whereas giving up one's work duties for the sake of material enjoyment (snowboarding, sailing etc.) is actually endemic to tamas guna. This type of response was typical of many of the responses to this question, despite its meaning being defined within the question itself, and despite it being a closed-ended question. Responses to this question will therefore not be quantified.
9. As a scientist, are you at all interested in whether or not species of Antarctic fauna and flora have (or are) a spiritual soul? Can you explain your answer?	Oh, definitely. I've never been asked that before or thought about it, but certainly I'd be interested, and ...also have ... self-awareness, and if they didn't they'd be dead. ...Yes, definitely. I think incredibly interesting if you could find out. Put this microphone onto an Emperor penguin [laughter] (Robertson, Appendix M, 125).	This response clearly represents sattva guna, with the interviewee having a clear interest in whether or not Antarctic faunal and floral species have, or are, a spiritual soul. It is therefore quantifiable. As this response typifies many of the responses to this question, responses to this question will be quantified.

TABLE N2 (1-21): Guna designation of responses to Interview Questions 1, 2, 3 and 9

- Descriptions of guna characteristics are taken from the CGCG appearing in Appendix A
- The name *Elli* appearing within interview transcripts represents the interviewer/researcher.

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TABLE N2-1: Adams, Neil

INTERVIEW QUESTION NO.	QUESTION	RESPONSE	GUNA DESIGNATION OF RESPONSE	GUNA DESIGNATION CLARIFICATION
1	What inspires/excites you the most about being an Antarctic scientist?	In the initial instance it was actually going to Antarctica. It was actually just one of those dreams I've had all my life to go and experience what Antarctica is like ...the excitement was actually being in the Antarctic environment and the science was a way of getting there in the first instance ... I'll be honest, I'm not doing this for anybody else. My research has always been an intrinsic desire to know why, and is personally driven. The science I do has always been a personal pursuit.	RAJAS/ TAMAS	<p>Desiring to experience the Earth's natural environment through the material senses (seeing, touching, hearing, smelling, tasting, and perceiving) is predominantly characteristic of rajas guna. Whilst <i>sense gratification</i> is also inherent to tamas guna, within tamas guna it takes on a different form. In rajas guna, the individual seeks to extend his/her enjoyment of material phenomena under the conception that such enjoyment is somehow beneficial to the individual and to others.</p> <p>Within tamas guna, the individual engages in sense enjoyment that is directly destructive, such as the taking of intoxication, or engagement in violent activities which cause harm to the individual him/herself and often to others.</p> <p>Selfish desires, whilst endemic to both rajas and tamas gunas, is in this case situated within rajas guna.</p>

				Adams states that he is trying to be <i>honest</i> (a sattvic characteristic).
2	Can you tell me about your original motivations for becoming an Antarctic scientist?	The same answer. I guess the science was a means of getting to Antarctica. I mean I've always been interested in science.	RAJAS	<i>Knowledge gathered through the material senses</i> and desiring to experience the natural environment through the material senses are both typical of rajas guna.
3	Can you tell me anything about your own consciousness during your working day i.e. what usually goes through your mind during an ordinary working day?	The questions I'm trying to answer or the systems I'm trying to develop, are to assist forecasting and better understand our Antarctic atmosphere -so a typical day is actually looking at Antarctica from a remote sensing point of view.... I am a very task orientated person.	RAJAS	Mundane work tasks carried out within scientific research, based on empirical methodology, is endemic to rajas guna.
9	As a scientist, are you at all interested in whether or not species of Antarctic fauna and flora have (or are) a spiritual soul? Can you	Well, I've never had any other belief other than the fact that every living, well fauna anyway, as having a soul. Yes, they all do. I don't see any difference between myself and any other animal - although it depends if you're getting down to single cell organisms I suppose. Certainly in the higher vertebrates in Antarctica. I mean why wouldn't they. It's a fairly arrogant comment or view to	SATTVA	<i>Being interested in and concerned about spiritual matters</i> and cultivating <i>knowledge by which one undivided spiritual nature is seen in all living entities, though they are divided into innumerable material forms</i> , are sattvic characteristics. Whilst Adams questions the capacity of current science to accommodate research questions regarding the spiritual soul, he nevertheless has a clear interest in the subject matter (sattva guna).

	explain your answer?	have that we're the only ones with a soul. If we have one ourselves?. Plants – I haven't given that a great deal of thought. ... It's not something that I believe is open to scientific pursuit. ... There's a place for theology and there's a place for those sorts of questions but I don't think they mesh with science.		
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TABLE N2-2. Allison, Ian

Q. NO.	QUESTION	RESPONSE	GUNA DESIGNATION OF RESPONSE	GUNA DESIGNATION CLARIFICATION
1	What inspires/excites you the most about being an Antarctic scientist?	I guess the place itself – the size and the unspoilt nature of a lot of it. I never get sick of being in the Antarctic. I never get bored by new surprises, new things you see there.	RAJAS	Experiencing, and desiring to experience the natural environment through the material senses is endemic to rajas guna.
2	Can you tell me about your original motivations for becoming an Antarctic scientist?	It was the science and also science that was exciting. Science that involved some environmental, work involved work other than in a laboratory. ... It was also the attraction of the place itself and doing something other people weren't able to do.	RAJAS	<i>Gathering knowledge through the material senses and other characteristics affiliated with empiricism, and being attracted to material designations</i> such as Antarctica, are both endemic to rajas guna.
3	Can you tell me anything about	At the moment I guess I'm mostly making mental lists of what I've got to complete in	RAJAS	Engagement in <i>mundane</i> work tasks such as administrative or management tasks, <i>devoid of</i>

	your own consciousness during your working day i.e. what usually goes through your mind during an ordinary working day?	the time I've got. A lot of my work now is administrative and management and I very seldom have a chance to pause and think about some of the bigger science issues.		<i>consciousness of the higher spiritual purpose</i> of those tasks, typify rajas guna. Whilst tamas guna also represents the lack of awareness of higher ethical and spiritual purposes, Allison's response represents rajas guna due to his awareness being taken up with work demands.
9	As a scientist, are you at all interested in whether or not species of Antarctic fauna and flora have (or are) a spiritual soul? Can you explain your answer?	I guess I'm not interested in it because I haven't really thought about it. I have trouble with the whole issue of spirituality. That's probably because of the way I am. I'm not even sure what it means in people. They can be thinking about high level issues, largely abstract, and there's a role in that. I don't see a lot of difference between theology and some cosmology.	TAMAS	Being <i>uninterested in or unconcerned about spiritual matters</i> in characteristic of tamas guna.

TABLE N2-3. Barmuta, Leon

Q. NO.	QUESTION	RESPONSE	GUNA DESIGNATION OF RESPONSE	GUNA DESIGNATION CLARIFICATION
1	What inspires/excites you the most about being an Antarctic scientist?	Having never been to Antarctica, my virtual interest in Antarctica is that it's a place that has very special recent geological history ... some researching can only be done in Antarctica. ... That's the main reason for doing that research. If we could do it somewhere else that's better we'd do that.	RAJAS	<i>Adherence to mundane knowledge</i> , by which the individual speculates about the true nature of the material manifestation, is characteristic of rajas guna, whether relevant research be geology, physics, biology etc.
2	Can you tell me about your original motivations for becoming an Antarctic scientist?	I've always been more than vaguely interested in Antarctica, well not so much Antarctica but also some Antarctic islands ... I felt comfortable that we were doing meaningful science that could only be done there and for me that's always been a big part of becoming involved in that type of research. ... Yes, and also a big part of it is feeling that I'm not wasting the taxpayers money – it's not junket science. That's always been a very strong opinion that I have is that if you go to somewhere that's difficult logistically to work in, then you need to have good reason for going there.	SATTVA/ RAJAS	Concern about engaging in <i>purposeful work</i> that does not waste resources or takes advantage of others, is inherent to sattva guna. Empirical science dependent on specific material circumstances is typical of rajas guna.
3	Can you tell me anything about your own	What usually goes through my mind is how much administration there is to do and how's it going to fit. Yes, it's mostly stuff to	RAJAS	<i>Mundane</i> work tasks such as administrative or management tasks, not accompanied by consciousness of higher purposes typify rajas

	consciousness during your working day i.e. what usually goes through your mind during an ordinary working day?	do with trying to juggle the huge administrative load ... fourteen-month-old baby making sure that ? works stops? ?...? ... go and rescue from childcare. I'd like to say that there is some higher mental processes involved there.		guna.  Family life is ordinarily based on <i>personal and extended sense gratification</i> (wanting an enjoyable life with a nice spouse and children). Therefore, being preoccupied by such matters during one's working day is also characteristic of rajas guna.
9	As a scientist, are you at all interested in whether or not species of Antarctic fauna and flora have (or are) a spiritual soul? Can you explain your answer?	I just find aesthetically animals and plants really interesting and beautiful to look at and inspiring. ... There's a lot of copepods out there but they can be beautiful in their own right as well, but I stop short of calling that a spiritual connection or a connection that's as deep as the connection I feel for my wife and my family.	RAJAS	The inability to see that in every living being is a similar spiritual nature is endemic to rajas and tamas gunas. In Barmuta's case, this inability manifests within rajas guna due to his affection towards other living beings (even though he can not see their spiritual nature). Within tamas guna the individual is not affectionate towards others.  Being limited to meaningful connections only with one's own biological family, and not with all other living beings, is typical of rajas guna.

TABLE N2-4. Bindoff, Nathan

Q. NO.	QUESTION	RESPONSE	GUNA DESIGNATION OF RESPONSE	GUNA DESIGNATION CLARIFICATION
1	What inspires/excites you the most about being an	The things that have inspired and excited me about Antarctica, it's the issues of Antarctica and climate change, so that's one. The issues of water mass formation around	RAJAS	<i>Mundane</i> interests such as interests in the material composition and functioning of the material world, without such interests incorporating spiritual knowledge (sattva guna), is characteristic

	Antarctic scientist?	Antarctica and there's a question of climate change in those, and there's the issues of the very large-scale global circulation, which includes the Southern Ocean. ... the things that have motivated me is the science perspective, so whilst I've been eager to get hold of resources to address those questions, it is always more or less in the context of this underlying science.		of rajas guna. <i>Empirical research</i> is also typical of rajas guna.
2	Can you tell me about your original motivations for becoming an Antarctic scientist?	I've done it for my career perspectives ... The original motivations if you like were external to Antarctica. My motivations now would be much more embracing of Antarctica in a sense.	RAJAS	<i>Career-mindedness</i> and <i>ambition</i> are both characteristic of rajas guna.  Fondness of material designations such as a specific material geographical place is also inherent to rajas guna, representing a type of <i>extended sense gratification</i> . It is also affiliated with the rajasic characteristic of <i>knowledge that is dependent on mundane circumstances</i> .
3	Can you tell me anything about your own consciousness during your working day i.e. what usually goes through your mind during an ordinary working day?	I would say fifty per cent of what goes through my mind is about the tasks at hand, and that fifty per cent would be a kind of an administrative activity, unfortunately - science administration if you like ... I reckon about seventy per cent of my day is spent thinking about a bunch of tasks, ... Yes, they're driven by science.	RAJAS	Bindoff states that ordinarily, at least half of his consciousness is filled with <i>mundane</i> administrative work tasks, and with mundane scientific concerns, which are endemic to rajas guna.

9	As a scientist, are you at all interested in whether or not species of Antarctic fauna and flora have (or are) a spiritual soul? Can you explain your answer?	I'm not a biologist, I'm a physical oceanographer, so in a way I would have said that I didn't care, as a scientist. As a scientist I don't care.	TAMAS	Being <i>uninterested in and unconcerned about spiritual matters</i> is endemic to tamas guna.
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TABLE N2-5. Bowman, John

Q. NO.	QUESTION	RESPONSE	GUNA DESIGNATION OF RESPONSE	GUNA DESIGNATION CLARIFICATION
1	What inspires/excites you the most about being an Antarctic scientist?	I think when I first saw the advertisement for the position I first obtained in Tasmania, I was immediately interested in it. I thought 'Oh, it's Antarctica, that's interesting'. It would be something new to do from what I'd been doing before, so it would represented new experiences and, new opportunities. So that's really what I saw and felt. Subsequently I became more quite excited as I realised Antarctic science was such an open area, particularly from a	RAJAS	Bowman is inspired and excited about Antarctica itself, because it is interesting to him, meaning that it is somehow stimulating for his mind ( <i>sense gratification</i> ) (rajas guna). Bowman states that this includes the science conducted there, which is empirical research. Desiring to discover material phenomena through the material senses is endemic to rajas guna.

		microbiology point of view.. ... I suppose that's really what excited me was the potential for discovery, and it wasn't necessarily discovery from a commercial point of view it was the discovery in itself – pure and simple. You know, curiosity, what will be uncovered, what were the nature of the organisms etc. So that's what really drove me for the position I think.		
2	Can you tell me about your original motivations for becoming an Antarctic scientist?	I think those two questions to me are very closely related because I mean in the case of Antarctic science I didn't want to just go down there and see all the icebergs and penguins, it was more that I saw the opportunities. ... Yes, scientific discovery and sense of achievement that would come from the research effort ...Personal achievement as well as – yes, personal achievement primarily. I mean obviously you need to have something to show for yourself in your life.	RAJAS	Bowman's original motivations for becoming an Antarctic scientist were research discovery and personal achievement (rajas guna). Whilst he states that he didn't just want to experience the aesthetic Antarctic landscape, he did want to be part of some scientific discovery, which is another form of <i>sense gratification</i> (extended/ sophisticated sense gratification). Personal <i>career achievement</i> is also typical of rajas guna.
3	Can you tell me anything about your own consciousness during your working day i.e. what usually goes through your	Okay. I'll try and be honest. I mean it depends in the past it's probably different to what it is now, but generally speaking I sort of focus on a number of things I need to get done. So I concentrate on doing these set activities. Of course some things are interesting to do and some things less so - more routine. And of course then I am	SATTVA/ RAJAS	<i>Performing one's prescribed duties with determination, because they ought to be done, whether or not such duties are pleasing, is endemic to sattva guna. Honesty is also characteristic of sattva guna.</i>  Working hard, with <i>great endeavour</i> , for material pursuits or results, is endemic to rajas guna.

	mind during an ordinary working day?	always thinking about the things that need to be done. There always seem to be lots of things that need to be done and ‘Oh, I can’t do them today. I haven’t got the time.. That’s probably the primary concerns I have on a day-to-day basis. I don’t mind it and it’s not discomforting, it’s just a reality I have these things to do and I’m getting more and more things piled up.		
9	As a scientist, are you at all interested in whether or not species of Antarctic fauna and flora have (or are) a spiritual soul? Can you explain your answer?	I suppose, yes I would say I am interested in the sense that is there something more than just their nuts and bolts and how they behave. I mean is there something more that would be interesting ... You know they might have their own super-consciousness maybe, you never know. I mean when you’re doing science you tend to deconstruct things, try to take them apart in little pieces, so maybe eventually we will know so much that we should try and turn around to look at the bigger picture in the future.	SATTVA	<i>Being interested in and concerned about spiritual matters</i> in characteristic of sattva guna, as is the realisation that <i>greater knowledge</i> (the bigger picture) needs to be pursued. The sattvic characteristics <i>the pursuit of greater and real knowledge</i> and <i>careful study of the past and future</i> are both relevant.

TABLE N2-6. Burns, Gary

Q. NO.	QUESTION	RESPONSE	GUNA DESIGNATION OF RESPONSE	GUNA DESIGNATION CLARIFICATION
1	What inspires/excites you the most about being an Antarctic scientist?	That would be the science and the ability to do my science down there. The Antarctic division is probably the best place at the moment to be a scientist. The universities are under a lot of pressure to swap from what their original task was to being more a teaching institution and the CSIRO is under pressure to raise money outside and to make itself very industry related. I like the opportunities that Antarctica presents to let me do some scientific research in areas that interest me.	RAJAS	<i>Empirical science</i> is endemic to rajas guna. Concerns about industry and <i>economics</i> are also characteristic of rajas guna.
2	Can you tell me about your original motivations for becoming an Antarctic scientist?	I actually joined the Department of Supply as a cadet in my second year of university and it was because there was an advertisement for cadets for that and it mentioned the cosmic ray and upper atmosphere physics research in Antarctica and I applied for that because I'd remembered we had a visit when I was in ? Grade 10 and I always had in the back of my mind that was interesting and I knew a bit about Macquarie Island, so it was that that motivated me to join that and then I just had to fight within the Public Service as	RAJAS	<i>Empirical research</i> and <i>attachment to specific work</i> are both characteristic of rajas guna. Adventure in a <i>mundane job/career</i> , without such activities incorporating a higher spiritual and ethical purpose, is also characteristic of rajas guna, as the individual seeks to engage in different types of extended <i>sense gratification</i> .

		everything swapped and changed and I got flopped out of the department I was trying to hang for and I eventually got back across.... The adventure in a job and the fact that it was within my area, but more adventure in those days motivates you.		
3	Can you tell me anything about your own consciousness during your working day i.e. what usually goes through your mind during an ordinary working day?	Well, it's more trying to get things done. We generally have a list, you never run out of things to do as a scientist. You are always thinking of something else and that's probably true of almost every job in it's own way, particularly if you're motivated to work in it, and sometimes it's the frustration of something that just has to be done ?...? right to enable you to achieve something else.	RAJAS	<i>Working hard for material gain, to achieve specific results, with aims to somehow enjoy the fruits of one's work, is characteristic of rajas guna. Frustration and stress resulting from work is typical of rajas guna.</i>
9	As a scientist, are you at all interested in whether or not species of Antarctic fauna and flora have (or are) a spiritual soul? Can you explain your answer?	OK. I guess I don't get to that level in terms of I wouldn't express it in a religious context like you have. But is it something that I'm concerned about ... I would say, yes, without the religious context.	SATTVA	<i>Being interested in and concerned about spiritual matters is typical of sattva guna.</i>

TABLE N2-7. Church, John

Q. NO.	QUESTION	RESPONSE	GUNA DESIGNATION OF RESPONSE	GUNA DESIGNATION CLARIFICATION
1	What inspires/excites you the most about being an Antarctic scientist?	What inspires me the most about doing what I do – I probably don't describe myself as an Antarctic scientist – is sea level rise I think is an interesting scientific – a very challenging scientific – issue. It involves oceanography, understanding how the oceans work, how they interact with the atmosphere. It also involves other challenging components, the work with the glaciologists, work with ? terrestrial? people and it also has a direct impact on society. ... I guess I want to be part of the solution to some of the uncertainties, but I also want to have an impact of direct relevance to society as well.	RAJAS	<i>Gathering knowledge through the material senses, by which one speculates about the reality of one's own existence and of the world around oneself, without a higher spiritual purpose, is endemic to rajas guna.</i>
2	Can you tell me about your original motivations for becoming an Antarctic scientist?	Back in the early 1990s and the late 1980s even I became interested in the role of the ocean and climate, particularly the role of the ocean and climate change. The Southern Ocean was a key part of that. At that stage Australia had no Southern Ocean program, either in the Antarctic Division or CSIRO. We were keen in initiating such a program and an opportunity came along and we grabbed it.	RAJAS	<i>Gathering knowledge through the material senses and other characteristics affiliated with empiricism are endemic to rajas guna.</i>

3	Can you tell me anything about your own consciousness during your working day i.e. what usually goes through your mind during an ordinary working day?	The main thing is how do I deal with all this bloody email. ... I don't know how to answer this question. I guess I'm some sort of practical, down to Earth person. I have a huge international commitment. ... Yes, I'm on international steering committees, so balancing those with my obligations to my employer and actually producing results that are both relevant to science and to society and it's getting that balance and also there's also a family commitment ... I guess what drives me is getting the results but it's then a matter of balancing up all these competing demands, and I guess I'm not as efficient as I should be.	RAJAS	Church has indicated that he is <i>frustrated</i> by all his work commitments and responsibilities. <i>Stress, anxiety, misery and frustration</i> resulting from materially orientated work activities are all symptomatic of rajas guna, as are <i>family concerns/affections</i> . <i>Working hard</i> towards achieving materially orientated results is typical of work within rajas guna.
9	As a scientist, are you at all interested in whether or not species of Antarctic fauna and flora have (or are) a spiritual soul? Can you explain your answer?	No I have no interest in that question. I'm not that way inclined. ... I do believe conservation and biodiversity, whether it's Antarctica or anywhere else, is an important issue and we need to try and conserve biodiversity. But as to the spiritual aspects of your question I have no comment at all.	SATTVA/ RAJAS/ TAMAS	Although Church would like to see the environment <i>preserved</i> (sattva guna) the desire to intervene on its behalf through scientific efforts is endemic to rajas guna. Relevant sattvic characteristics include <i>the desire to maintain/sustain/preserve</i> . Relevant rajasic characteristics include <i>the propensity to manipulate and control material nature/lord it over material nature and adherence to mundane knowledge</i> .  <i>Being uninterested in and unconcerned about spiritual matters</i> is characteristic of tamas guna.

TABLE N2-8. Coleman, Richard

Q. NO.	QUESTION	RESPONSE	GUNA DESIGNATION OF RESPONSE	GUNA DESIGNATION CLARIFICATION
1	What inspires/excites you the most about being an Antarctic scientist?	I guess the main overlap with the science that I'm doing. My main thing in terms of science for the last 10 years I guess has been global climate change and I've been looking at that from the oceans, and also the cryosphere. So the ice sheets are really useful areas to study in terms being sensitive to climate change. Ice sheets are very sensitive indicators of any climate change. The excitement is the awe and wonder of the place having visited there I think. I sent back a comment, after the first flight down one of the rifts on the ice sheet, to the students and colleagues in Hobart and said 'well, if the helicopter crashes tomorrow I'm happy', because it was just an incredible experience.	RAJAS	<i>Gathering knowledge through the material senses and the desire to experience the natural environment through the material senses, are both endemic to rajas guna.</i>
2	Can you tell me about your original motivations for becoming an Antarctic scientist?	The original motivation for going into surveying was it was an outdoors job, challenging, you go to places that most people don't go to, kind of frontier type experiences, but it never turned out that way in terms of my initial career path ... . So when I came down to Hobart, there was certainly an opportunity for expanding my	RAJAS	Desiring to experience and enjoy material nature ( <i>sense enjoyment</i> ) and <i>acquiring scientific knowledge on the material body/material world</i> are both endemic to rajas guna.

		Antarctic interest ... I think it's both. The setting without the science would be interesting to see but the desire to go back all the time would diminish. I mean if you've seen a place once that's fine in terms of being a tourist, but in terms of trying to solve fundamental problems, it is the combination.		
3	Can you tell me anything about your own consciousness during your working day i.e. what usually goes through your mind during an ordinary working day?	If I was sitting here at Hobart and I don't have too much consciousness about what I'm trying to do for Antarctic work except make spare time to be able to do the research, which in my position at the moment doesn't happen too easily.... If you're down there, for us, you're just totally involved in doing projects and interacting with other people within the community and being able, if you like, to progress things in the optimum way with the other constraints that exist. ... it's task orientated, but you really try to make the most out of the science opportunities. ... If you look at it in terms of the projects that I'm involved with, they are consuming something like a million dollars, or a million and a half dollars of taxpayers money in terms of funding the logistics for the projects. So I'm very conscious of that and trying to optimise the science return and basically what you said you would do, you can achieve.	RAJAS	<i>Adherence to mundane knowledge</i> and related mundane work tasks are endemic to rajas guna. Working for <i>economic gain</i> or benefit is also endemic to rajas guna.

9	As a scientist, are you at all interested in whether or not species of Antarctic fauna and flora have (or are) a spiritual soul? Can you explain your answer?	<p>In terms of my work environment, being well away from flora and fauna, but having worked with a few scientists down there that have been doing seal studies and human impacts on animals, yes I think all creatures have a soul in some way and you can certainly see the effects of some of the behaviour of human existence on the animals. Their patterns of adaptability are certainly obvious.</p> <p><b>Elli:</b> Do you think that Antarctic biology programs should either perhaps research this aspect of animals or at least be mindful of this when they go ??? the animals.</p> <p><b>Richard:</b> Definitely I think so.</p>	SATTVA	<p><i>Being interested in and concerned about spiritual matters, and seeing all living beings as having/being a spiritual soul, are characteristic of sattva guna. The sattvic knowledge by which one undivided spiritual nature is seen in all living entities, though they are divided into innumerable (material) forms is also relevant.</i></p> <p>The sattvic characteristic <i>the pursuit of greater and real knowledge</i> is also present.</p>
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TABLE N2-9. Davidson, Gary

Q. NO.	QUESTION	RESPONSE	GUNA DESIGNATION OF RESPONSE	GUNA DESIGNATION CLARIFICATION
1	What inspires/excites you the most about being an Antarctic scientist?	Doing Antarctic science. ... The other thing about this in particular is that the science that you can do on Macquarie Island is very special in terms of its geology, so that's exciting too, that we're able to, I guess, be competitive with much more wealthy research programs who are working on the	RAJAS	<i>Gathering knowledge through the material senses and other characteristics affiliated with empiricism, as well as economic concerns, are typical of rajas guna.</i>

		ocean floor, because we're working on stuff that's brought up to the surface.		
2	Can you tell me about your original motivations for becoming an Antarctic scientist?	I've always looked at Antarctica and realised that a lot of my research interests are very much ore deposit geology focussed and for reasons of the Antarctic Treaty, it's never been a very likely thing that ore deposit geologists spend much time on Antarctica. We can make the case to go down there where we want to look at analogues, that we can then apply those lessons back onto mainland or more global problems.	RAJAS	<i>Adherence to mundane knowledge</i> and other characteristics affiliated with empiricism are endemic to rajas guna.
3	Can you tell me anything about your own consciousness during your working day i.e. what usually goes through your mind during an ordinary working day?	<p>I think you spend probably half your time planning for the next few days and if you're teaching then you find your teaching just saturates your time ... . I think it's fair to say that most people in a working day – or ?...? during a working day – you do spare a bit of time for thinking, 'how can I be involved in the rest of world outside of these four walls', especially on the weekend.</p> <p><b>Elli:</b> So Friday's are different.</p> <p><b>Garry:</b> Yes, Fridays are a bit more relaxed. Sometimes there's a lot more ?...? you realise you haven't done so much during the week that you wanted to get done. I find in this job it's quite a busy job. It is a consuming job and you need to keep on top.</p>	RAJAS/ TAMAS	<p><i>Mundane work tasks performed for results</i>, and/or for <i>economic</i> and other material gains, are situated within rajas guna.</p> <p>Being unable to focus on one's work duties, thinking only of the material pleasures that await one after work and <i>determination that can not go beyond dreaming</i>, are endemic to tamas guna.</p>

9	As a scientist, are you at all interested in whether or not species of Antarctic fauna and flora have (or are) a spiritual soul? Can you explain your answer?	Am I'm interested in it. I guess I haven't given it a lot of thought I have to say ... I do, nevertheless, have an empathy that they're down there copping this awful weather and these awful conditions day in and day out and we get to experience it in very short times. Whether that truly comes close to appreciating spiritual soul I don't think it would get that far, again because I'm not a religious person ... Yes, I'm certainly concerned – when you see an animal that looks damaged you think, do they feel pain and then that relates to sentience and at what level they appreciate that pain.	SATTVA/ TAMAS	Showing compassion for the suffering of others, including non-human living beings, is endemic to sattva guna. It is affiliated with the sattvic characteristics of <i>showing compassion towards others</i> and <i>knowledge by which one undivided spiritual nature is seen in all living entities, though they are divided into innumerable forms</i> .  <i>Being uninterested in, and unconcerned about, spiritual matters</i> is endemic to tamas guna.
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TABLE N2-10. Miller, Denzil

Q. NO.	QUESTION	RESPONSE	GUNA DESIGNATION OF RESPONSE	GUNA DESIGNATION CLARIFICATION
1	What inspires/excites you the most about being an Antarctic	I think first and foremost it's a challenging area to work so it brings the best out of an individual person in terms of the logistics of actually carrying out the science, the difficulty of achieving the mental focus	SATTVA/ RAJAS	Miller's concern about maintenance and sustainability of the material environment is typical of the mixed sattva and rajas gunas, in which the individual wants to see the environment <i>preserved</i> (sattva guna), but thinks that his/her

	scientist?	that's required to achieve it. ... I think the second one is that certainly in the applied context I always ask the question, 'what would have happened if CCAMLR hadn't been here'? ... So the feeling is that some of the work that you've done is used and it's used to make a very, very important environmental consequence.		intervention based on <i>mundane knowledge</i> will bring about such preservation (rajas guna).  <i>Gathering knowledge through the material senses</i> is endemic to rajas guna.
2	Can you tell me about your original motivations for becoming an Antarctic scientist?	I essentially picked a job that was out of the waste-paper basket, applied for the job and got it, and that was documenting some of the first, well the first scientific study since Challenger in the 1700s, marine fauna around the islands of Marion and Prince Edward in the south-west Indian Ocean and that went on for a year or two and then the institute I was working for got interested in, as the rest of the world became interested in Antarctic krill as a potential fisheries resource. I got involved in that for a couple of years and really loved it, then they wanted me back in the local fishery. I remained interested in Antarctica because I now knew where I wanted to go.	RAJAS	<i>Gathering knowledge through the material senses</i> is characteristic of rajas guna.
3	Can you tell me anything about your own consciousness during your	There are elements obviously of things like frustration and that's normally because either you feel you're not in control of the situation, or you feel someone's done something you wouldn't have done. ...	SATTVA/ RAJAS/ TAMAS	<i>Performing one's duties with great determination and enthusiasm, without wavering in success or failure</i> , is typical of sattva guna.  <i>Frustration resulting from work</i> is typical of rajas

	working day i.e. what usually goes through your mind during an ordinary working day?	However, my general consciousness of each day is exciting. I do find every day is something exciting presented to me and in that I always try and go back to the basic principles that I've trained on when faced with a problem I would much more take an analytical approach than a fragmentary one. ... I analyse what I'm doing and try and analyse the consequences of what I'm doing.		guna.  <i>Helplessness, hopelessness</i> or being unable to control one's situation is endemic to tamas guna.
9	As a scientist, are you at all interested in whether or not species of Antarctic fauna and flora have (or are) a spiritual soul? Can you explain your answer?	To me I think it's irrelevant because they have something and that's something that I'll always tried to understand. I may never, I may not have the tools to do it. If you call that spirituality, yes. Am I interested to find out what it is, yes. Will I – I don't know.	SATTVA	<i>Being interested in and concerned about spiritual matters</i> is characteristic of sattva guna.

TABLE N2-11. Morgan, Vin

Q. NO.	QUESTION	RESPONSE	GUNA DESIGNATION OF RESPONSE	GUNA DESIGNATION CLARIFICATION
1	What inspires/excites you the most	I quite enjoy doing Antarctic science It's interesting. I like it because it's research and it's fun doing research, There is a lot of	RAJAS	<i>Gathering knowledge through the material senses</i> is endemic to rajas guna. <i>Extended sense gratification</i> in the form of seeking to enjoy the

	about being an Antarctic scientist?	scope in Antarctic science. It's got all sorts of aspects. Also, fieldwork is fun – it has built-in holidays!		material environment (in activities such as holidays) is also typical of rajas guna.
2	Can you tell me about your original motivations for becoming an Antarctic scientist?	Well I needed a job, and this was a matter of falling into the right place at the right or wrong time, whatever you think. I really didn't make a conscious decision to become an Antarctic scientist. I really made a conscious decision I think to spend a year in Antarctica and because I'd done a science degree, it was going to be doing science ... But in the beginning there weren't any specific motivations. I certainly didn't seek to do Antarctic science. I really sort of got into it and found it was quite nice and enjoyable when I was in it, rather than wanting to do that.	RAJAS/ TAMAS	<p><i>Mundane occupation and mundane work</i> are themselves endemic to rajas guna, due largely to <i>economic prioritisation</i> underpinning the reasons for such work.</p> <p>Making important decisions based on convenience alone, or on what is easiest, <i>without regard for higher purposes</i> is typical of tamas guna. Making decisions without being conscious of one's actions, or their consequences, is also endemic to tamas guna. It is affiliated with the characteristic of <i>when one's higher awareness fails and finally disappears and one is thus unable to concentrate one's attention, one's mind is ruined and manifests ignorance and depression.</i></p>
3	Can you tell me anything about your own consciousness during your working day i.e. what usually goes through your mind during an ordinary working day?	I think the answer to this question is no.	TAMAS	Being <i>unaware</i> of one's own consciousness, or even just of one's own thoughts on a daily basis, is typical of tamas guna.

9	As a scientist, are you at all interested in whether or not species of Antarctic fauna and flora have (or are) a spiritual soul? Can you explain your answer?	Yes, I'm slightly interested in whether the whole thing is perhaps a system but no, I can't make any sensible comments on that question at all ... I don't think I'm really interested because I ... no, I can't make a sensible comment on that.	SATTVA/ TAMAS	<p>The interviewee first states that he is slightly interested in whether or not Antarctic fauna and flora have, or are, a spiritual soul (sattva guna).</p> <p>Then he becomes <i>bewildered</i> (tamas guna) and states that he has <i>no interest in spiritual matters</i> (tamas guna).</p>
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TABLE N2-12. Nicol, Steve

Q. NO.	QUESTION	RESPONSE	GUNA DESIGNATION OR RESPONSE	GUNA DESIGNATION CLARIFICATION
1	What inspires/excites you the most about being an Antarctic scientist?	<p>What we're trying to do is to answer some fairly fundamental questions about particular organisms, organisms that are being harvested commercially and how those organisms interact with that physical ?environment?. It's a very difficult thing to do and it's a field that developing rapidly and it has ?practical? outcomes. That's what really drives me on in doing this.</p> <p><b>Elli:</b> Okay, so the actual outcome and what you intend to do with it.</p>	RAJAS	<i>An insatiable desire for results; knowledge derived through the material senses; adherence to mundane knowledge; and acquiring scientific knowledge on the material body/material world (empiricism) are all endemic to rajas guna.</i>

		<b>Steve:</b> Yes, absolutely.		
2	Can you tell me about your original motivations for becoming an Antarctic scientist?	My motivation for becoming an Antarctic scientist, when I first worked at the Antarctic Division I worked on North Atlantic krill before, and so when there was a job available for a krill biologist working at the Antarctic Division it seemed an ideal job. It fitted exactly my experience, so that was the motivation to sort of work on something I was familiar with and work in an area where krill.	RAJAS	<i>Ambition</i> and the prioritisation of one's own <i>career</i> over higher purposes such as the want to serve and help others (including non-human species such as krill) is typical of rajas guna.
3	Can you tell me anything about your own consciousness during your working day i.e. what usually goes through your mind during an ordinary working day?	I find that, particularly when I'm working at the Antarctic Division, that almost my entire day is spent reacting to other people's wants and needs. There isn't a lot of time for consciousness, there isn't enough time to actually plan to do things. You end up responding to other people's needs, so if things go through my mind they're generally in relation to the last person who bothered me, the next person who's going to bother me, and if possible if I get a spare moment of time to actually try to do some of the research work as well. It's a very reactive mode that I'm in.	RAJAS/ TAMAS	Living in a 'reactive' mode is symptomatic of living in the lower modes of material nature. The individual is 'bothered' by others as he/she can not cope with the events surrounding him/herself. The rajasic <i>stress</i> , <i>anxiety</i> , <i>frustrations</i> and <i>misery</i> are relevant, as are the tamasic <i>helplessness</i> ; <i>hopelessness</i> ; <i>intolerant anger</i> ; and <i>impatience</i> .  Not having enough time for consciousness is also endemic of the lower modes of nature.
9	As a scientist, are you at all interested in whether or not	Not really, no. For science it's not a question as a ?...? study for a start. From a scientific point of view it's a non-starter and from a personal point of view I'd actually be	SATTVA/ TAMAS	First Nicol states that he is <i>not interested in whether or not Antarctic fauna and flora have, or are, a spiritual soul</i> , which is endemic to tamas guna.

	species of Antarctic fauna and flora have (or are) a spiritual soul? Can you explain your answer?	more interested to know I had one. I'm not entirely convinced that I do, so I shouldn't go out looking for it in krill ... it's a fantastic question but I don't know how you'd do it.		Nicol then comments that 'it's a fascinating question...' indicating that he does have some interest in the matter (sattva guna), although he is unsure as to whether or not it could be proved.
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TABLE N2-13. Ramm, David

Q. NO.	QUESTION	RESPONSE	GUNA DESIGNATION OF RESPONSE	GUNA DESIGNATION CLARIFICATION
1	What inspires/excites you the most about being an Antarctic scientist?	I guess I've always been interested in the marine science side of things, the Southern Ocean and being involved with the ocean and Antarctic because it's just such an extreme place, and essentially untouched. They're the key elements.	RAJAS	Seeking <i>stimulation</i> for the subtle material mind through empirical research activities is endemic to the rajasic characteristic of <i>sense gratification</i> . Being attracted to exotic material destinations is also typical of rajas guna, being affiliated with the characteristics of <i>material affluence and luxury</i> ; <i>sense gratification</i> ; and <i>attachment to specific material designations</i> .
2	Can you tell me about your original motivations for becoming an Antarctic scientist?	I guess it's partly circumstance. I was fisheries biologist before getting the position here. I was actually working up in Darwin on tropical fisheries. I'd heard of some of the work that was being done down here – The Antarctic has large scale, big fisheries which was appealing. When I saw the	RAJAS	<i>Career-mindedness</i> and <i>personal ambition</i> are situated within rajas guna.

		position advertised there was an opportunity to continue the sort of work I was doing but on a larger scale and in an area where there was little known.		
3	Can you tell me anything about your own consciousness during your working day i.e. what usually goes through your mind during an ordinary working day?	<p>Well to a large extent it depends on what I'm doing at the particular time. At the moment for example I'm developing some fishery reports so it's a lot of programming and thinking about ways to manipulate the data and what needs to be done. I'm a fairly practical person so thoughts usually extend to what I'm doing at the moment.</p> <p><b>Elli:</b> So sort of task orientated.</p> <p><b>David:</b> Yes. There are other issues that come up in terms of strategic thoughts but a lot of it's task orientated.</p>	RAJAS	Carrying out <i>mundane work tasks</i> and ordinary work tasks such as manipulating data collected from the material environment are endemic to rajas guna. Strategising and planning how to utilise material resources is also typical of rajas, affiliated with the rajasic characteristic of <i>the propensity to manipulate and control the material nature</i> .
9	As a scientist, are you at all interested in whether or not species of Antarctic fauna and flora have (or are) a spiritual soul? Can you explain your answer?	Yes, I'm interested. It's a question people ask. It influences the way people perceive not only Antarctic fauna and flora but all fauna and flora and charismatic megafauna and those sorts of things. It's something that comes into even the work I do in terms of the ethics of tagging animals or capturing animals. What you do influences their behaviour.	SATTVA	Ramm states that he is definitely <i>interested in whether or not species of Antarctic fauna and flora have, or are, a spiritual soul</i> , which is typical of the mode of goodness.

TABLE N2-14. Reid, James

Q. NO.	QUESTION	RESPONSE	GUNA DESIGNATION OF RESPONSE	GUNA DESIGNATION CLARIFICATION
1	What inspires/excites you the most about being an Antarctic scientist?	I suppose the most exciting thing about it was the idea of going to Antarctica and working there. I guess that was my main motivation.	RAJAS	Seeking to <i>stimulate the material senses</i> , through whatever means (including enjoying an aesthetic landscape) is typical of rajas guna.
2	Can you tell me about your original motivations for becoming an Antarctic scientist?	I fell into it by accident. I'd never set out deliberately to become an Antarctic scientist.	TAMAS	Making serious decisions on the basis of convenience, ease or material comfort is typical of tamas guna. The relevant characteristics are <i>acting whimsically, for no purpose</i> and <i>selfishness: the focus is on one's own immediate needs (perceived needs) and on one's own immediate pleasures and comforts</i> .
3	Can you tell me anything about your own consciousness during your working day i.e. what usually goes through your mind during an ordinary working	In an ordinary working day I might be teaching and a whole lot of admin. and not much research so it's hard to say what is going through my mind. ... Yes, time constraint's very huge. Just prioritising various things that you have to do.	RAJAS/ TAMAS	Dealing with <i>mundane work tasks</i> is endemic to rajas guna. Doing so <i>without awareness</i> of oneself or of one's own consciousness is typical of tamas guna.

	day?			
9	As a scientist, are you at all interested in whether or not species of Antarctic fauna and flora have (or are) a spiritual soul? Can you explain your answer?	I don't have any thoughts about that at all.	TAMAS	<i>Being uninterested in, and unconcerned about, spiritual matters</i> is typical of tamas guna.

TABLE N2-15. Riddle, Martin

Q. NO.	QUESTION	RESPONSE	GUNA DESIGNATION OF RESPONSE	GUNA DESIGNATION CLARIFICATION
1	What inspires/excites you the most about being an Antarctic scientist?	What I really do feel that what we're doing is very worthwhile. We do make a difference. Australia is the only country to have established a human impacts research program. It's the only country that has dedicated a significant part of its research effort to the question of reducing people's impact down there.	SATTVA/ RAJAS	<i>Action that maintains/sustains/preserves</i> is characteristic of the mixed sattva and rajas gunas, as the individual wants to see the environment <i>preserved</i> (sattva guna) thinking <i>mundane knowledge</i> such as <i>knowledge based on duality</i> will achieve such preservation (rajas guna). The sattvic the <i>pursuit of greater and real knowledge</i> is relevant due to the aims of the Human Impacts program, namely to learn how human beings can restrict their material desires

				to exploit the natural environment. The sattvic <i>control of the mind and the senses</i> is relevant.
2	Can you tell me about your original motivations for becoming an Antarctic scientist?	I went down there and fell in love with the place. That was my first experience working in the Antarctic. When I saw the description of this position, the Program Leader of Human Impacts, I saw that it allowed me to combine three of my main interests – one, working in the Antarctic, the second is the marine aspect, and the third is the clear applications side of things, so things worked there. ... after I had been exposed to it, the Antarctic setting certainly was a motivator but the prime motivator of my career has been doing something useful environmentally. A second prime motivator has been to do something that I enjoy doing on a daily basis.	SATTVA/ RAJAS	<p>Being motivated to maintain the wellbeing of the Earth, including non-human species, is typical of the mixed sattva and rajas gunas. Motivation to help others, rather than oneself, especially when such motivation extends to non-human species, is endemic of sattva guna, whilst the desire to control material nature is rajasic.</p> <p>Being motivated for the purpose of enjoying oneself, or from the <i>stimulation</i> that an aesthetic setting may give, comes from the rajasic characteristic of <i>sense gratification</i>. <i>Career-mindedness</i> is also endemic to rajas guna.</p>
3	Can you tell me anything about your own consciousness during your working day i.e. what usually goes through your mind during an ordinary working day?	<p>‘I wish I could clear up all this mess,’ ‘I wish I could set enough time aside to get everything properly filed and organised,’ and I know I never will. I wish I had more time to spend going into depth in certain tasks and the opposite to that of course is I wish there weren’t so many nagging urgent little things that get in the way of doing that.</p> <p><b>Elli:</b> So time constraint is one thing.</p> <p><b>Martin:</b> Time constraint is definitely, yes.</p>	RAJAS	<i>Mundane work tasks</i> and the <i>frustration</i> that comes from carrying out such tasks is endemic to rajas guna.

9	As a scientist, are you at all interested in whether or not species of Antarctic fauna and flora have (or are) a spiritual soul? Can you explain your answer?	If you could prove to me that they did I'd be fascinated. And yes I am interested in that as a general question, otherwise I wouldn't have thought about ? that other? relative ranking in any sort of spiritual ?league people? for Antarctic species as opposed to other species. Yes I would be interested but I have difficulty putting a context around spiritual soul. As I say I don't have a religious framework to hang it against. I think of the spirit as being perhaps self-awareness or consciousness or whatever, so that's one aspect and I don't believe an element of that exists beyond the body.	SATTVA/ RAJAS	<i>Being interested in spiritual topics</i> such as the spiritual soul is characteristic of sattva guna, as is <i>the pursuit of greater and real knowledge</i> . Riddle also states that he does not believe that a non-material element such as awareness or consciousness exists beyond the physical body. Such a perspective is endemic to rajas guna.
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TABLE N2-16. Rintoul, Steve

Q. NO.	QUESTION	RESPONSE	GUNA DESIGNATION OF RESPONSE	GUNA DESIGNATION CLARIFICATION
1	What inspires/excites you the most about being an Antarctic scientist?	I guess what really excites me about the kind of science that I do is the fact that the climate system is this amazingly complex and vast system where the ocean and the atmosphere and the ice, plants on land, soils, marine organisms are all interacting with each other to determine the climate that we experience on land, in our day to day life.	RAJAS	Knowledge attained through empirical research, comprising <i>mundane information</i> on the interaction of material elements, according to material causal factors (i.e. material causes only within the material realm), is typical of rajas guna.

2	Can you tell me about your original motivations for becoming an Antarctic scientist?	Before I was a physicist I was a geologist and then I realised that I was mostly going into geology because I liked being out on mountains and glaciers and outside.	RAJAS	Being motivated to act as a result of the <i>material senses being stimulated</i> by aesthetic material phenomena, such as picturesque mountains and glaciers, is endemic to rajas guna. So is <i>gathering knowledge through the material senses</i> .
3	Can you tell me anything about your own consciousness during your working day i.e. what usually goes through your mind during an ordinary working day?	I suppose when things are good it's completely absorbing. That kind of level of concentration and being absorbed is really what's required to do it well. I think that's what probably what makes the more management job frustrating because there's a thousand different things happening at once and you never have a bit of time and space to really concentrate on any one thing at a time ?...? So consciousness-wise it leads to a kind of a scattered consciousness, which I don't enjoy.	RAJAS	Not being able to deal with whatever mundane work tasks that one is ascribed, resulting in scattered consciousness or <i>perplexity of the mind</i> , is typical of rajas guna.
9	As a scientist, are you at all interested in whether or not species of Antarctic fauna and flora have (or are) a spiritual soul? Can you explain your	I mentioned it in the nature of consciousness as a whole and it would be the question of how like or unlike humans are to other animals is also an interesting question. For the kind of science that I do, I'm not sure if that has much effect on my science because I don't work with animals basically, and I'm not sure that sea ice has a soul.	SATTVA	Rintoul states that 'how like or unlike humans are to other animals is <i>also</i> an interesting question', indicating that he finds the subject matter of Question 9 interesting (sattva guna). Considering the possibility of non-human entities within nature such as sea-ice as possibly having a soul, is also typical of sattva guna, in which the individual can see spirit, or the possibility of spirit, within all types of entities.

	answer?			
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TABLE N2-17. Robertson, Graham

Q. NO.	QUESTION	RESPONSE	GUNA DESIGNATION OF RESPONSE	GUNA DESIGNATION CLARIFICATION
1	What inspires/excites you the most about being an Antarctic scientist?	It's not just a matter of producing a scientific paper and a journal and forgetting about it. I don't really think about that so much any more. It's trying to take what we're doing... visualise it's application and management two years later.	RAJAS	Working with <i>mundane</i> data derived from <i>gathering knowledge through the material senses</i> is endemic to rajas guna.
2	Can you tell me about your original motivations for becoming an Antarctic scientist?	I was totally over the moon by the thought of doing ecological studies on a species like the 'Emperor' in the middle of the Antarctic winter because of the originality of the research ... Yes, that was the original. Yes I was working in Canberra when I saw an ad. for a '...wintering?' biologist with Emperor penguins and when I saw that job I would have walked over burning coals to get it I reckon ... It's an inspirational species of bird to work on, and the experience that goes with it.	RAJAS	<i>Gathering knowledge through the material senses</i> and acting on the basis of being attracted to the material aspects of living beings ([extended] <i>sense gratification</i> ) are both endemic to rajas guna.
3	Can you tell me anything about your own	It's trying to deal with things, get trials and experiments going, doing the paperwork and writing stuff up. The mechanical process	RAJAS	<i>Gathering knowledge through the material senses</i> is endemic to rajas guna.

	consciousness during your working day i.e. what usually goes through your mind during an ordinary working day?	from inside of doing the job that will ultimately lead to actual research work and manifestation of that according to the main objective.		
9	As a scientist, are you at all interested in whether or not species of Antarctic fauna and flora have (or are) a spiritual soul? Can you explain your answer?	Oh, definitely. I've never been asked that before or thought about it, but certainly I'd be interested, and ?also have? self-awareness, and if they didn't they'd be dead. ... Yes, definitely. I think incredibly interesting if you could find out. Put this microphone onto an Emperor penguin [laughter].	SATTVA	<i>Being interested in, and concerned about spiritual matters</i> in general is typical of sattva guna, as is seeing that non-human species also possess self-awareness and consciousness and are of a spiritual nature. The sattvic <i>knowledge by which one undivided spiritual nature is seen in all living entities, though they are divided into innumerable (material) forms</i> is also relevant

TABLE N2-18. Southwell, Colin

Q. NO.	QUESTION	RESPONSE	GUNA DESIGNATION OF RESPONSE	GUNA DESIGNATION CLARIFICATION
1	What inspires/excites	... the sheer difficulty of the projects I've had to take on, which were big scale, and	RAJAS	Being inspired by challenges posed by different material phenomena, for material purposes such

	you the most about being an Antarctic scientist?	working in such a remote area as Antarctica, but not just Antarctica, the pack-ice of Antarctica meant that anything at that scale that you try to do is really difficult and that is challenging and that does excite me.		as conducting empirical research, is typical of rajas guna. So is seeking stimulation from aesthetic geographical places like Antarctica. It is affiliated with the rajasic characteristics of (extended) <i>sense gratification</i> and <i>knowledge derived through the material senses</i> (empirical knowledge).
2	Can you tell me about your original motivations for becoming an Antarctic scientist?	I wanted to be out there being a scientist and I was stuck in the office being a bureaucrat ... It wasn't so easy, however, because it was a contract – four years – and my wife was settled back in Canberra and my kids were going to school and all of that ... It's not just working in Antarctica. In fact probably the motivation is changed now from what it was originally. Maybe it's the motivation not to be a bureaucrat again, that's strong enough in the knowing what I do well and don't do well and what I like and don't like, to realise that if I was doing that I would be really unhappy.	RAJAS	<i>Gathering knowledge through the material senses</i> is endemic to rajas guna. Being <i>attached to family</i> , and making important decisions according to one's <i>mundane</i> family situation is also characteristic of rajas guna. Being motivated to work in a materially stimulating place (an aesthetic and physically challenging environment) such as Antarctica is also typical of rajas guna.
3	Can you tell me anything about your own consciousness during your working day i.e. what usually goes through your	What usually goes through my mind. I guess I'm fairly driven in a way, internally, and I'm constantly setting myself goals and deadlines and things like that and that's often what I'm thinking about. I'm not thinking of just about doing that ?...? right now, I'm thinking of trying to get it done so it fits into this bigger picture of trying to get	SATTVA	<i>Working with great determination and focusing on the greater purpose of one's work</i> , is endemic to sattva guna. Working according to set schedules, and being able to stick to those schedules without stress or anxiety is also typical of sattva guna.

	mind during an ordinary working day?	things done. That's probably what's going through my mind most of the time, trying to piece all of that together in a planning sense, in most senses I guess.		
9	As a scientist, are you at all interested in whether or not species of Antarctic fauna and flora have (or are) a spiritual soul? Can you explain your answer?	I have had an interest and I explored that kind of interest around about ten years ago. It was that kind of stage where I was asking some of those kind of questions and read a bit. ... So I've had an interest in the past to explore that kind of thinking, but as a population and ecologists that kind of thinking doesn't have a part in a way in that even thinking of individuals, you don't think of them –... All I can say is I have been interested and I've explored that area at a certain time and stage when it was important for me, but it's not something that I would say I'm actively seeking better understanding of now.	SATTVA	As Question 9 asks about the interviewee's <i>interest</i> in fauna and flora having, or being, a spiritual soul, and not about whether or not the interviewee is currently pursuing that interest, Southwell's response is situated within sattva guna, in which <i>interest in spiritual matters</i> is located.

TABLE N2-19. Trull, Tom

Q. NO.	QUESTION	RESPONSE	GUNA DESIGNATION OF RESPONSE	GUNA DESIGNATION CLARIFICATION
1	What inspires/excites	I guess probably the idea that the southern ocean and other processes have global	RAJAS	<i>Gathering knowledge through the material senses</i> is endemic to rajas guna, as is being

	you the most about being an Antarctic scientist?	impacts are the main thing ... Yeah, interesting from the perspective of science.		inspired by material phenomena for the purpose of material goals.
2	Can you tell me about your original motivations for becoming an Antarctic scientist?	It's pretty much the same answer as the first question. I got into what looked like a stimulating field with science.	RAJAS	Seeking <i>stimulation of the material senses</i> , which includes the subtle material mind is typical of rajas guna.
3	Can you tell me anything about your own consciousness during your working day i.e. what usually goes through your mind during an ordinary working day?	Pretty mundane as probably assesses the list of tasks that I'm working on. I often have a voice in the back of my head saying you really got to get behind these little mundane things and consider where your science is going. It's pretty much work today kind of thing.	RAJAS	<i>Mundane work tasks</i> , without consideration of their higher spiritual purpose is endemic to rajas guna.
9	As a scientist, are you at all interested in whether or not species of Antarctic fauna and flora have (or	I don't have any interest in that. I guess I do want to qualify that by saying that I like my dog, and I believe that animals have social behaviours, they have social norms, they have moments of joy and moments of sorrow. So I recognise that animals at least - I don't know about plants - but animals at	TAMAS	<i>Being uninterested in and unconcerned about spiritual matters</i> , such as the spiritual soul of non-human living beings, is typical of tamas guna.

	are) a spiritual soul? Can you explain your answer?	least have consciousness and ?...? . I've always thought that was some of the stupidest bits of science I've ever heard of.		
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TABLE N2-20. Woehler, Eric

Q. NO.	QUESTION	RESPONSE	GUNA DESIGNATION OF RESPONSE	GUNA DESIGNATION CLARIFICATION
1	What inspires/excites you the most about being an Antarctic scientist?	My role and my thoughts of being a scientist aren't confined to the Antarctic. The same things that excite me about doing science in Tasmania or science anywhere else in Australia. The same things that excite me about being an Antarctic scientist, there's the potential for discovery and to learn something about the way the system works and in many ways to do the science that we need for management purposes or for conservation.	SATTVA/ RAJAS	<i>Gathering knowledge through the material senses</i> is endemic to rajas guna, as is applying knowledge derived therefrom to environmental management programs.
2	Can you tell me about your original motivations for becoming an Antarctic scientist?	I don't know if it was particularly the Antarctic or whether it was the opportunity to do research or whether it was a combination of those and something else, I don't know. The slide show was a pretty picture show. It wasn't geared up around necessarily wildlife or research or whatever.	RAJAS	<i>Gathering knowledge through the material senses</i> and <i>career-mindedness</i> are both typical of rajas guna.

		<p>It was one person's trip down south and visiting the stations and showing some of the landscape and the wildlife and by that stage I had all but finished an undergraduate degree in science anyway and it was just what to do with the next step. Was I going to do an honours degree, was I just going to go off and get a job and it was just a case of being in the right place at the right time and seeing the right thing. That was in itself enough to motivate me, or steer me, into doing a honours degree in zoology and its picked up since then.</p>		
3	<p>Can you tell me anything about your own consciousness during your working day i.e. what usually goes through your mind during an ordinary working day?</p>	<p>There's two types of ordinary working days. One is when I'm in the field in the Antarctic and the other is when I'm back here. The mindset is completely different obviously between the two and the two balance each other. ... My time here when I'm in the office is basically a function just dealing with the day to day commitments, deadlines, writing proposals, filling reports and providing advice of whatever for meetings or people needing information. ... Conversely, when I'm in the field I can almost, but not entirely, put all that stuff to one side simply because I'm on station somewhere or on a ship somewhere and not nearly as approachable or able to be involved in meetings or anything like that.</p>	RAJAS	<p>Whilst Woehler states that being in the office and being in the field represent two very different types of mindsets, they do not vary according to guna methodology. They both engage the individual in <i>mundane work tasks of gathering knowledge through the material senses</i>. Since the interviewee does not state that his consciousness is focused on the higher purpose of what he is doing, his consciousness during his ordinary working days remains within rajas guna.</p>

		It's two very completely different mindsets and the routines are completely different.		
9	As a scientist, are you at all interested in whether or not species of Antarctic fauna and flora have (or are) a spiritual soul? Can you explain your answer?	And I have no interest in flora or fauna having a spiritual soul. Again, do I answer that as a researcher or is it me as a person. ... It's one of these intangibles that I have no way of being able to incorporate into a research program or anything like that. ... I'm not interested in whether they have a soul or not, or any sort of spiritual ?entity? awareness. It's not on my radar and when it comes to me thinking about the work that I'm doing because for me whether they do or not is immaterial to the work that I'm doing.	TAMAS	<i>Having no interest in spiritual matters</i> , such as whether or not non-human beings have, or are, a spiritual soul, is typical of tamas guna.

TABLE N2-21. Wright, Simon

Q. NO.	QUESTION	RESPONSE	GUNA DESIGNATION OF RESPONSE	GUNA DESIGNATION CLARIFICATION
1	What inspires/excites you the most about being an Antarctic scientist?	Well, I guess the main thing is the feeling that I'm able to do something useful ... I got into Antarctic work by chance, it wasn't deliberately. I was interested in photosynthesis ... Well I suppose the main significance is through understanding the carbon flux in the Southern Ocean. It's	SATTVA/ RAJAS/ TAMAS	Wanting to do something useful or helpful is in itself endemic to sattva guna. It is affiliated with the sattvic characteristic of <i>executing actions that deserve to be performed</i> . The way in which such actions are actually executed may be situated within any one of the three modes.

		working towards, or providing data, for other people to do the modelling for ocean CO <sub>2</sub> flux and also the food availability for the ecosystem, that's the other side of the program.		<p><i>Gathering knowledge through the material senses, in which material data on the material environment is collected and processed to attain mundane knowledge on the material manifestation, is endemic to rajas guna.</i></p> <p>Making important decision based on convenience or chance is typical of tamas guna, being affiliated with <i>acting whimsically, for no purpose.</i></p>
2	Can you tell me about your original motivations for becoming an Antarctic scientist?	Well, it's a wonderful place to work. I don't actually get ashore that much, mind you. I've spent two years at sea in total with only perhaps ten weeks ashore. That was fantastic, being in the marine microbial program, but there's not much opportunity for walking around the back blocks of the continent. You see a lot of fantastic stuff from a ship, wildlife and icebergs and scenery and I've taken a lot of photos.	RAJAS	Being motivated by the material senses and taking pleasure in an aesthetic place such as Antarctica, is characteristic of rajas guna. <i>Sense gratification</i> is the relevant characteristic.
3	Can you tell me anything about your own consciousness during your working day i.e. what usually goes through your mind during an	I suppose a lot of the time I'd just be concentrating on what I'm reading or doing without much background thoughts at all. Often there's time pressures and how to achieve these things that are required and frustrations of wasting time on administrative stuff. From time to time an odd inspiration about things that might be happening in the ecosystem and re-checking	RAJAS/ TAMAS	Becoming frustrated by factors such as time pressures is typical of rajas guna, in which <i>frustration, anxiety, stress</i> and <i>misery</i> all result from mundane work activities. Dealing with <i>mundane work tasks</i> is also endemic to rajas guna. Doing so <i>without awareness of oneself or of one's own consciousness</i> is typical of tamas guna.

	ordinary working day?	that or ideas of better ways of analysing things. ... I don't get that much time for actual contemplation while I'm at work. I suppose those sorts of things sometimes happen at weekends or in the middle of the night or whatever.		
9	As a scientist, are you at all interested in whether or not species of Antarctic fauna and flora have (or are) a spiritual soul? Can you explain your answer?	<p>I'm certainly interested. I've thought a lot about this in earlier times. In fact when I got into biochemistry in the first place, one of the reasons I started on plants was I hated killing animals.</p> <p><b>Elli:</b> You hated killing animals.</p> <p><b>Simon:</b> Yes. I don't often think too much about killing single cell algae but sometimes I'm aware of it at least, when you see them under the microscope you're aware that they are living things trying to do their thing. I certainly don't believe that humans are qualitatively different from other animals and that we are unique in having a soul whatever that means.</p>	SATTVA	<p><i>Being interested in spiritual matters</i> in general is typical of sattva guna, as is the understanding that all living beings are qualitatively the same. The <i>distaste for killing or hurting animals</i>, as well as any living beings, is also a symptom of sattva guna.</p> <p>The sattvic <i>the pursuit of greater and real knowledge</i> is relevant through Wright's inherent interest in the spiritual nature of all living beings, even though he is currently not pursuing such knowledge.</p>

## APPENDIX O: Significant Statements by Interviewees According to the Vedic Triguna

- All descriptions of guna characteristics are taken from the CGCG appearing in Appendix A
- Significance has been determined according to the clarity of statements in representing one of the three gunas, as well as the overall prevalence of specific topics and their respective gunas within each interview.
- The name *Elli* appearing within transcripts represents the interviewer/researcher.

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*1. Adams, Neil: Meteorologist, Bureau of Meteorology*

There is one statement considered significant in Adams' responses to interview questions:

Certainly it would be nice some days to wake up and think it would just be nice to have a simpler life. I'm not sure about the austere part of it. I still want to put petrol in my motorbike so I can go for a ride somewhere and I guess that's materialistic. No, I quite enjoy researching and quite enjoy working and I don't think being a research scientist is necessarily materialistic. There's not much money in science. I don't think we're the richest people in the world, or the poorest. (Appendix M, 7)

This statement indicates that Adams, whilst having considered renouncing material pursuits, is attached to the lifestyle that his career brings. This type of consciousness is typical of rajas guna and is also quite prevalent within responses to this question by other scientists. The rajasic *sense gratification* and *attachment to material circumstances* are relevant. Adams states that he does not consider being a research scientist as materialistic, yet the science he engages in is 100% focusing on material aspects of material phenomena, using his material senses to acquire knowledge on the material environment. He also states that he does not consider the monetary income that his professional position brings as particularly gratifying. Adams' consciousness in this particular scenario is indicative of being influenced by the mode of passion, in which one symptom is that the individual never ceases to strive for more material gain, always considering what he/she has as being insufficient.

*2. Allison, Ian: Program Leader of Glaciology, Antarctic Climate and Ecosystems Cooperative Research Center/Australian Antarctic Division*

Allison addresses the issue of scientists becoming attached to their theories. The ability to observe one's colleagues' attachment to their own scientific theories (rajas guna) usually means that the individual him/herself, is aloof from such behaviour as he/she can objectively observe it. Such insight into the nature of the workings of the mode of passion is typical of predominance within sattva guna, whereas within rajas guna the individual can not recognise such attachment, nor realise its significance. The relevant sattvic characteristic is *steady, focused intellect* and *clear-mindedness*, as well as *being aloof from mundane and material circumstances*.

Another significant statement made by Allison addresses self-analysis, especially in the form of self-criticism, which is endemic to sattva guna. Such self appraisal is affiliated with the sattvic characteristics of *self-realisation*; *honesty*; and *humbleness* which may be considered as important for someone in Allison's position as the Program Leader for Australian Antarctic Glaciology. Allison states:

**Ian:** It's self-motivation and a certain amount of dedication and also along with that a self-criticism – checking and being careful of the work you do.

**Elli:** That's interesting. I haven't heard that mentioned – the self-criticism.

**Ian:** In that you have to be your own hardest critic I think, on a lot of the stuff you do. (Appendix M, 13)

### 3. Barmuta, Leon: *Freshwater Ecologist, University of Tasmania*

Barmuta states that it is very important to him to not waste taxpayers' money and that he needs to know that the science he conducts while in the Antarctic is for a very good reason:

A big part of it is feeling that I'm not wasting the taxpayers money – it's not junket science. That's always been a very strong opinion that I have is that if you go to somewhere that's difficult logistically to work in then you need to have good reason for going there. (Appendix M, 17)

This type of consciousness is characteristic of the mixed sattva and rajas gunas, in which the individual is conscious of the needs of the environment to be *preserved* (sattva guna) but thinks that *mundane* scientific intervention will keep the environment unspoiled (rajas guna). Relevant sattvic characteristics include *the desire to maintain/sustain/preserve* and *action that is responsibility to both material and non-material needs of others*. The relevant rajasic characteristic is *knowledge gathered through the material senses*, and other rajasic characteristics affiliated with empiricism.

When asked to define what he means by 'important science,' Barmuta replies that gathering evidence from different material phenomena such as ice-cores and sedimentary comprises such 'important science' because it leads to information on climate change. Such sources of knowledge, as materially sophisticated as they may be, are endemic to rajas guna, in which knowledge is derived through the material senses (empiricism). This progression of the desires of the individual, in which the desire to see the environment *preserved* (sattva) falls down to the level of rajas guna, when the individual thinks that the natural environment needs humankind's mundane knowledge to maintain itself, typifies within contemporary scientific approaches.

Later in the interview, however, Barmuta does stress the importance of scientists not just collecting pieces of information (data) but actually understanding how that information can be used, what it should and should not be used for and the importance of not identifying data on its own as comprising knowledge. Such insight indicates an influence from sattva guna, being affiliated with the sattvic characteristics of *responsibility* and *clear-sightedness*.

Another significant aspect of Barmuta's interview is that he uses the word *passion/ate* (rajas guna) seven times to describe his work colleagues and himself.

### 4. Bindoff, Nathan: *Oceanographer, CSIRO Marine Research/University of Tasmania*

There are three significant statements that need mentioning. The first is Bindoff's comments on the topic of doing science in the service of others. Bindoff affirms that the science he engages in (empirical research) is not carried out for selfish purposes, yet he does not consider it as a service for humankind, or any other kind of living beings. He states that:

it might be a bit glib to say in the service of mankind ... It's not selfish interest as such. ... Yes, so service is a slight distraction because that says that you're responding simply to other people's ideas and that you're not adding anything yourself. ... The things that excite me is the impact of Antarctica on the rest of the world, the rest of the globe, so my interest in Antarctica is to tease out how it affects the rest of the world. (Appendix M, 25)

These comments indicate that Bindoff is focused on making a contribution that is somehow different to that of others. He conducts science based on being excited by the workings of the different global ecological systems, but he is not interested in doing so under the umbrella of service for others. Such consciousness is typical of *rajas guna*, in which self-service and self-interests are pursued within the context of *sense gratification*, with little consciousness of the needs of others. The main goals of such pursuits are to satisfy the senses (including the mind) through interesting and stimulating projects.

The second statement is:

Austerity is perhaps the wrong idea in a way. Hard work, which is ecclesiastical-like very often, the rigor of work. Maybe that's a Protestant ethic I've just expressed, but the rigor of work and the discipline of work, plus interaction, is what's stimulating. (Appendix M, 30)

This statement also typifies *rajas guna*, in which it is not uncommon for the individual to treat his/her career as a type of religion, often based on the work ethic of hard work and great rewards (Miller 1996). Relevant rajasic characteristics include *sense gratification*; *intense endeavour*; and *hard work/great endeavour to enjoy material comforts*.

The third statement is:

I've loved my job for twelve years or thereabouts and I would say that the things I've loved about it is the realisation of solving or tackling, tackling probably more than solving them, a variety of problems. (Appendix M, 30)

This statement further affirms Bindoff's representation within *rajas guna*, as he states he is more interested in tackling environmental problems rather than solving them. The rajasic characteristic of *sense gratification* is again relevant, as the individual prioritises the stimulation of the mind (*rajas guna*) over finding solutions to pending environmental management dilemmas (*sattva guna*).

##### 5. Bowman, John: Microbiologist, University of Tasmania/Australian Food Safety Centre of Excellence

There are three statements considered significant in Bowman's interview. The first is his comments regarding his role as mentor for his students:

**John:** Because sometimes it requires more intuition, something you can't measure very easily. (*interruption*). People constantly knocking on my door– that's one good thing that happens to me, I hopefully dispense useful advice, It's what I did to my PhD supervisor... (*indecipherable informal chat*)

**Elli:** That's part of your normal day.

**John:** Well, it happens all the time, yes- Basically acting as a mentor, one of my major roles I have here. (Appendix M, 35)

Bowman states that students constantly knocking on his door, is a good thing, meaning that such persons want his help and that in fact they do not disturb him. He likes giving his time to such people. This is indicative of consciousness within sattva guna, in which the individual is not disturbed or bothered by giving of his/her time to help others, even if such helping impinges on his/her own time. It is a quality that is associated with the sattvic characteristics of *tolerance*; *showing compassion towards others*; and *unselfishness*.

The second significant statement concerns science publications:

I think you can be proud about some of the things you do, especially if people cite you, then you know that people are taking notice of your work. To me that's probably the best feeling of success, that people actually read your work and are interested in it. (Appendix M, 37)

This statement typifies within rajas guna, in which pride of one's career achievements is common. Relevant rajasic characteristics include *seeking fame*, *glorification and admiration/a fondness for hearing oneself praised/ seeking honour*, *recognition and status within society*.

The third significant statement is:

It's not like I'm interested in material goods and I'm not an overly ambitious person, I just want to be able to keep on discovering things that's all. I mean it doesn't cost that much money but obviously you've got to keep in mind that you're doing should be reasonably useful and not too self-indulgent, and I think I'm hopefully managing that. At least at this stage in my life, maybe when I retire I'll want to have a more spiritual existence and get away from the over-intellectualisation of things. (Appendix M, 37)

This statement reflects consciousness in sattva guna, in which the individual is not attached to material or monetary gain or involvement. Being aware of the need for doing useful work that is not self-indulgent is endemic to sattva guna, as is the desire to renounce material life for a spiritual existence at the end of one's life, or at any other time of one's life. Relevant sattvic characteristics include *awareness of and interest in higher ethical and spiritual purposes of work* and *detachment from (renunciation of) material circumstances*.

6. Burns, Gary: *Principle Research Scientist, Space and Atmospheric Science-  
Australian Antarctic Division*

There are two significant issues within Burns' interview that need mentioning. The first is the number of times he refers to his family commitments playing a role in his decision-making about his professional activities. For example:

**Elli:** Okay. Question No 8: Have you ever considered giving up your professional position as a scientist for a simpler life, and a simpler life here means renouncing material life for a life of austerity and spiritual self-realisation and can you explain your answer.

**Gary:** I haven't and I wouldn't. I mean, I can think better when I'm comfortable and I like to make sure – I mean I'm certainly motivated to make a salary and a wage to support my family and make them comfortable and give them the opportunities that I reckon I've had to develop their lives and careers, and I would be – and then again, yes, because I certainly would consider when I got to the stage of perhaps considering early retirement, so that I can give a bit more time to the family, but it wouldn't be to cut out the science. (Appendix M, 46)

In this statement, Burns reveals his consciousness as being situated within rajas guna, in which attachment to and prioritisation of one's family, is typical. It is associated with rajasic qualities of (extended) *sense gratification*, by which the individual seeks out different types of material enjoyment, comforts and stimulation with family members, community-members and fellow citizens. *Attachment to material circumstances* (rajas guna) is also relevant. The other significant factor within Burns' interview is his focus on monetary issues:

The Antarctic Division, when I first joined it, had a budget of six million dollars. I mean, it's hard to equate the same budgets because different things are put in the cost these days, but it's up around \$100 million now, so that's a massive change even though it's twenty-five years and few government departments have expanded like that, and I've looked around and there's a lot more scientists. Now I would have liked to have seen more of that. I would think it would've been more appropriate if more of that money had come into my particular area, but every scientist will say that, but I feel that way so I say it that way. (Appendix M, 40)

These statements are indicative of consciousness within rajas guna, in which the individual is under the impression that the more material resources one has, such as monetary resources, the better science one can produce. Also typical of rajas guna is the consciousness that the material resources one has, are never enough. Relevant rajasic characteristics include *unlimited hankering for sense enjoyment, unrestricted sense enjoyment and materialism*.

7. Church, John: *Program Leader of Sea-Level Rise, CSIRO, Antarctic Climate  
and Ecosystems Cooperative Research Center*

There are two significant statements within Church's interview. The first of these is:

**Elli:** Okay. Question No 8: Have you ever considered giving up your professional position as a scientist for a simpler life, and a simpler life here means renouncing

material life for a life of austerity and spiritual self-realisation, and can you explain your answer?

**John:** I certainly can explain the answer. I certainly have given thought to giving up life to a simpler life and I guess it relates to something I said earlier - the pressures of international obligations and national obligations and obligations to my employer and obligations to society and my family and with my personal life. Sometimes I'd like life to be simple. There have been phases when I've said, well I can't stand this any longer I'm out of here. But I have not done it and there's probably two answers. One, like most of us I am probably somewhat scared of the unknown and perhaps, more importantly, I do actually want to have an impact both in the science and its impact on society. (Appendix M, 51)

This statement is represented by rajas guna, due to Church's sense of obligation to persons such as his employers and his family. Relevant rajasic characteristics include (extended) *sense gratification*, in which one serves one's own senses and the objects of one's own senses through involvement with one's family, one's society, one's nation etc. Such work is not aimed at *the satisfaction of the Supreme* (a sattvic characteristic) but rather at the satisfaction of the individual him/herself and select others. The sattvic quality of *desiring to disassociate oneself from materialistic life* is also relevant.

The second significant statement by Church is:

**John:** ...ethics are an important thing and an important thing for me to consider as well. If I want to have an influence into the future and be influencing society and government, I not only have to be independent but also be seen to be independent.

**Elli:** Yes, I was going to say ... some people I've spoken with have interpreted ...? as ethics [*indecipherable*]

**John:** Yes, I've forgotten what the question was, but certainly environmental ethics has an important role to play. (Appendix M, 50)

Environmental ethics are situated within sattva guna, in which the intrinsic value of non-human living entities is considered. Relevant characteristics include *morality* and *ethics*.

#### 8. Coleman, Richard: Research Scientist (Physical Sciences) Antarctic Climate and Ecosystem Cooperative Research Centre/University of Tasmania

There are two significant factors within Coleman's interview, with regards to the triguna. The first is his statements on the approach that current Australian Antarctic science takes to directing research:

So, the excitement is really trying to make contributions that will hold for generations. We are just pushing into areas of research where we think the science is important for understanding climate change. (Appendix M, 52)

This statement is highly representative of rajas guna, in which knowledge is pursued through empiricism and speculation about the real nature of the material

world. Relevant characteristics include *knowledge derived through the material senses* and other rajasic characteristics affiliated with empiricism. Coleman states “we are just pushing into areas of research where we think the science is important...” (Appendix M, 52). This type of approach to learning about worldly phenomena is not recommended by the Vedas, as the subtle material mind, in its contaminated state, is unable to accurately discern important from unimportant information. Coleman further states that he is aware that the scientists he works with are all of a similar consciousness, stating that “sure. Those that I’ve been involved with have a similar mentality” (Appendix M, 55).

The second issue worth mentioning is the following:

I guess that engendered, if you like, the inspiration to go again, so I would like to keep going often to do field work and science projects and being able to get hands-on experience in Antarctica. It’s so much better for understanding the science. It’s a bit like doing satellite oceanography and until you’ve been to sea and you actually can see what the instrumentation is measuring from space you don’t get a perception of, if you like, the awe and wonder of the place. (Appendix M, 52)

This statement is also highly indicative of consciousness within rajas guna, in which the individual finds it difficult to learn anything without ‘hands-on’ experience, or, in other words, without engaging the material senses. Relevant rajasic characteristics are the same as for the statement above.

9. Davidson, Gary: *Earth Sciences Senior Lecturer at the University of Tasmania/Australian Antarctic Division*

The first statement concerns economic or monetary issues, which Davidson makes reference to a number of times. He confirms that his scientific activities “come down to how far it is from market” (Appendix M, 59) indicating that the science he engages in is dependent on the availability of funding. Such circumstances confirm the prevalence of rajas guna within empirical research practices, as decisions regarding the pursuit of knowledge become dependent on material affluence. The Vedanta asserts that the pursuit of real knowledge has nothing to do with availability of material resources, as such knowledge is not dependent upon engagement of the material senses in material activities.

Davidson also states that “sometimes fundamental knowledge can end up being applied. At other times it’s simply trying to push the boundaries of knowledge more about the world around us” (Appendix M, 61). This statement suggests that scientific research is not always aimed at any specific purpose and can end up not being used at all by anyone. Acquiring knowledge without any higher purpose is specifically mentioned in the *Srimad Bhagavatam* (Bhaktivedanta 1987-8, 11:25:24) as being endemic to tamas guna, the mode of ignorance. Being aware that such activities go on, without taking steps to rectify them, also reflects consciousness within the mode of ignorance.

Davidson also comments that “We don’t want to harm the environment and we’re undertaking research that we perceive has a very little impact on the environment” (Appendix M, 62). In other words, Davidson and other scientists are guessing as to

what is harmful and what is not harmful for the environment. This type of pursuit of knowledge and relevant activities is endemic to both sattva and rajas gunas, affiliated with the sattvic characteristic of *the desire to maintain/sustain/preserve* and *the distaste of harming any living being, or witnessing the harming of any living being*. Relevant rajasic characteristics include *knowledge producing many theories and doctrines by dint of mundane logic and mental speculation* and other rajasic characteristics affiliated with empiricism.

*10. Miller, Denzil: Executive Secretary for the Commission on the Convention of Antarctic and Marine Living Resources*

There are a number of significant statements made by Miller. Most of these are affiliated with sattva guna. Three are of specific significance. In the first instance, Miller addresses scientists' need for enthusiasm and greater awareness in conducting their science:

Enthusiasm and what one does really helps in applying oneself in an appropriate way. I don't mean enthusiasm to the point of view of just going on and on and on about everything, but it raises your energy level, it raises your nervous energy if you like, it raises your vision – lifts your vision outward. I had a chemistry lecturer at university once who said you cannot expect anybody to be enthusiastic about what you do unless you are enthusiastic about it yourself. Science is very much an element of that. (Appendix M, 70)

Miller also mentions the importance of enthusiasm, stating that

So, yes I do believe spirituality and also it does make the enthusiasm thing. That insight enthusiasm comes from a commitment and that commitment is sometimes very intangible. You have to believe in what you're doing and if you want to say spirituality is a belief, well it is as well. It's all those things. (Appendix M, 71)

Both these statements are indicative of consciousness within sattva guna, in which work is carried out with *great determination and enthusiasm*. As Bhaktivedanta states:

one who performs his duty without association with the modes of material nature (in this case referring to the lower modes of passion and ignorance), without false ego, with great determination and enthusiasm, and without wavering in success or failure is said to be a worker in the mode of goodness. (Bhaktivedanta 1989, 18:26)

Miller's representation within sattva guna is further supported by his following comment:

Where it becomes dangerous is where it becomes ego-driven. Scientists are independently speaking and independently thinking and they're very often smart in many cases. They do in sometimes believe that science is infallible and therefore it's unquestionably correct. Well it's not. It's correct a good part of the time, if you think by the principles it isn't. I think one has to be conscious and certainly in reality I can't say it always works. (Appendix M, 71)

In this case, it can be safely assumed that Miller's comment about science being ego-driven, refers to what is described in the Vedic literature as the *false ego* (see sections 2.2.4 and 2.2.5). Identification with one's false ego means identification with the material body, comprised of both gross and subtle material elements, which causes the individual to imbibe qualities such as *false pride; arrogance; self-importance* etc. (rajasic and tamasic characteristics).

One comment that does place Miller back into the mode of passion, however, is his comment on objectivism that "one has to be able to be, if you like, objective enough to be able to do that. I think that that kind of approach does come from a scientific background" (Appendix M, 70). This statement indicates that Miller is of the impression that real objectivism requires a scientific background, which is typical of rajas guna. Within rajas guna, the individual views empirical study of material phenomena as superior to any other type of knowledge gathering, and finds it difficult to appreciate the objectivity of individuals not engaged in similar pursuits of knowledge.

*11. Morgan, Vin: Member of Ice-cores Program, Antarctic Climate and Ecosystem Cooperative Research Center*

There are two statements considered especially significant. The first of these places Morgan within the mode of ignorance (tamas guna) with rajas guna also being represented to a lesser degree:

I don't believe that the science and the research should be aimed at some immediate problem or some specific thing that we really want to find out about. ...It's very difficult to aim science. ...I think really good things that have come out of science have been because someone's just sort of put their head down and sort of done that work. I'm a little bit sceptical of the government goals of science and things. If you know where you're going it's really not sort of... basic research I think the science should be interesting for its own sake. (Appendix M, 78)

The *acquisition of knowledge without any higher purpose* is endemic to tamas guna, as is *acting whimsically, for no purpose*. Such an approach to work will lead the individual further into the mode of ignorance, in which *foolish materialistic knowledge* is produced. Conducting activities such as science for the sake of science being interesting or stimulating for the mind, is endemic to rajas guna. It is affiliated with the rajasic characteristic of *sense gratification*.

The second significant statement made by Morgan is endemic of consciousness within sattva guna:

**Vin:** There's higher principles, such as just being honest, and you can be honest in different ways I suppose in research. Again, this is just scientific research anywhere. I mean it isn't specifically Antarctic research of course... and there's been a few cases of people being dishonest. There's something (the journal) nature - an article recently saying that you should have to have a licence. You can lose your licence to

practice medicine. If you behave really dishonestly, should people lose their licences to practice science, namely their PhDs ...

**Elli:** That's interesting.

**Vin:** Yes, I mean people should be honest. That's very obvious because if people aren't honest the system collapses and becomes a terrible mess. There's been a few cases. I think a lot of people are worried and yes, I think it's of concern. (Appendix M, 80)

*Honesty* is characteristic of sattva guna. It is affiliated with qualities such as truthfulness, purity, fearlessness and virtue. Morgan's emphasis on the importance of this quality is indicative of consciousness within sattva guna. The sattvic characteristic of *awareness of, and interest in, higher ethical and spiritual purposes of work* is also relevant, in this case higher ethical principles.

*12. Nicol, Steve: Program Leader (Marine Ecosystems) Australian Antarctic Division/Antarctic Climate and Ecosystems Cooperative Research Center*

The following statements are situated within rajas guna:

It's very difficult [*indecipherable*] ...to get actually definitive evidence, so what you actually need to do is get enough pieces of evidence that means that the most likely explanation in this case would be that there has been a change in sea ice. You're never going to prove it completely because nobody observed it at the time but there are a number of proxy pieces of information, and if you get enough of those coming together then you have to say, well okay that is the most likely explanation for all these observations. (Appendix M, 85)

That's one of the things about science is that it actually does build on a system of knowledge. You actually get a build-up of knowledge and people depend on that build-up of knowledge to make their value judgements and set up their hypotheses and so on and that's building all the time. (Appendix M, 86)

The statements are indicative of knowledge within the mode of passion, in which the individual learns through experience, through experimentation and speculation about the real nature of material phenomena, based on earlier speculations and theories of other scientists. Relevant rajasic characteristics are *knowledge producing many theories and doctrines by dint of mundane logic and mental speculation; acquiring knowledge on the material body/material world* and other rajasic characteristics affiliated with empiricism. In most cases, such an approach to knowledge is capable of delivering immediate causal factors only, of material phenomena:

Well in some cases it can. You can definitely prove that if someone had a malaria parasite they will get the symptom of malaria. That's sort of cause and affect, so in some complex systems you can do that. (Appendix M, 86)

In other words, knowledge within rajas guna can only deliver immediate material causal factors of material events that do not, according to Vedic teachings, constitute

the ultimate causal factors. Such information, whilst often accurate within restricted contexts, is also often inaccurate within the broader cosmological contexts of cause and effect and can therefore not deliver *greater or real knowledge*, endemic to sattva guna.

Nicol makes reference to one issue that is indicative of sattva guna. It is his ability to see and understand the ramifications of material conditioning on one aspect of the empirical research process, specifically that scientists tend to have their “pet theories” and that these are the theories that tend to be developed within science (Appendix M, 85). He also mentions that the direction of science depends on the observer (the individual scientist) acknowledging that empirical research methods are inconsistent due to the influences of researchers’ consciousness. Such insights are endemic to sattva guna, being affiliated with the sattvic characteristics of *greater knowledge*; *clear-sightedness*; and *alertness/wakefulness*.

*13. Ramm, David: Data Manager, Commission for the Convention on the Conservation of Antarctic Marine Living Resources*

There are three statements in Ramm’s interview considered important to mention. The first is the following:

Taking the krill fish as an example, we try and quantify as much as possible of that fishery. But there are other elements such as the skipper’s choices of where they’re going to fish and what their intentions are which are important. That’s qualitative information that we’re trying to gather, in the long term, and we would like to quantify that information so we can put it into the models. (Appendix M, 92)

This statement is highly representative of rajas guna, in which the individual will continuously try to quantify all the phenomena he/she encounters in order to try and learn their nature. In this statement, Ramm states that even when qualitative data has been collected, the aim of his organisation is to try to quantify it. Such an approach to learning represents the mode of passion, in which knowledge constitutes information on the material world with little, if any insight into relevant non-material causal factors. Rajasic characteristics include *knowledge gathered through the material senses*; *acquiring knowledge on the material body/material world* and other rajasic characteristics affiliated with empiricism.

The second statement considered significant is Ramm’s response to Question 5:

**Elli:** Okay. Question No 5: Do you have thoughts on the idea that spiritual insight and wisdom should play, or does already play, an active role in contemporary scientific research such as physics and biology?

**David:** I think it does. I think big bang theories and creation of the universe, they’re on the edge of being spiritual I guess. I think it’s important. It should definitely be included. (Appendix M, 93)

Ramm's response is endemic to sattva guna, in which the individual acknowledges the importance of including spiritual factors in research into material phenomena, in this case not specifically for ethical or moral reasons, but for scientific reasons. Within sattva guna, the individual's consciousness, being less contaminated, allows the individual to see that non-material energies are at work within the material cosmos. The individual thereby incorporates research into such energies whilst also studying material energies, phenomena etc. The relevant sattvic characteristic was *being interested in, and concerned about, spiritual matters; greater and real knowledge; and clear-sightedness.*

The last statement worth mentioning places Ramm within rajas guna:

**Elli:** Are they putting forward that they are concerned with the lives of individual animals or is it more, as far as you know, that they are concerned with populations of animals.

**David:** The basic concern is at the level of populations, but I'm sure there are some people who are concerned about individual animals ... I can't answer that but from a CCAMLR perspective it's the populations that are important and the principles of conservation are based on the population as a whole and not allowing the population to fall below certain levels. The focus of our work is managing populations. (Appendix M, 94)

Ramm's response indicates that the science he and his work colleagues engage in is typical of rajas guna, in which the intrinsic value of individual beings is not the motivation for, or the focus of, activity. Instead, the focus is on the physical survival of populations (i.e. numbers) of individuals, and even more so, on ecosystems on which populations of animals depend to maintain their material bodies. Relevant rajasic characteristics include *gathering knowledge through the material senses; acquiring scientific knowledge on the material body/world; and knowledge by which one sees that in every different body there is a different type of living entity.*

*14. Reid, James: Dean, Faculty of Science, Engineering and Technology,  
University of Tasmania*

There is only one statement considered significant in Reid's interview, in addition to his responses to Questions 1, 2, 3 and 9. This statement represents consciousness within rajas guna. Reid addresses the many tasks at hand that are overwhelming for him on a daily basis:

Yes, time constraint's very huge. Just prioritising various things that you have to do. With teaching ... you can't do much about that. There's always marking and ... supervision and there are so many demands ... let alone administration. Often you can come in and have your whole day completely written-off with stuff that you hadn't even thought you were going to do that day – a knock on the door at nine o'clock and it's an honours student and that's it. (Appendix M, 97)

Reid indicates that there is often much that happens in his working day that he has not planned for, and that unscheduled events often take precedence. When an individual is controlled by the material modes of passion and ignorance, he/she is unable to cope with whatever events are presented to him/herself, throughout his/her

day. In the mode of goodness, the individual is *self-controlled* and is well *organised* and *aware* of what each working day may bring, and even if unscheduled events should arise, he/she is not bothered by them. He/she is also *tolerant* within different circumstances. In Reid's case, however, his inability to deal with time constraints, teaching demands, administrative demands and unscheduled interactions with others, indicate consciousness within rajas guna, as such stressors are present within his work activities. Relevant rajasic characteristics include *stress*; *anxiety*; and *frustration*. Tamasic characteristics include *helplessness*.

*15. Riddle, Martin: Leader of Human Impacts Program, Australian Antarctic Division*

There are two statements considered significant in Riddle's interview. The first addresses the Australian Antarctic Division's Human Impact (HI) Program, of which Riddle is the program-leader:

What excites and inspires me about being an Antarctic scientist - what I really do feel that what we're doing is very worthwhile. We do make a difference. Australia is the only country to have established a human impacts research program. It's the only country that has dedicated a significant part of its research effort to the question of reducing people's impact down there. (Appendix M, 102)

The dedication of material resources to specifically trying to reduce or minimise adverse human impact on the natural environment (including non-human living beings) is endemic to sattva guna. In sattva guna, the individual is peaceful and dedicated to reducing the suffering of others, both human and non-human individuals, primarily according to relevant ethical and spiritual knowledge. In rajas guna the individual is self-centered, caring primarily for him/herself and for his/her family, with philanthropic activities being aimed primarily at one's own community, nation etc. In tamas guna the individual becomes careless, violent and destructive, causing suffering for others. Riddle's HI program could therefore be said to be influenced by sattvic qualities of consciousness, with rajas guna also showing some presence.

The second statement worth mentioning is Riddle's response to Question 9, regarding his interest in whether or not Antarctic fauna and flora have, or are, a spiritual soul:

So the plants and animals that happen to live on the round-about over there have the same intrinsic value as the plants and animals of the Antarctic however charismatic the Antarctic ones may be ... yes I am interested in that as a general question, otherwise I wouldn't have thought about ... that ... relative ranking in any sort of spiritual ... league ... for Antarctic species as opposed to other species. Yes I would be interested but I have difficulty putting a context around spiritual soul. But clearly, if it could be proven either way, it would be a finding of great importance. (Appendix M, 108-9)

This response is highly representative of sattva guna, with one minor representation also in rajas guna. The understanding that all animals and plants are equally

important, regardless of where they reside, or what species they belong to, is endemic to sattva guna, in which the intrinsic value is seen in every individual living being. Relevant sattvic characteristics include *being interested in, and concerned about, spiritual matters and knowledge by which one undivided spiritual nature is seen in all living entities, though they are divided into innumerable forms*. Being of the opinion that such an issue is important and that if such a thing could be proven, then that would be an important discovery, is specifically characteristic of sattva guna, as its significance is acknowledged. Relying on empirical science to ‘prove’ such a phenomenon, however, is typical of rajas guna.

16. Rintoul, Steve: *Physical Oceanographer, Program Leader of the Climate Change and Variability Program, Antarctic Climate and Ecosystems Cooperative Research Center*

There is only one significant statement within Rintoul’s interview, within the context of the triguna:

**Elli:** ... Question No 8: Have you ever considered giving up your professional position as a scientist for a simpler life, and a simpler life here means renouncing material life for a life of austerity and spiritual self-realisation, and can you explain your answer?

**Steve:** ... I’ve got to work every day and I have a regular salary and it’s a long way from the life of renunciation. There’s a bit of an attraction there. I have spent time in various places around the world, India and the Middle East and so on and I’ve kind of toyed with the idea in some ways and in the end I feel like my life I think has a balance now. It really works for me and for my family, because I do have a regular wage coming in. There’s some aspects of life for me and my family which are in a sense simpler than they would be if I had renounced more material things. (Appendix M, 115)

This response is typical of rajas guna, in which the individual is under the conception that his/her life is simpler, easier or better due to material prosperity. Material prosperity, endemic to rajas guna, may give an individual some relief from the temporary miseries associated with being materially embodied (having to find food, shelter and education). It can never, however, alleviate the individual’s heaviest burden: the affliction of being encumbered by nescience and illusion as to his/her real spiritual identity. As long as the individual remains under the conception of “I am this material body,” then he/she will continue to exploit the material realm for his/her material enjoyment, which in turn keeps the individual bound within the laws of material nature (Bhaktivedanta 1974). The relevant rajasic characteristic is *sense enjoyment/sense gratification*.

Rintoul indicates in his response that he is attached to his monetary income and the material comforts that it brings him and his family. Being *attached* to material comforts, including family-life, is endemic to rajas guna. The relevant rajasic characteristics are *being attached to material circumstances* and *sense gratification*.

17. Robertson, Graham: *Seabird Ecologist, Australian Antarctic Division*

There are two statements considered significant in Robertson's interview. The first concerns Robertson's response to Question 3:

**Elli:** ... Can you tell me anything about your own consciousness during your working day. In other words what usually goes through your mind during an ordinary working day?

**Graham:** ... It's trying to deal with things, get trials and experiments going, doing the paperwork and writing stuff up ... Yes. I suppose the key thing would be the lack of satisfaction of having not written up yesterday's work, so to speak. Often that applies because there's so much other stuff to do that you often don't ... You just don't get time to do the things you would really like to do ... The broken plate – the fractured way of moving forward. I'm talking about frustrations in ... normal life ... Self-indulgence is being pragmatic ... Yes, we're on a bit of a treadmill where you've got to keep money coming in and outputs going out and they're sort of linked, and if you spin out of that after a period you'll start to have negative feedback. I suppose in a way scientists like seeing the product of their science paper come out or report that's used and quoted or something. (Appendix M, 120)

The mode of passion is represented a number of times in this response. Robertson first states that his consciousness is typically filled with ordinary science-related tasks throughout his typical working day. Robertson adds that he gets frustrated by not being able to give as much attention to all the tasks that he is required to attend to. This is also typical of *rajas guna*, in which the individual is overly active in pursuing material goals, resulting in *misery* and *frustration*. *Self-indulgence* in one's work and career options is also typical of *rajas guna*, as is the *prioritisation of making money* over a more renounced life with fewer material facilities (*sattva guna*).

Finally, Robertson's desire for results from material activities and the desire for the results of one's own work to be acknowledged by others, is also typical of *rajas guna*, in which the individual seeks *fame*; *glory*; *admiration*; and *status within society*.

The second significant statement is characteristic of *sattva guna*:

**Graham:** ... In terms of the spiritual insight stuff, it would be impossible for a person to talk about anyone other than themselves wouldn't it, in that question.

**Elli:** Right, yes.

**Graham:** I would say certainly for me it's certainly a factor ... Human beings will have a sense for that, or maybe it's such a strong part of the human condition, some allusion to the greater being. It all characterises our species and you could say that nature is like an outdoor church. You ... don't ... have to go to a church, you can go to nature and you can get your spirituality from that, which I would agree with, rather than going to some abstract domain. People would sense that unless they were inert, they would sense that in any area where they go, particularly in the wilderness. (Appendix M, 122)

This statement represents *sattva guna*, in which the individual incorporates spiritual insight into his/her daily activities. Robertson states that spiritual insight is an integral

part of being human, and indicates that he attains his own spiritual insight from being in the wilderness. Such an understanding is affiliated with the sattvic characteristic of *residing* (or being present in) *a secluded place such as the forest* (away from materialistic life) and taking advantage of that seclusion for spiritual benefits, such as gaining spiritual insight into life in general. Also, the characteristics of *being interested in, and concerned about, spiritual matters and knowledge by which one undivided spiritual nature is seen in all living entities, though they are divided into innumerable forms* are relevant.

*18. Southwell, Colin: Ecologist, Australian Antarctic Division*

There are three significant statements made by Southwell in his interview. The first is indicative of consciousness within both rajas and tamas gunas:

The sheer difficulty of the projects I've had to take on, which were big scale, and working in such a remote area as Antarctica, but not just Antarctica, the pack-ice of Antarctica meant that anything at that scale that you try to do is really difficult and that is challenging and that does excite me. It depresses me sometimes as well because it's so difficult to do things. (Appendix M, 126)

In this statement, Southwell states that the science research projects he takes on both excite him (the rajasic *sense gratification*) and depress him (the tamasic *depression*) due to their degree of difficulty. In rajas guna, the individual seeks out tasks that are challenging either physically or mentally, seeking to enjoy those challenges. This is defined as a type of extended *sense gratification*, one of the most prominent characteristics of rajas guna. Within tamas guna, the individual is overcome by the tasks at hand, feeling *helpless* and *incapable*, which leads to *depression* and a sense of *hopelessness*.

Southwell's second significant statement is representative of both sattva and rajas gunas:

In reality different scientists bring completely different philosophies in a way to their own science. So you can have two people working on exactly the same concept who would create a completely different project and way of working through it. I believe very strongly that scientists bring their own consciousness to science. We should be trying to overcome that ... That's the way I see science is working but scientists are people and people are individuals and probably that's one reason why science has evolved the way it is. If you put two different people together with the same concept, they will approach it in different ways. (Appendix M, 127-8)

This type of insight into the real nature of contemporary science is endemic to sattva guna, from which the individual is able to raise him/herself above the influences of the lower modes in order to see clearly the influences of quality of consciousness on the outcomes of activities.

The third significant statement is also characteristic of rajas guna:

That's just human nature because when I've written papers and developed conclusions, there's a certain ego attached to it I guess, and we like to think we've got truth, or we've got best and the best will stay the best. (Appendix M, 129)

In this statement Southwell admits to ‘a certain ego’ being attached to producing science results, such as those that comprise scientific publications. As with Miller above, in this case Southwell is referring to what Bhaktivedanta identifies as ‘false ego’ (Bhaktivedanta 1989, *intro* 12) represented in qualities such as *false pride*; the *desire for honour and recognition* etc. VCS, as discussed in Chapter Two, sees real ego as the actual spiritual or non-material identity of the individual, which is, in its pure state, free from any undesirable personal qualities such as false pride or self aggrandisement.

19. Trull, Tom: Program Leader of Ocean Control of CO<sub>2</sub>-Climate and Ecosystems Program, Antarctic Climate and Ecosystems Cooperative Research Center

There are two statements considered significant from Trull’s interview, in addition to his responses to Questions 1, 2, 3 and 9. The first represents consciousness within *rajas guna* and is affiliated with the *rajasic* characteristics of *ambition* and *seeking honour, prestige, status and recognition within society*:

I think that without some sort of larger view or passion it’s just too grinding ...Other people want to get the glory that comes from recognition from the ... really innovative. I think the idea of being innovative sometimes is even more important than being important ...And so I’m driven a bit by that. I could be recognised for having done something new, as opposed with not always something important.... I certainly think that recognition of my colleagues for a job well done is valuable to me. (Appendix M, 136)

Although scientists were not asked what their religious beliefs were, in the following statement Trull divulges his position on the matter:

I don’t really know what spiritual insights are. I guess people have intuitions. I can think of those as some kind of subconscious assessment of how things are likely to work and then projecting them onto their physical environment. I’m certainly an agnostic and close to being an atheist and I don’t really think that there’s any intuition that comes to us from some more powerful being or greater force. (Appendix M, 137)

Trull’s consciousness regarding spiritual matters is representative of the mode of ignorance, affiliated with the *tamasic* characteristics of *the failing of awareness of a higher spiritual nature, understanding which considers irreligion to be religion and religion to be irreligion, under the spell of illusion and darkness, and strives always in the wrong direction; and faithlessness*.

20. Woehler, Eric: *Honorary Research Associate (Biology), Institute of Antarctic and Southern Ocean Studies/Australian Antarctic Division*

There is only one significant statement, or rather two statements regarding the one issue that will herein be mentioned. The two statements concern Woehler's interest in Antarctic fauna. In the first instance he comments on how he initially became attracted to the Antarctic biological program:

I had a very strong interest in wildlife when I was doing zoology. In fact I was doing almost a double major in zoology as well as a major in computer science and perhaps my involvement had already leaned me towards some sort of life sciences approach. I had grown up with animals and always had an interest in animals. (Appendix M, 142)

In the second instance, which comprises his response to Question 9, he comments on how he definitely has no interest, whatsoever, in the possibility of animals having, or being, a spiritual soul:

And I have no interest in flora or fauna having a spiritual soul. Again, do I answer that as a researcher or is it me as a person ... I'm not interested in whether they have a soul or not, or any sort of spiritual ... entity ... awareness. It's not on my radar and when it comes to me thinking about the work that I'm doing because for me whether they do or not is immaterial to the work that I'm doing. (Appendix M, 147)

These two statements tell us that Woehler has always been interested in animals, but that he is not at all interested in their possible spiritual nature/aspect. In other words, Woehler is very interested in the biological or material functioning of animals, but not in their possible spiritual functioning, indicating a strong representation of the tamasic characteristic of *being uninterested in and unconcerned about spiritual matters*. Otherwise, Woehler's affection for animals, expressed through his scientific interests, is typical of rajas guna, in which the individual's *attachment* to others is based on their material embodiment.

21. Wright, Simon: *Senior Research Scientist (Marine Microbial Ecology)*  
*Australian Antarctic Division*

There are two statements considered specifically significant in Wright's interview. The first concerns his attitude towards his career:

Personally I'm not driven by ambition for personal career path. I'm fairly happy doing the sort of thing I'm doing. I don't want to take on higher roles. As well as that there's the desire to doing quality work, make sure that anything I put into literature is correct. I suppose the higher level, which I mentioned earlier, is that what we're doing here is actually going to be useful in terms of making the world better in the long run to understanding the processes and hopefully making that knowledge available in time to stop the worst damage that might occur. (Appendix M, 153)

Such an attitude towards one's work duties is characteristic of sattva guna, in which the individual is not ambitious, nor trying to get ahead of others in their professional position. Relevant sattvic *characteristics* include *satisfaction within oneself*; *a sense of happiness and knowledge*; and *one who performs his duty ... without false ego, with*

*great determination and enthusiasm, and without wavering in success or failure.*

Wright also states that it is important to him that what he puts out is correct, and that on a higher level, it is important to him to know that he is somehow making the world a better place (even though he may not necessarily know how to achieve that). Such qualities are also endemic to the mode of goodness.

The second significant statement concerns Wright's work commitments, which despite his significant association with the mode of goodness (above), drag him down to the mode of passion:

Well, keeping up the literature is a full-time job, doing the research is a full-time job, having a family is a full-time job. There are not enough hours in a lifetime to do everything that's required. There's always a feeling of struggling to keep up with workloads and whatever. I often look at some friends who stop at 5pm and go home and forget about everything until the next day. (Appendix M, 153)

These difficulties expressed by Wright are typical of rajas guna, in which the individual is afflicted with feelings of *distress* and *anxiety*, caused by too much *activity*. *Great endeavour* and working hard for long hours for material ends, is also characteristic of rajas guna, in which the individual finds it hard to cope with the pressures and expectations of life in general. *Envy*, in the form of desiring the material comforts or luxuries of others, is also endemic of rajas guna.

## APPENDIX P: Abhidharma Factor Representation of Responses to Interview Questions 3, 5, 6, and 8

TABLE P1: Demonstration of the Quantifiability of Responses to Interview Questions Using Abhidharma Factors

- The following responses represent a high degree of similarity with other interviewees' responses to the same questions.
- *Quantifiable* here refers to the capacity of responses to clearly represent specific Abhidharma factors for the purpose of later being totaled.

QUESTION NO.	RESPONSES	COMMENT
1. What inspires/excites you the most about being an Antarctic scientist?	It was actually just one of those dreams I've had all my life to go and experience what Antarctica is like. I don't know whether that's really because it's the last frontier or whether it was just because it was uninhabited if you like, but the excitement was actually being in the Antarctic environment and the science was a way of getting there in the first instance (Adams Appendix M, 2).	Adams' response indicates that he was interested in experiencing the Antarctic environment, with the science also being an attraction. There is no specific representation of any Abhidharma factors in his response, meaning the response is not quantifiable. As this response typifies many responses to Question 1, interviewees' responses to Question No. 1 will not be quantified.
2. Can you tell me about your original motivations for becoming an Antarctic scientist?	My motivation for becoming an Antarctic scientist, when I first worked at the Antarctic Division I worked on North Atlantic krill before, and so when there was a job available for a krill biologist working at the Antarctic Division it seemed an ideal job. It fitted exactly my experience, so that was the motivation to sort of work on something I was familiar with and work in an area where krill ?...? had a very real relevance in terms of management, in terms of a key role in the ecosystems (Nicol	This response, which typifies most interviewees' responses, does not address either positive or negative Abhidharma factors, instead giving mundane information about events of the past. Interviewees' responses to Question No. 2 will not, therefore, be quantified.

	Appendix M, 84).	
3. Can you tell me anything about your own consciousness during your working day i.e. what usually goes through your mind during an ordinary working day?	I guess I'm fairly driven in a way, internally, and I'm constantly setting myself goals and deadlines and things like that and that's often what I'm thinking about. I'm not thinking of just about doing that ?...? right now, I'm thinking of trying to get it done so it fits into this bigger picture of trying to get things done. That's probably what's going through my mind most of the time, trying to piece all of that together in a planning sense, in most senses I guess (Southwell Appendix M, 127).	Most interviewees responded to this question by discussing their intentional thought patterns. Some discussed their unintentional thoughts. In either case, most responses were representative of at least one Abhidharma factor. Responses to Question No. 3 will therefore be quantified. In the sample given here, Southwell's response represents Positive Mental Events of <i>concern/ conscientiousness; diligence/ enthusiasm; and alertness/suppleness</i> , as well as the Positive Perfections of <i>energy and determination/resolution</i> .
4. In your opinion, what role, if any, does qualitative science play in Antarctic science?	Well really what I struggle to do is quantitative work. Beyond that I'm not quite sure how to answer. I think that physical scientists, they're always trying to struggle with making things more quantitative, narrowing uncertainty and actually making estimates of uncertainty (Church Appendix M, 48).	Whilst this response may be attributed to the Negative Mental Event of <i>desultoriness/non-discernment</i> , it does not afford evaluation with much certainty. It typifies many of scientists' responses to this question, in which scientists were unable to decisively answer the question in a way that could be quantified. As this is the case, responses to Question No. 4 will not be quantified.
5. Do you have any thoughts on the idea that spiritual insight and wisdom should play, or do already play, an active role in contemporary scientific research such as physics and biology?	I haven't really thought about this. No, I can't really give an opinion and I haven't really read anything to do with it either. I've seen books, which are about this area but I've always passed them by. It's not really my thing, I've got so many things to do than to get into this. I'm not a religious person My spirituality whatever that is, is minimal I have to admit. I'm too pragmatic, which I think is typical my family in general (Bowman Appendix M, 35).	This response is represented by the Negative Mental Event of <i>unconcern/unconscientiousness</i> , in which the individual prioritises material life over non-material (spiritual) life. Whilst responses to this question were varied, interviewees generally took a position on the matter that enabled responses to be defined. Responses to this question will therefore be quantified.

<p>6. What do you think the goals and values are that are most prominent in your work culture at the Australian Antarctic Division?</p>	<p>In general the people that I interact with all have a strong environmental ethic, and I say that without exception, and that is probably a self-selecting, self-fulfilling thing. Most of them enjoy the outdoors but in a non-destructive way so they're much more likely to be bushwalkers and rock climbers than four-wheel drivers and trail bike riders within the group. They enjoy what they do and it's important – I believe it's important – that we set as a target, as a goal, actually making a pleasant working environment (Riddle Appendix M, 107).</p>	<p>Environmental ethics is generally representative of <i>non-violence</i>, a Positive Mental Event. They are also represented by the Positive Perfection of <i>morality/virtue</i> towards non-human living entities (and the natural environment in general). Whilst overall responses to this question were varied, they will be quantified.</p>
<p>8. Have you ever considered giving up your professional position as a scientist for a simpler life (<i>simpler life</i> here means renouncing material life for a life of austerity and spiritual self-realisation). Can you explain your answer?</p>	<p>It flashes past my mind occasionally. Sometimes I think I'd just like to go off surfing somewhere because that's my escape. I know from when I was a young surfer I'd go off and do that early in the morning and that was it. I didn't need any more of that for the rest of the day and I needed something that was I guess intellectually stimulating rather than physically, and surfing I could say was a spiritual kind of thing as well. (Southwell Appendix M, 133).</p>	<p>This response represents the Negative Emotions of <i>attachment</i> and <i>lack of intrinsic awareness/ignorance</i>. As Southwell states that going surfing and enjoying the material energy is spiritual, according to Abhidharma factors he is in <i>ignorance</i>. This is supported by the conclusion that indulging in pleasures of the senses is the beginning of Negative Mental Events. His <i>attachment</i> to such pleasures is revealed through his indulgence in them.</p> <p>The Negative Mental Events of <i>desultoriness/non-discernment</i> and <i>lack of trust/faithlessness</i> may also be relevant. This is confirmed by Southwell's mind being absorbed in pursuing sense objects (<i>desultoriness/non-discernment</i>) and his <i>lack of trust/faithlessness</i> in cultivating more serious spiritual qualities such as the Positive Perfection of <i>renunciation</i>, or the Positive Mental Events of <i>non-attachment</i> and <i>non-deludedness/non-bewilderment</i>.</p>

		Southwell's response to this question is fairly typical of all scientists' responses to this question. Responses to this question will therefore be quantified.
9. As a scientist, are you at all interested in whether or not species of Antarctic fauna and flora have (or are) a spiritual soul? Can you explain your answer?	As the Buddhist view of the spiritual soul is that it does not exist in any form, responses to this question will not be processed against Abhidharma factors. Whilst Theravada Buddhism does maintain that spiritual practice is necessary to achieve enlightenment, the individual's spirit is not identified with an eternal individual self. Buddhism sees spirituality as an antithesis to materialism, in that the former is the practice of abstinence from material indulgence and the latter is unnecessary stimulation of the senses that distracts the individual from his/her higher goals. Such distraction leads him/her to ignorance instead of spiritual enlightenment.	

TABLE P2 (1-21): Abhidharma Factor Representation of Responses to Interview Questions 3, 5, 6, and 8

- Descriptions of Abhidharma factors are taken from the CAFG-GACTA appearing in Appendix B.
- The name *Elli* appearing within interview transcripts represents the interviewer/researcher.

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TABLE P2-1. ADAMS, NEIL

INTER- VIEW QUEST- ION NO.	QUESTION	RESPONSE	ABHIDHARMA FACTOR REPRESENT- ATION	ABHIDHARMA FACTOR REPRESENTATION CLARIFICATION
3	Can you tell me anything about your own consciousness during your working day i.e. what usually goes through your mind during an ordinary working day?	But with my research hat on, the questions I'm trying answer or the systems I'm trying to develop, are to assist forecasting and better understand our Antarctic atmosphere so a typical day is actually looking at Antarctica from a remote sensing point of view... So as I'm doing research I will be keeping an eye on what's actually happening and then looking at the modelling work that I'm doing and the systems I'm designing to see what they're telling me – trying to match up to get some sort of feel of what's really going on and an understanding of the processes that drive the atmosphere.	Positive Mental Events	“To make complete and to realise all worldly and transworldly excellences” (Appendix B, 5) describes the Positive Mental Event of <i>concern/conscientiousness</i> . This representation is supported through Adams' usage of words such as 'questions I'm trying to answer,' 'better understand,' 'what's actually happening,' and 'understanding of the process.' Such endeavours are affiliated with “concern with regards to things in the past. Concern with regard to things in the future. Concern with regards to things in the present” (Appendix B, 5) all which are relevant factors within meteorology.
5	Do you have any thoughts on the idea that spiritual insight and wisdom should play, or do already play, an active role in	Spiritual insight for me doesn't play a part in the physics. I'm not a biologist and I'm not dealing with animals in Antarctica, other than purely as a tourist. I appreciate the animals in Antarctica when I go and see them. I wasn't there in any sort of scientific capacity. Certainly in the physics as a forecaster and a	Negative Emotions	<i>The lack of intrinsic awareness/ignorance</i> of differences between material and non-material considerations constitutes a Negative Emotion, according to the Abhidharma. According to Guenther and Kawamura:  Asanga and his brother who follow the <i>dgongs-pa</i>

	contemporary scientific research such as physics and biology?	researcher I didn't dwell too much on the whys and wherefores at a spiritual level... Certainly in the work I do, no it's not a spiritual thing.		<p><i>rjes 'grel</i> (Sandhinirmocanasutra) divide the Buddha Word into implicit and explicit statements and posit an <i>alayavijnana</i>. They declare the whole of reality to be of the nature of mere mentation [sems tsam gyi bdag-nyid]" (Guenther and Kawamura 1975, 15-6).</p> <p>I.e. The Theravada Abhidharma views the real nature of the material cosmos as mentation, a subjective manifestation. The Abhidharma thereby sees Adams' lack of acknowledgement that the quality of consciousness of scientists plays a vital role in determining their experiences of reality, as <i>lack of intrinsic awareness/ ignorance</i>.</p>
6	What do you think the goals and values are that are most prominent in your work culture at the Australian Antarctic Division?	I think it's a really strong desire to understand, just to figure out what the processes are that are going on that are driving what we're seeing. ... it is just to understand the processes because it's highly non-linear processes - the whole earth environment. We're reaching that point where we're trying to put together a complete earth simulation so it's understanding the process of this. The goals and values I see is a striving of that understanding. Trying to piece that jigsaw together.	Positive Mental Events/ Positive Perfections	Trying hard to understand the workings of the natural environment, represents the Positive Mental Event of <i>concern/conscientiousness</i> . Endeavouring to understand the natural environment also represents the Positive Perfections of <i>determination/resolution</i> and <i>energy</i> . Whilst empirical research methods are steeped in materialism, the resolve itself on behalf of scientists to understand the Earth, is a positive factor.
8	Have you ever considered giving	Certainly it would be nice some days to wake up and think it would just be nice to	Negative	The Abhidharma states that to be <i>attached</i> to material lifestyles is a Negative Emotion, even

	up your professional position as a scientist for a simpler life ( <i>simpler life</i> here means renouncing material life for a life of austerity and spiritual self-realisation). Can you explain your answer?	have a simpler life. I'm not sure about the austere part of it. I still want to put petrol in my motorbike so I can go for a ride somewhere and I guess that's materialistic. No, I quite enjoy researching and quite enjoy working and I don't think being a research scientist is necessarily materialistic.	Emotions/ Negative Mental Events	though Adams disagrees with such an understanding. The Negative Mental Events of <i>desultoriness/non-discernment</i> and <i>lack of trust/faithlessness</i> are also relevant. This is confirmed by Adams' mind being absorbed in pursuing sense objects ( <i>desultoriness/non-discernment</i> ) and his <i>lack of trust/faithlessness</i> in cultivating more serious spiritual qualities such as the Positive Perfection of <i>renunciation</i> , or the Positive Mental Events of <i>non-attachment</i> and <i>non-deludedness/non-bewilderment</i> , which would afford him with clear-sightedness as to his own predicament.
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TABLE P2-2. ALLISON, IAN

INTERVIEW QUESTION NO.	QUESTION	RESPONSE	ABHIDHARMA FACTOR REPRESENT- ATION	ABHIDHARMA FACTOR REPRESENTATION CLARIFICATION
3	Can you tell me anything about your own consciousness during your working day i.e.	At the moment I guess I'm mostly making mental lists of what I've got to complete in the time I've got. A lot of my work now is administrative and management and I very seldom have a chance to pause and think about some of	Positive Perfections	The Positive Perfection of <i>energy</i> is relevant. Whilst Allison may not 'think about some of the bigger science issues' his endeavours represent this Positive Perfection. The Positive Perfection of <i>patience/forbearance</i> is also relevant in terms of his surrendering to administrative and managerial

	what usually goes through your mind during an ordinary working day?	the bigger science issues... Most of the science I do is when I've got to review papers and things that other people in the group are working on.		tasks out of duty.
5	Do you have any thoughts on the idea that spiritual insight and wisdom should play, or do already play, an active role in contemporary scientific research such as physics and biology?	Well wisdom has to have ?...? Insight also, but I'm not sure what level of spiritual insight. Again it's getting onto the qualitative science idea. People have to be able to think of abstract concepts – have insight into those to really advance things. I personally wouldn't ?...? spiritual ?...?	Negative Emotions/ Negative Mental Events	Although Allison's response is a little unclear, the Negative Emotion of <i>indecision</i> is apparent, as is the Negative Mental Event of <i>desultoriness/non-discernment</i> . The Abhidharma defines this factor as manifesting when “the mind is scattered over the five desirable objects of the sensuous world” (Appendix B, 15). The Abhidharma claims that when the mind is absorbed in the senses it loses its discernment. This description is relevant, as Allison is unsure of his standpoint on the issue of the role of spiritual insight and wisdom in science.
6	What do you think the goals and values are that are most prominent in your work culture at the Australian Antarctic Division?	<p><b>Ian:</b> I guess it's the commitment to the objectives you're trying to deliver on. It's self-motivation and a certain amount of dedication and also along with that a self-criticism – checking and being careful of the work you do.</p> <p><b>Elli:</b> That's interesting. I haven't heard that mentioned – the self-criticism.</p> <p><b>Ian:</b> In that you have to be your own hardest critic I think, on a lot of the stuff you do.</p>	Positive Mental Events/ Positive Perfections	The Positive Mental Events of <i>self-respect</i> and <i>decorum/consideration for others</i> are relevant. Without such qualities, scientists would not be able to engage in self-criticism. The Positive Perfections of <i>energy</i> and <i>determination/resolution</i> are also relevant. Without <i>virtue</i> scientists would not be able to maintain self-motivation and self-criticism.

8	Have you ever considered giving up your professional position as a scientist for a simpler life ( <i>simpler life</i> here means renouncing material life for a life of austerity and spiritual self-realisation). Can you explain your answer?	I guess I'm not interested in it because I haven't really thought about it. I have trouble with the whole issue of spirituality. That's probably because of the way I am. I'm not even sure what it means in people. They can be thinking about high level issues, largely abstract, and there's a role in that. I don't see a lot of difference between theology and some cosmology.	Negative Emotions/ Negative Mental Events	<p>Allison's statement represents the Negative Mental Events of <i>unconcern/unconscientiousness</i> and <i>inattentiveness</i>. <i>Unconcern/conscientiousness</i> means to prioritise material or temporary considerations. <i>Inattentiveness</i> is described as lacking "watchfulness" (Appendix B, 14), represented here in Allison's lack of attention to what spirituality means. There is also a lack of understanding and <i>concern/conscientiousness</i> about spiritual issues.</p> <p>The Negative Emotion <i>lack of intrinsic awareness/ignorance</i> means "confusedness about the ultimate" (Appendix B, 18).</p>
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TABLE P2-3. BARMUTA, LEON

INTERVIEW QUESTION NO.	QUESTION	RESPONSE	ABHIDHARMA FACTOR REPRESENT- ATION	ABHIDHARMA FACTOR REPRESENTATION CLARIFICATION
3	Can you tell me anything about your own consciousness during your	What usually goes through my mind is how much administration there is to do and how's it going to fit. Yes, it's mostly stuff to do with trying to juggle the huge administrative load - ?...? graduate	Negative Emotions/ Negative Mental	When the mind is <i>attached</i> (Negative Emotion) to material considerations it produces frustration. <i>Ebullience/restlessness/distraction</i> (a Negative Mental Event) occurs when the mind is obstructed by material considerations (when sense enjoyment

	working day i.e. what usually goes through your mind during an ordinary working day?	teaching, post-graduate supervision, administering grant things, and I must confess that working in the Antarctic Division there is even more forms and things to deal with so it's ?...? plus ?...? fourteen month old baby making sure that ?works stops? ?...? ... go and rescue from childcare. I'd like to say that there is some higher mental processes involved there.	Events/ Positive Perfections	is prioritised over spiritual development).  However, Barmuta admits that he lacks in such higher mental processes, which represents <i>truthfulness/does not deceive</i> (a Positive Perfection).
5	Do you have any thoughts on the idea that spiritual insight and wisdom should play, or do already play, an active role in contemporary scientific research such as physics and biology?	I certainly don't have any religious slant these days. One level doesn't really come into the science that I do, but then there's another bit of me that says, well I'll look at the things that I'd like to work on, or try to get funding to work on ... To be honest I can't think of a lot of scientists I've met that I would call 'wise.'	Negative Emotions/ Positive Perfections	Barmuta asserts that spirituality is not a part of his professional activities. According to the Abhidharma, such an assertion is affiliated with <i>arrogance/self-importance</i> and <i>the lack of intrinsic awareness/ignorance</i> , as all phenomena are fundamentally of "the nature of mere mentation" (Appendix B, 18) meaning that they manifest according to metaphysical, or spiritual laws. He also states that most scientists lack in wisdom, suggesting that the Negative Emotion of <i>lack of intrinsic awareness/ignorance</i> is present within the scientific community. Barmuta's truthfulness about this lacking of wisdom is affiliated with the Positive Perfection of <i>truthfulness/does not deceive</i> .
6	What do you think the goals and values are that are most	I think that for Kerrie and John whom I'm working with, and Louise, we're genuinely interested in and driven by a fascination for fauna in this particular	Negative Emotions/ Positive Mental	Whilst Barmuta states that he and his work colleagues have genuine interest in fauna, interest does not necessarily constitute <i>loving-kindness</i> or <i>concern/conscientiousness</i> . It does constitute

	prominent in your work culture at the Australian Antarctic Division?	neck of the woods. Nobody's going to eat it but it's got an interesting story to tell ... Another bunch of people who I have something to do with in the Antarctic Division are quite passionate about doing good public, good science. Andrew's very motivated about doing good fisheries, or getting ? researcher supports? ...The other people I know are involved in ?...? side of things and are very passionate about gathering data which actually makes a difference.	Events	<i>attachment</i> to material considerations, in which the individual is <i>attached</i> to material life in general (as opposed to seeking to end material embodiment for a higher spiritual existence). However, Barmuta also states that he and his colleagues are interested in work that 'makes a difference,' indicating <i>concern/conscientiousness</i> for others. <i>Concern/conscientiousness</i> is a Positive Mental Event.
8	Have you ever considered giving up your professional position as a scientist for a simpler life ( <i>simpler life</i> here means renouncing material life for a life of austerity and spiritual self-realisation). Can you explain your answer?	I quite frequently think about giving up being an academic but I'd like to still be a scientist. <i>[laughter]</i> But I wouldn't want to take such a substantial cut in pay in order to undergo an austere lifestyle. I came from a middle working class background and I know what being poor is like, so it's not something that I particularly idolise and I had quite a few friends who did that sort of Nimbin thing and all that sort of stuff and went off and lived in communes. If I wanted to have a lifestyle of thinking about whether the goat needed milking or not then I would've chosen that by now.	Negative Emotions/ Negative Mental Events	<i>Attachment</i> to material life-styles is a Negative Emotion. Barmuta has chosen a lifestyle, in which his monetary income provides him with material comforts, indicating that he is materially attached.  The Negative Mental Event of <i>desultoriness/non-discernment</i> is also relevant. This is confirmed by Barumta's mind being absorbed in pursuing sense objects. The CAFG-GACTA describes <i>desultoriness/non-discernment</i> as manifesting when "the mind is scattered over the five desirable objects of the sensuous world" (Appendix B, 15).

TABLE P2-4. BINDOFF, NATHAN

INTERVIEW QUESTION NO.	QUESTION	RESPONSE	ABHIDHARMA FACTOR REPRESENTATION	ABHIDHARMA FACTOR REPRESENTATION CLARIFICATION
3	Can you tell me anything about your own consciousness during your working day i.e. what usually goes through your mind during an ordinary working day?	I would say fifty per cent of what goes through my mind is about the tasks at hand and that fifty per cent would be a kind of an administrative activity, unfortunately - science administration if you like. I negotiate contracts at various times so there's some legal work in there – these aren't quite the answers you might expect but it's motivating other staff and students to deliver in their chosen areas, it's delivering on ACE and TPAC goals, partly of which are all inter-related and made that way. So a fair a bit of my time is spent that way and then the work I do with students is science, because they all do scientific projects, so that's pretty much as close as I get to science.	Negative Emotions/ Negative Mental Events	When the mind is <i>attached</i> to material considerations it produces frustration. <i>Ebullience/restlessness/distraction</i> (a Negative Mental Event) occurs when the mind is obstructed by material considerations i.e. when the individual is “distracted by the demands of the senses” (Appendix B, 11).
5	Do you have any thoughts on the idea that spiritual insight and wisdom should play, or do	Wisdom is of course – well I'm going to mean it to mean – a common experience in accumulated overtime, so wisdom plays quite a big role in a lot of programming and push of Antarctic science. It's the sense of where people	Negative Emotions/ Positive Mental Events	The <i>lack of intrinsic awareness/ignorance</i> (a Negative Emotion) represents this statement due to the lack of spiritual vision on behalf of the ACRC.  Bindoff does state that wisdom plays a part in

	already play, an active role in contemporary scientific research such as physics and biology?	think things ought to be that are of interest about Antarctica and the rest of the world ... I don't think there's a spiritual view that comes out of any of the programs that we've talked about – the ACRC doesn't have a spiritual view on Antarctica, the program leaders don't express it ever that way, so I don't hear that ? as a term?		Antarctic science, defined by himself as 'a common experience in accumulated overtime.' This definition moderately corresponds with what the Positive Mental Event of <i>concern/conscientiousness</i> , described by the CAFG-GACTA as that which "cherishes accumulated knowledge/wisdom and detracts from what is unwholesome" (Appendix B, 5).
6	What do you think the goals and values are that are most prominent in your work culture at the Australian Antarctic Division?	The ACRC is still very young. I think the things that were exciting about the Antarctic CRC was that – maybe arrogant thought – that we could do new things for and about Antarctica and it was that optimism, and naïve belief maybe, that we could have an impact on the global community in Southern Ocean and Antarctica. That was the chief goal I would say from the Antarctic CRC's point of view. So we were pretty excited about the possibilities of the various voyages... The new ACRC – the work culture – it hasn't quite got up to steam yet, the new appointments haven't arrived, which is the fresh, enthusiastic blood that we require to some extent. There's a slightly different emphasis, there's a strategic focus on commercial ?gain? so there's new words like 'IP' and 'secrecy' and 'intellectual property' that	Negative Emotions/ Negative Mental Events/ Positive Perfections	<p>The Negative Emotion of <i>arrogance/self-importance</i> is described as "an inflated mind as to what is perishable and its function is to serve as the basis for disrespect and frustration. It is associated with pride and the lack of humbleness" (Appendix B, 17). The Negative Mental Event of <i>mental inflation</i> is also relevant due to scientists' overestimating their own capabilities.</p> <p>Whilst this was the case, their approach was characterised by <i>energy</i>, constituting a Positive Perfection. The prioritisation of economic considerations is affiliated with the Negative Mental Event of <i>attachment</i>.</p>

		has to be preserved and the ways to achieve that and so on, and a greater emphasis on paper trails.		
8	Have you ever considered giving up your professional position as a scientist for a simpler life ( <i>simpler life</i> here means renouncing material life for a life of austerity and spiritual self-realisation). Can you explain your answer?	<p><b>Elli:</b> Okay, No 8: Have you ever considered giving up your professional position as a scientist for a simpler life, and a simpler life here means renouncing material life for a life of austerity and spiritual self-realisation, and then also can you explain your answer?</p> <p><b>Nathan:</b> [laughter]</p> <p><b>Elli:</b> Have you ever had the urge to go to the Himalayas?</p> <p><b>Nathan:</b> Never to the Himalayas. I've thought about buying a block of land on the beach at Research Bay at Cockle Creek or something and kicking up my feet there, and I have those thoughts. I'm not sure that I'd quite renounce the material life because I can't resist gadgets and things like that, but it would certainly be a life of austerity, and would it be spiritual self-realisation? No, I think it would be a spiritual death to be honest.</p>	Negative Emotions/ Negative Mental Events	Bindoff's statement indicates that he is materially <i>attached</i> (a Negative Emotion) as he is not willing to give up his material lifestyle. The Negative Mental Events of <i>desultoriness/non-discernment</i> and <i>lack of trust/faithlessness</i> are also relevant. This is confirmed by Bindoff's mind being absorbed in pursuing sense objects ( <i>desultoriness/non-discernment</i> ) and his <i>lack of trust/faithlessness</i> in cultivating more serious spiritual qualities such as the Positive Perfection of <i>renunciation</i> , or the Positive Mental Events of <i>non-attachment</i> and/or <i>non-deludedness/non-bewilderment</i> . According to the Abhidharma, any of these would help scientists stay aloof and objective to the scientific process.

TABLE P2-5. BOWMAN, JOHN

INTERVIEW QUESTION NO.	QUESTION	RESPONSE	ABHIDHARMA FACTOR REPRESENTATION	ABHIDHARMA FACTOR REPRESENTATION CLARIFICATION
3	Can you tell me anything about your own consciousness during your working day i.e. what usually goes through your mind during an ordinary working day?	I'll try and be honest. I mean it depends in the past it's probably different to what it is now, but generally speaking I sort of focus on a number of things I need to get done. So I concentrate on doing these set activities. Of course some things are interesting to do and some things less so - more routine. And of course then I am always thinking about the things that need to be done. There always seem to be lots of things that need to be done and 'Oh, I can't do them today. I haven't got the time ... That's probably the primary concern/conscientiousness I have on a day-to-day basis. I don't mind it and It's not discomforting, It's just a reality I have these things to do and I'm getting more and more things piled up! But it's not like it's the things are really unpleasant to do or anything.	Positive Perfections/ Negative Emotions	<i>Truthfulness/does not deceive</i> is a Positive Perfection. Prioritising material considerations over spiritual considerations is symptomatic of <i>attachment</i> to material life in general and is a Negative Emotion. Contrarily, performing activities whilst being mindful of spiritual considerations is symptomatic of <i>non-attachment</i> , a Positive Mental Event.
5	Do you have any thoughts on the idea that spiritual insight and	I haven't really thought about this. No, I can't really give an opinion. and I haven't really read anything to do with it either. I've seen books, which are about	Negative Mental Events	This response is represented by the Negative Mental Event of <i>unconcern/ unconscientiousness</i> , in which the individual prioritises material life over non-material (spiritual) life.

	wisdom should play, or do already play, an active role in contemporary scientific research such as physics and biology?	this area but I've always passed them by. It's not really my thing, I've got so many things to do than to get into this. I'm not a religious person My spirituality whatever that is, is minimal I have to admit. I'm too pragmatic, which I think is typical my family in general.		
6	What do you think the goals and values are that are most prominent in your work culture at the Australian Antarctic Division?	Within the pure scientist groups there's not this feeling that we're there to get things to commercialise and make money from it. It's more a curiosity factor as well as the discovery factor, In previous projects I've also related to that area too ... I sort of felt that the reasons we were doing it were different to that of the pharmaceutical company, which was only interested in an end goal to make money. It's just a different philosophy I think. In the end we developed a resource (what we isolated) and I think that's where the true scientific curiosity and interest can be developed from. We still have that resource, so I feel most of the scientists I work with tend to have value orientated goals that appreciate the value of Antarctica for its uniqueness and its specialness, rather than for something to exploit –They're the people I tend to work with. I mean I haven't come across	Positive Mental Events/ Positive Perfections	Bowman's statement is representative of the Positive Mental Events of <i>concern/ conscientiousness; decorum/ consideration for others; and non-violence</i> . This is supported by Bowman's statement that there is a lack of prioritising commercialisation. His statement indicates that most of his work colleagues appreciate Antarctic for its intrinsic value, rather than something to exploit. This quality of consciousness is also affiliated with the Positive Perfection of <i>morality/virtue</i> .

		that many people who have the counterview, in fact very few.		
8	Have you ever considered giving up your professional position as a scientist for a simpler life ( <i>simpler life</i> here means renouncing material life for a life of austerity and spiritual self-realisation). Can you explain your answer?	I have to say no to that one. I haven't really ever for a moment considered being a Buddhist monk or something like that. It's only because I like what I'm doing in the here and now. I mean that's basically it. It's not like I'm interested in material goods and I'm not an overly ambitious person, I just want to be able to keep on discovering things that's all. I mean it doesn't cost that much money but obviously you've got to keep in mind that you're doing should be reasonably useful and not too self-indulgent, and I think I'm hopefully managing that.	Negative Emotions	Bowman is <i>attached</i> to his occupation. Without considering the <i>renunciation</i> of material life, attachment to the pursuance of material commodities continues. Bowman's desires to keep discovering things reveal his attachment to mental stimulation.

TABLE P2-6. BURNS, GARY

INTERVIEW QUESTION NO.	QUESTION	RESPONSE	ABHIDHARMA FACTOR REPRESENTATION	ABHIDHARMA FACTOR REPRESENTATION CLARIFICATION
3	Can you tell me anything about your own consciousness	Well, it's more trying to get things done. We generally have a list, you never run out of things to do as a scientist. You are always thinking of something else and	Negative Emotions/	When the mind is <i>attached</i> to material considerations it produces frustration. <i>Energy</i> , also relevant, represents a Positive Perfection.

	during your working day i.e. what usually goes through your mind during an ordinary working day?	that's probably true of almost every job in it's own way, particularly if you're motivated to work in it, and sometimes it's the frustration of something that just has to be done ?...? right to enable you to achieve something else.	Positive Perfections	
5	Do you have any thoughts on the idea that spiritual insight and wisdom should play, or do already play, an active role in contemporary scientific research such as physics and biology?	Spiritual is a bit harder. I'm not religious therefore perhaps I don't think on that level. Wisdom I think has always been very important because that's what guides your qualitative thinking as to where the opportunities for further understanding what you're studying are. So I sort of think that those things are there, and certainly in earlier, well I guess for a religious person, perhaps the wisdom and the concept of the universe would sort of help them. You know – it might be part of the structure that says I want to work as a scientist and study this, but ultimately when it comes down to what is there and what isn't there, I think that's just helping to provide the foundation for your motivation, rather than actually doing your science. I think certainly wisdom is very import ... Antarctic.	Negative Emotions	The Negative Emotion of the <i>lack of intrinsic awareness/ignorance</i> is relevant within this statement, due to Burns' lack of awareness of non-material considerations of science.
	What do you	I think there's more dedication today. I		The Positive Perfection of <i>energy</i> is relevant.

6	think the goals and values are that are most prominent in your work culture at the Australian Antarctic Division?	can still point out, there might be a few people within the division that perhaps aren't that way motivated. The system has got them down and it's just become a job. But if you put how many there are you know are like that, to how many there were like that a while ago, or percentage-wise, it's improved. And I'd say that would be the same all the way through society related to the change in productivity that we've got.	Positive Perfections	
8	Have you ever considered giving up your professional position as a scientist for a simpler life ( <i>simpler life</i> here means renouncing material life for a life of austerity and spiritual self-realisation). Can you explain your answer?	I haven't and I wouldn't. I mean, I can think better when I'm comfortable and I like to make sure – I mean I'm certainly motivated to make a salary and a wage to support my family and make them comfortable and give them the opportunities that I reckon I've had to develop their lives and careers, and I would be – and then again, yes, because I certainly would consider when I got to the stage of perhaps considering early retirement, so that I can give a bit more time to the family, but it wouldn't be to cut out the science.	Negative Emotions	The Negative Emotion of <i>attachment</i> is relevant, specifically through features such as material comfort and the development of economic situations for family members.

TABLE P2-7. CHURCH, JOHN

INTERVIEW QUESTION NO.	QUESTION	RESPONSE	ABHIDHARMA FACTOR REPRESENTATION	ABHIDHARMA FACTOR REPRESENTATION CLARIFICATION
3	Can you tell me anything about your own consciousness during your working day i.e. what usually goes through your mind during an ordinary working day?	<p><b>John:</b> The main thing is how do I deal with all this bloody email.</p> <p><b>Elli:</b> Yes I think I tend to relate to that one as well actually.</p> <p><b>John:</b> I don't know how to answer this question. I guess I'm some sort of practical, down to earth person. I have a huge international commitment.</p> <p><b>Elli:</b> International.</p> <p><b>John:</b> Yes, I'm on international steering committees, so balancing those with my obligations to my employer and actually producing results that are both relevant to science and to society and it's getting that balance and also there's also a family commitment.</p>	Negative Emotions	When the mind is <i>attached</i> to material considerations it "produces frustration" (Appendix B, 16).
5	Do you have any thoughts on the idea that spiritual insight and wisdom should play, or do	Okay, in that context I don't believe in God and spirits etc., so I guess I'd simply have to say it has not impact [ <i>indecipherable</i> ]. Perhaps, more broadly, certainly wisdom I think does. There would be two aspects of it. One would	Negative Mental Events	According to the Abhidharma, the Negative Mental Event of <i>lack of trust/faithlessness</i> is "the mind associated with the category bewildering which does not have deep conviction" (Appendix B, 12). Church's response may be said to represent a lack of trust in non-material

	already play, an active role in contemporary scientific research such as physics and biology?	be physical insight. There's a million things I could do, but choosing which one to do and which explanation to pursue to try and understand something involves physical insight. That's perhaps a little bit more like your qualitative science I guess. That's an important thing to do. It's important to have that physical insight. Another side might be, wisdom probably plays an important role in the sense of – well perhaps in responding to climate change. What are appropriate solutions. When might be the right time for society to adopt these solutions. What are the broader impacts. So in that sense, I'd say wisdom certainly does have a role to play.		phenomena. He appreciates wisdom within the context of management and policy decisions based on material considerations.
6	What do you think the goals and values are that are most prominent in your work culture at the Australian Antarctic Division?	Okay the goals are really trying to understand the environment, the ocean and the climate system, and the group I'm in focus on climate change. Incorporating that understanding in ways that society can benefit from, particular prediction models predicting the future, as well as actually understanding what's happening now. I think there's value in that alone without making predictions for the future. The culture is very much that the science is important, it needs to be independent, it needs to be top quality, it	Positive Mental Events/ Positive Perfections	Trying hard to understand the workings of the natural environment represents the Positive Mental Event of <i>concern/conscientiousness</i> , described as “to realise all worldly and transworldly excellences” (Appendix B, 5). It also represents the Positive Perfections of <i>determination/resolution</i> and <i>energy</i> . Whilst scientific knowledge itself is undoubtedly steeped in materialism, the resolve itself on behalf of scientists to understand the Earth is a positive factor.

		needs to be international standard, we need to link internationally.		
8	Have you ever considered giving up your professional position as a scientist for a simpler life ( <i>simpler life</i> here means renouncing material life for a life of austerity and spiritual self-realisation). Can you explain your answer?	I certainly can explain the answer. I certainly have given thought to giving up life to a simpler life and I guess it relates to something I said earlier - the pressures of international obligations and national obligations and obligations to my employer and obligations to society and my family and with my personal life. Sometimes I'd like life to be simple. There have been phases when I've said, well I can stand this any longer I'm out of here. But I have not done it and there's probably two answers. One, like most of us I am probably somewhat scared of the unknown and perhaps, more importantly, I do actually want to have an impact both in the science and its impact on society.	Positive Perfections	Church's needs to <i>renounce</i> the complexities of material life, although they are intermittent, are indicative of the Positive Perfection of <i>renunciation</i> . This perfection is described by the CAFG-GACTA as that which "departs from sense pleasures and existence" and verifies the "unsatisfactoriness" of sense pleasure and sense existence (Appendix B, 20). In Church's case, he experiences the need to disassociate himself from different types of sensual involvement through his career and family life.

TABLE P2-8. COLEMAN, RICHARD

INTERVIEW QUESTION NO.	QUESTION	RESPONSE	ABHIDHARMA FACTOR REPRESENTATION	ABHIDHARMA FACTOR REPRESENTATION CLARIFICATION
3	Can you tell me anything about your own consciousness during your working day i.e. what usually goes through your mind during an ordinary working day?	If I was sitting here at Hobart and I don't have too much consciousness about what I'm trying to do for Antarctic work except make spare time to be able to do the research, which in my position at the moment doesn't happen too easily. So it's usually weekends that are the only time that you could get spare time to plan and to do some of the science. If you're down there, for us, you're just totally involved in doing projects and interacting with other people within the community and being able, if you like, to progress things in the optimum way with the other constraints that exist. Such things from weather logistics, to just general day to day issues that come up.	Negative Mental Events	Coleman states that he does not have much consciousness about his work except trying to find time in his rushed schedule. This lack of consciousness or awareness is affiliated with the Negative Mental Event of <i>gloominess/dullness</i> , described as that which "causes one to not perceive things clearly. It also causes the mind to become insensitive, meaning it can not comprehend matters properly. It causes the mind to lapse into darkness" (Appendix B, 11).
5	Do you have any thoughts on the idea that spiritual insight and wisdom should play, or do already play, an	I think the spiritual aspects of what people believe and how they behave is much more an individual behaviour rather than a group behaviour these days. But I think that's the evolution of religion as a whole in current times... Certainly for the scientists that go down. It's more	Positive Mental Events/ Positive Perfections	An environment in which acceptance of others' philosophical and religious persuasions is dominant is affiliated with the Positive Perfection of <i>patience/forbearance</i> .  Other relevant factors include the Positive Mental Events of <i>non-hatred</i> and <i>non-attachment</i> .

	active role in contemporary scientific research such as physics and biology?	to me common sense in terms of making decisions and some experience in knowing which decisions are the right ones to make.		
6	What do you think the goals and values are that are most prominent in your work culture at the Australian Antarctic Division?	I think for me it's about leadership. Being able to make strategic plans for research and setting out goals that need to be achieved over a short and long period of time. Being able to integrate others into the projects that certainly can't be done by yourself so it's including others. Being able to value other's input, by other students or other colleagues and being able to, if you like, get the best out of everybody in terms of the common goal.	Positive Perfections	The Positive Perfection of <i>energy</i> is relevant. The Positive Perfection of <i>morality/virtue</i> may also be relevant in terms of Coleman's valuing his work colleagues' contributions and working towards the common or greater goal.
8	Have you ever considered giving up your professional position as a scientist for a simpler life ( <i>simpler life</i> here means renouncing material life for a life of austerity and spiritual self-realisation). Can	Well, firstly I don't think I would give up the life of a scientist because I think it is a pretty simple and focussed life. You're not in the game to make money, well certainly from the science that we're doing here. In other science areas, I guess you can make inventions and make large amounts of money from the work undertaken. ... Yes, well simple and focussed in terms of I'm pretty locked onto achieving what I am trying to do, so that way there's a few peripheral things that I ignore and so you're setting	Positive Perfections/ Positive Mental Events	The Positive Perfection of <i>determination/resolution</i> is relevant, due to Coleman's consciousness about his work duties. He states that in his experience, working as a scientist is a simple and focused life, without motivations about earning a lot of money. The Positive Mental Event of <i>non-attachment/detachment</i> is also relevant due to his being unattached to making a lot of money. He also states that important tasks take priority over his family-life, indicating a sense of purposefulness, which may be described as being affiliated with the Positive Mental Event of <i>concern/ conscientiousness</i> .

	you explain your answer?	priorities in what you want to do next. So there are weekends where family sometimes takes second priority in terms of doing what I think needs to be done.		
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TABLE P2-9. DAVIDSON, GARY

INTERVIEW QUESTION NO.	QUESTION	RESPONSE	ABHIDHARMA FACTOR REPRESENTATION	ABHIDHARMA FACTOR REPRESENTATION CLARIFICATION
3	Can you tell me anything about your own consciousness during your working day i.e. what usually goes through your mind during an ordinary working day?	I think you spend probably half your time planning for the next few days and if you're teaching then you find you're teaching just saturates your time ?...?. When you're working on a teaching day, or prior to a day that's going to have a lot of teaching on it, then you focus on the logistics and really preparing your mind to be on top of the subject that you're going to be talking about for hours on end. You might not have talked about that for many months before. I do have to brush up and then if it's a span that I'm focussing on my research, then I'll be dividing my time between the things that are imperative to do quickly and also then looking at contact with my graduate	Positive Perfections/ Negative Mental Events	<p>The Positive Perfection of <i>energy</i> is relevant, as is indicated by Davidson's endeavours to fulfil his many work commitments. <i>Determination/resolution</i> may also be relevant due to his focus on achieving the best results from his activities.</p> <p>The Negative Mental Events of <i>jealousy/envy; ebullience/restlessness/distraction; and inattentiveness</i> are also present within Davidson's desires to enjoy what he can't during his working hours i.e. activities that others are enjoying, such as playing in the snow.</p>

		students, so that we are all going forward as a team ... So there are those thoughts, and there are thoughts of 'wouldn't it be nice to be out on the snow that we've been having'. It's an interesting thing I suppose. ... during a working day – you do spare a bit of time for thinking, 'how can I be involved in the rest of world outside of these four walls', especially on the weekend.		
5	Do you have any thoughts on the idea that spiritual insight and wisdom should play, or do already play, an active role in contemporary scientific research such as physics and biology?	In terms of an active role I don't think it would be an <i>active</i> role. I think that it may be for some people, but it's not for me. There are no religious boundaries for instance that I feel inhibit or impede or control the nature of my scientific research as might occur say if we had a fundamentalist Christian undertaking this sort of geological work and their rigorous notions of time can often come into conflict with what they're observing ... I think that wisdom is always important in scientific research, knowing what to study that is not going to be a wasted endeavour ... I think that wisdom does play a very active role in the structure of scientific research. It's wisdom and insight that allow scientists to know where are the holes in here or where are	Negative Emotions	Davidson discusses that insight and knowledge are relevant to his scientific research. However, he also refutes the idea that religious (taken here as inferring <i>spiritual</i> ) aspects of his work are irrelevant. I.e. the Negative Emotion of <i>lack of intrinsic awareness/ignorance</i> is relevant. This Negative Emotion is described as “ignorance about what constitutes material and non-material considerations” (Appendix B, 18).

		the weaknesses in understanding here, so that's fundamentally what's pushing your perspective on an opportunity. I think that you could term that wisdom.		
6	What do you think the goals and values are that are most prominent in your work culture at the Australian Antarctic Division?	We don't want to harm the environment and we're undertaking research that we perceive has very little impact on the environment ... goals is always to forge new linkages with other institutions, mostly overseas because the rewards in the granting process are greater for working with overseas people. It's a rewarding thing in itself because of their different perspectives that they bring and certainly that's been terrific in our work. I also have a goal of not trying to do too much, not extending past into new fields too much and I hope that other people respect that as well. You don't get too greedy, even though you may have a unique opportunity to do research, you don't try and do everything.	Positive Mental Events/ Negative Emotions	<p>The Positive Mental Events of <i>non-violence</i> and <i>decorum/consideration for others</i> are relevant. <i>Non-violence</i> is relevant through scientists' wanting to refrain from harming the natural environment. <i>Decorum/consideration for others</i> is relevant through Davidson's desire to not be greedy in terms of the development of research areas. <i>Decorum/consideration for others</i> is described in the CAFG-GACTA as "avoiding acts that may have negative ramifications for oneself and for others" (Appendix B, 2).</p> <p>The Negative Emotion of <i>attachment</i> is also relevant in terms of Davidson's prioritisation of material considerations such as forging new linkages with other research institutions.</p>
8	Have you ever considered giving up your professional position as a scientist for a simpler life	If a simpler life is self-realisation I guess I have a template that wouldn't necessarily occur right in your house and a simpler life might mean that you don't have a house, so your life still could be struggle. To what extent that then struggle is a simpler life, I think that	Negative Emotions	The Negative Emotion <i>opinionatedness/afflicted views</i> is relevant. The CAFG-GACTA defines it as "an emotionally tainted appreciation which is <i>concern/conscientiousness</i> with the five psycho-physical constituents as 'I' or 'mine'. It is associated with dogma and claim, and constitutes speculation about what is perishable and what is

	( <i>simpler life</i> here means renouncing material life for a life of austerity and spiritual self-realisation). Can you explain your answer?	there's a tension there so my '...' idea of a simpler life is that all you needs are taken care of because they're very minimal but that you are still able to obtain the circumstances of basic necessities of warmth and food and health. In this notion of a simpler life I think there's an assumption that the things that we struggle for have been met somehow, so there is an unreality to that ... I haven't considered taking the family to Vanuatu and becoming a member of a simpler community. I guess I'm too comfortable in what I'm doing now and I'm able to achieve spiritual comfort by interacting with the environment here in Tasmania. I think that is the closest to spirituality that my life sees, apart from looking up into the great firmament.		not perishable" (Appendix B, 19). I.e. Davidson speculates about what constitutes spirituality and a simpler life, even though they are defined by the interviewer upon request. He gives his opinions on their meaning rather than responding to the question.  The Negative Emotion of <i>attachment</i> is also relevant due to his not wanting to part with the material comforts that his professional position brings.
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TABLE P2-10. MILLER, DENZIL

INTERVIEW QUESTION NO.	QUESTION	RESPONSE	ABHIDHARMA FACTOR REPRESENTATION	ABHIDHARMA FACTOR REPRESENTATION CLARIFICATION
3	Can you tell me anything about	There are elements obviously of things like frustration and that's normally	Negative	When the mind is <i>attached</i> to material considerations (a Negative Emotion) it produces

	<p>your own consciousness during your working day i.e. what usually goes through your mind during an ordinary working day?</p>	<p>because either you feel you're not in control of the situation, or you feel someone's done something you wouldn't have done. That takes a bit of maturity in dealing with. However, my general consciousness of each day is exciting. I do find every day is something exciting presented to me and in that I always try and go back to the basic principles that I've trained on when faced with a problem I would much more take an analytical approach than a fragmentary one. So I always try and think 'well what are the options attached to doing this and what are the options attached to doing that'. That doesn't mean I'm indecisive because I'm not a procrastinator but I analyse what I'm doing and try and analyse the consequences of what I'm doing.</p>	<p>Emotions/ Positive Mental Events/ Positive Perfections</p>	<p>frustration.</p> <p>The Positive Mental Event of <i>alertness/suppressiveness</i> is relevant within Miller's awareness of his own state of consciousness as being one of excitement. Also, he is analytical in his approach to his work, indicating his ability to focus on problems. The CAFG-GACTA defines <i>alertness/suppressiveness</i> as "concentration on and interest in positive objectives" (Appendix B, 5).</p> <p><i>Patience/forebearance</i>, a Positive Perfection, is also relevant due to Miller's patience with co-workers and his ability to maintain his disposition when dealing with others in general (indicated by his efforts to apply himself according to his training in dealing with relevant situations). This was indicated through Miller's entire interview, not just his response to this particular question.</p>
5	<p>Do you have any thoughts on the idea that spiritual insight and wisdom should play, or do already play, an active role in</p>	<p>I think coming from a biological background awareness if you like – it sounds almost arrogant – of natural order is spirituality in its own ends in many ways. One cannot be unmoved by standing back from a biological system and seeing the way it manifests itself in all its variations and variability. One can</p>	<p>Negative Emotions/ Positive Mental Events/ Positive Perfections</p>	<p>Although Miller admits that his statement may be one of <i>arrogance/self-importance</i> (a Negative Emotion) he nevertheless makes the statement. The Positive Perfection of <i>truthfulness/does not deceive</i> is relevant within the same response.</p> <p>The Positive Mental Event of <i>non-deludedness/non-bewilderment</i> is relevant due to Miller's</p>

	contemporary scientific research such as physics and biology?	only sit back but in awe and say, well that really is an indication of something that is beyond our consciousness ... yes I do believe spirituality and also it does make the enthusiasm thing. That insight enthusiasm comes from a commitment and that commitment is sometimes very intangible. You have to believe in what you're doing and if you want to say spirituality is a belief, well it is as well. It's all those things.		understanding of causal factors beyond his own condition of consciousness. <i>Non-deludedness/non-bewilderment</i> is described as "clear-sightedness as to what constitutes the illusion of the material realm of existence" (Appendix B, 4).
6	What do you think the goals and values are that are most prominent in your work culture at the Australian Antarctic Division?	That has a whole number of qualities that feed into that and in science those are the qualities of accuracy – the qualities of precision, the qualities of presentation, the qualities of logical flow, the qualities of principle, application of principle. In any human endeavour they're very much the same. We all want to be as precise as we can. We want to make sure we use the information in the best possible way that we can use it. We want to be sure that we're aware of any of the limitations in that information so we can either quantify them or at least identify them. We try to make sure that when we either present it to ourselves or kind of communicate it to others that it's intelligible, that it's logically constructed. It's those qualities that we certainly, within this	Positive Mental Events/ Positive Perfections	<p>The Positive Mental Events of <i>self-respect</i>; <i>alertness/suppleness</i>; and <i>concern/conscientiousness</i> are relevant. <i>Self-respect</i> is relevant in terms of Miller's acknowledgement of his own adherence to higher principles. <i>Alertness/suppleness</i> is relevant in terms of Miller's awareness of the professional qualities of his work colleagues.</p> <p><i>Concern/conscientiousness</i> is relevant through his general care taken by him and his work team to achieve high quality science. The Positive Perfection of <i>energy</i> is also relevant within this context.</p>

		organization, ascribe to. I think it's almost inherent and general scientific and as a whole, it has to be.		
8	Have you ever considered giving up your professional position as a scientist for a simpler life ( <i>simpler life</i> here means renouncing material life for a life of austerity and spiritual self-realisation). Can you explain your answer?	Has it ever entered my mind – yes, in that context, but I don't think I'd have the courage to do that. Plainly and simply because I guess a lot of what I'm doing in my science and a lot of what I do in my daily life, in this job in particular, I see as revealing things about myself all the time.	Positive Mental Events/ Positive Perfections	<p>The Positive Mental Event of <i>diligence/enthusiasm</i> is relevant. The CAFG-GACTA describes this quality as “inclination towards the wholesome. It is the mind intent on being ever active, devoted, unshaken ... and indefatigable. Enthusiasm is the dynamic quality of mind necessary to effectively accomplish any spiritual growth and understanding” (Appendix B, 4).</p> <p>The Positive Perfection of <i>renunciation</i> and the Positive Mental Event of <i>non-deludedness/non-bewilderment</i> are also relevant, due to Miller's readiness to <i>renounce</i> his professional position and his <i>non-deludedness/non-bewilderment</i> as to the self-realisation that he attains through his professional position.</p>

TABLE P2-11. MORGAN, VIN

INTERVIEW QUESTION NO.	QUESTION	RESPONSE	ABHIDHARMA FACTOR REPRESENT- ATION	ABHIDHARMA FACTOR REPRESENTATION CLARIFICATION
3	Can you tell me anything about your own consciousness during your working day i.e. what usually goes through your mind during an ordinary working day?	I think the answer to this question is no.	Negative Emotions	The Negative Emotion of <i>lack of intrinsic awareness/ignorance</i> is relevant, as Morgan is unable to give any responses as to his consciousness.
5	Do you have any thoughts on the idea that spiritual insight and wisdom should play, or do already play, an active role in contemporary scientific research such as physics and biology?	There's higher principles, such as just being honest, and you can be honest in different ways I suppose in research. Again, this is just scientific research anywhere. I mean it isn't specifically Antarctic research of course. There's a lot of discussion at the moment about ... and there's been a few cases of people being dishonest. There's something (the journal) nature - an article recently saying that you should have to have a licence. You can lose your licence to practice medicine. If you behave really	Positive Perfections	The Positive Perfection of <i>truthfulness/does not deceive</i> is relevant.

		dishonestly, should people lose their licences to practice science, namely their PhDs????		
6	What do you think the goals and values are that are most prominent in your work culture at the Australian Antarctic Division?	Well, there's certainly a goal that's required and it is to get work out, to do research and to get things out, and in fact to get papers published.	Positive Perfections	The Positive Perfection of <i>energy</i> is relevant.
8	Have you ever considered giving up your professional position as a scientist for a simpler life ( <i>simpler life</i> here means renouncing material life for a life of austerity and spiritual self-realisation). Can you explain your answer?	Yes. But not for very long ... I mean I haven't thought about it for very long. No, I haven't really actually thought of that. I mean I occasionally about thinking of retiring but that's for a life of austerity, no I haven't really thought of giving up the scientist, just being a scientist to sit in a cave and contemplate or whatever.	Negative Emotions/ Positive Perfections	First Morgan says that he has briefly considered giving up his profession for the sake of spiritual realisation (the Positive Perfection of <i>renunciation</i> ) but then he says that he has in fact not considered it seriously (the Negative Emotion of <i>attachment</i> ).  In addition to the above factors, the Negative Emotion of <i>indecision</i> is relevant.

TABLE P2-12. NICOL, STEVE

INTERVIEW QUESTION NO.	QUESTION	RESPONSE	ABHIDHARMA FACTOR REPRESENTATION	ABHIDHARMA FACTOR REPRESENTATION CLARIFICATION
3	Can you tell me anything about your own consciousness during your working day i.e. what usually goes through your mind during an ordinary working day?	I find that, particularly when I'm working at the Antarctic Division, that almost my entire day is spent reacting to other people's wants and needs. There isn't a lot of time for consciousness, there isn't enough time to actually plan to do things. You end up responding to other people's needs, so if things go through my mind they're generally in relation to the last person who bothered me, the next person who's going to bother me, and if possible if I get a spare moment of time to actually try to do some of the research work as well. It's a very reactive mode that I'm in. Generally I've got several different things on the go at once so what I'll be doing is going from ? wanting?, waiting for somebody else to provide information onto the next thing while I wait and so on. It's a juggling process and you have to be able to switch from research to people management, to being a travel agent to doing all sorts of things. It's	Negative Emotions/ Negative Mental Events	<p>The Negative Emotion of <i>lack of intrinsic awareness/ignorance</i> is relevant. As Nicol can't find enough time during his working day to experience 'consciousness,' ignorance, unawareness or a lack of conscious thought processes during his working day effect him. The Negative Mental Event <i>gloominess/dullness</i> is also relevant, in terms of Nicol's inability to perceive his own state of awareness.</p> <p>The Negative Mental Events of <i>resentment</i> and <i>inattentiveness</i> may also be relevant. Nicol seems to be displeased with his workload. His statements such as 'you end up responding to other people's needs, so if things go through my mind they're generally in relation to the last person who bothered me, the next person who's going to bother me' suggest an undertone of dissension.</p> <p>Nicol's statements suggest that he is unable to cope with his workload. Such a predicament may be affiliated with <i>inattentiveness</i>, by which the individual is distracted from his/her goals due to</p>

		very rare that you get a period of time where you're actually able to sit down and devote yourself to a single task for a protracted period.		material considerations.
5	Do you have any thoughts on the idea that spiritual insight and wisdom should play, or do already play, an active role in contemporary scientific research such as physics and biology?	<p>Well, my interpretation of what wisdom is if you like an accumulated series of insights, of what you accumulate with time that allows you to process your universe ...</p> <p><b>Elli:</b> Okay, and spiritual insight?</p> <p><b>Steve:</b> That's a more difficult one because it's something that most scientists wouldn't deal with at all in terms of they wouldn't reveal to other scientists whether they use spiritual insight and they wouldn't admit to it if they did, so you're unlikely to find out whether they ?...?. Personally I don't use spiritual insight very much.</p>	Negative Mental Events	The Negative Mental Event of <i>slyness-concealment</i> is relevant due to scientists' concealment about their spirituality. According to the CAFG-GACTA, <i>slyness-concealment</i> means "to desire to not be transparent due to unwholesome or negative thoughts and plans of action" i.e. scientists' choosing to not disclose their spirituality is an unwholesome mental event.
6	What do you think the goals and values are that are most prominent in your work culture at the Australian Antarctic Division?	In terms of science one of the most important things that scientists value is integrity I suppose and being taken seriously so that when they actually make a ?...? on something people actually sit up and take notice. They believe them because they believe in that particular person because of their track record or their – basically their track record – so I think that that, for most scientists, would	Positive Mental Events/ Positive Perfections	The Positive Mental Event of <i>self-respect</i> is relevant due to Nicol's statement that scientists' desire to be taken seriously and to be seen as having integrity. Such desires on behalf of scientists are also representative of the Positive Perfection of <i>morality/virtue</i> , in that they want to be seen as doing valuable work.

		be one of the most important things. They would be seen to have integrity.		
8	Have you ever considered giving up your professional position as a scientist for a simpler life ( <i>simpler life</i> here means renouncing material life for a life of austerity and spiritual self-realisation). Can you explain your answer?	Not since this morning. I wouldn't give it up for a more complex – but I would give it up for something that involved a great deal less stress at times. It might not necessarily be renouncing material life. It might ?...? ...if I won the lottery I would certainly drop science and go and do something far more material. I don't see myself currently wanting to have a more austere and spiritual life.	Negative Emotions	The Negative Emotion of <i>attachment</i> is relevant. Nicol is not interested in giving up his material comforts or in adopting spiritual practices. He is, in other words, attached to material or sensuous life.

TABLE P2-13. RAMM, DAVID

INTERVIEW QUESTION NO.	QUESTION	RESPONSE	ABHIDHARMA FACTOR REPRESENTATION	ABHIDHARMA FACTOR REPRESENTATION CLARIFICATION
3	Can you tell me anything about	Well to a large extent it depends on what I'm doing at the particular time. At the		The Negative Emotion of <i>attachment</i> is relevant. Ramm comments on his extensive plans to

	your own consciousness during your working day i.e. what usually goes through your mind during an ordinary working day?	moment for example I'm developing some fishery reports so it's a lot of programming and thinking about ways to manipulate the data and what needs to be done. I'm a fairly practical person so thoughts usually extend to what I'm doing at the moment.	Negative Emotions	manipulate the material energy (in the form of data) indicating absorption in material life.
5	Do you have any thoughts on the idea that spiritual insight and wisdom should play, or do already play, an active role in contemporary scientific research such as physics and biology?	<p><b>David:</b> I think it does. I think big bang theories and creation of the universe, they're on the edge of being spiritual I guess. I think it's important. It should definitely be included.</p> <p><b>Elli:</b> Okay. I kind of left that term 'spiritual insight' ?...? I didn't give you the ?...? ?...? People apply it in different ways.</p> <p><b>David:</b> I think certainly in high energy physics when you start to lose touch with the macroscopic world and delve into fundamental particles and how the universe was created - this definitely has elements of spirituality.</p>	Positive Mental Events	The Positive Mental Events of <i>non-deludedness/non-bewilderment; alertness/suppleness</i> ; and <i>concern/conscientiousness</i> are relevant. Ramm's ability to discern that a non-material dimension of a higher order exists is affiliated with the Positive Mental Event of <i>non-deludedness/non-bewilderment</i> . It is described in the CAFG-GACTA as "clear-sightedness as to what constitutes the illusion of the material realm of existence" (Appendix B, 4).
6	What do you think the goals and values are that are most prominent in your	I think probably the one that stands out in my mind is the influence of science in the whole process and CCAMLR tries to use the best available information or the best science possible, and that's quite unusual	Negative Emotions	The Negative Emotion of <i>attachment</i> is relevant. As the foundation of empirical science is material development, material prioritisation eventuates. As empiricism means attaining knowledge through the material senses, the representation of

	work culture at the Australian Antarctic Division?	for a body that's involved with managing fisheries. All the other management agencies that I know of let politics play a lot bigger role than we do at CCAMLR. In that sense CCAMLR has a Commission, which is basically the political group and a Scientific Committee which is an independent body that provides scientific advice to the Commission. The commission always takes note of the scientific advice. All of my work is channelled to the Scientific Committee so that side of things is important.		<i>attachment</i> is supported by the fact that dedication to empiricism means dedication to furthering the material paradigm ( <i>attachment</i> to material life).
8	Have you ever considered giving up your professional position as a scientist for a simpler life ( <i>simpler life</i> here means renouncing material life for a life of austerity and spiritual self-realisation). Can you explain your answer?	I've definitely thought about giving up this for a simpler life. I don't know whether it qualifies under your definition, but the idea to set sail on a boat and go around the world is very appealing. That doesn't renounce material life but it's a much simpler existence.	Positive Perfections/ Positive Mental Events	The Positive Perfection of <i>renunciation</i> is relevant. Ramm states he has considered renouncing his career for a simpler existence. He also states that he is aware that sailing around the world does <i>not</i> constitute renouncing material life ( <i>non-deludedness/non-bewilderment</i> ) indicating that he is able to understand the difference between material and spiritual activities and that some activities constitute lesser material involvement than others.

TABLE P2-14. REID, JAMES

INTERVIEW QUESTION NO.	QUESTION	RESPONSE	ABHIDHARMA FACTOR REPRESENTATION	ABHIDHARMA FACTOR REPRESENTATION CLARIFICATION
3	Can you tell me anything about your own consciousness during your working day i.e. what usually goes through your mind during an ordinary working day?	In an ordinary working day I might be teaching and a whole lot of admin. and not much research so it's hard to say what is going through my mind. When I'm able to spend a lot of time on research then you usually get caught up in it a lot and there's the desire to resolve problems with data or ?...? ...quite motivating. There's this sort of excitement with Antarctic stuff ?...? ?when data comes from the ship? ...getting the stuff, and you're the first person to see it.	Negative Emotions/ Negative Mental Events	The Negative Mental Event <i>gloominess/dullness</i> is relevant due to Reid's failure of awareness as to what is going through his own mind. <i>Lack of intrinsic awareness/ignorance</i> may also be relevant in terms of his inability to perceive his own conscious condition.  The Negative Emotion of <i>attachment</i> is relevant due to Reid's desires to experience Antarctic paraphernalia through the material senses.
5	Do you have any thoughts on the idea that spiritual insight and wisdom should play, or do already play, an active role in contemporary scientific research such as physics	I don't really have a strong point of view there. I guess something like wisdom is ?useful? ... I guess I'm thinking ?...? common sense kind of. I haven't got any strong ?...? ideas.	Negative Emotions/ Negative Mental Events	The Negative Emotions of <i>indecision</i> and <i>lack of intrinsic awareness/ignorance</i> are relevant, due to Reid's inability to come to a position on the question being asked. The Negative Mental Event of <i>desultoriness/non-discernment</i> may also be relevant for the same reasons.

	and biology?			
6	What do you think the goals and values are that are most prominent in your work culture at the Australian Antarctic Division?	It's a very difficult question. There are usually specific reasons I ?...? working on paper ?...? I guess that's where the pressure is, to publish data or to get things ?...? ... it usually pays to get everything organised and make sure the whole voyage isn't going to be a fiasco because you've forgotten to put in some piece of ?gear?	Negative Emotions	When the mind is <i>attached</i> to material considerations it produces frustration.
8	Have you ever considered giving up your professional position as a scientist for a simpler life ( <i>simpler life</i> here means renouncing material life for a life of austerity and spiritual self-realisation). Can you explain your answer?	<p>I haven't really thought of doing that. I've thought of trying to get a research job done ?...? something that's got less varied demands on your time. It would be nice to either have a job ?... teaching? or have the ?...</p> <p><b>Elli:</b> ?...? less demanding</p> <p><b>James:</b> Less demanding in terms of the variety of things you're expected to do.</p>	Negative Emotions	Reid comments that he has not contemplated giving up his professional position for the sake of spiritual pursuits, indicating that he is attached to his material circumstances. The CAFG-GACTA states that <i>attachment</i> produces frustration, which is evident in Reid's comments about his not wanting so many demands through his job.

TABLE P2-15. RIDDLE, MARTIN

INTERVIEW QUESTION NO.	QUESTION	RESPONSE	ABHIDHARMA FACTOR REPRESENTATION	ABHIDHARMA FACTOR REPRESENTATION CLARIFICATION
3	Can you tell me anything about your own consciousness during your working day i.e. what usually goes through your mind during an ordinary working day?	<p><b>Martin:</b> ‘I wish I could clear up all this mess’, ‘I wish I could set enough time aside to get everything properly filed and organised’, and I know I never will. I wish I had more time to spend going into depth in certain tasks and the opposite to that of course is I wish there weren’t so many nagging urgent little things that get in the way of doing that.</p> <p><b>Elli:</b> So time constraint is one thing.</p> <p><b>Martin:</b> Time constraint is definitely, yes. Balancing – for the sake of the tape, something that I said before the tape went on was that on a daily basis I’m really judged on how well I manage a group. I’m judged as a manager, but at the end of the year it doesn’t really matter. What really matters is how much you’ve produced.</p>	Negative Emotions	When the mind is <i>attached</i> to material considerations it produces frustration.
5	Do you have any thoughts on the idea that spiritual insight and	I would certainly like to think that wisdom is and does play a role in good science and contemporary scientific research includes a range of science from	Negative Emotions	The relevant Abhidharma factors in Riddle’s response are the Negative Emotions of <i>attachment</i> and <i>lack of intrinsic awareness/ignorance</i> . He states that most scientists are caught up in the

	wisdom should play, or do already play, an active role in contemporary scientific research such as physics and biology?	good science to worthless science... Let's put the ethics to one side, but if we're looking at it in terms of are people framing their activities as scientists within some bigger context, I suspect in general not. I suspect that most people are caught up in the nuts and bolts of their particular area of specialist expertise and get involved in the small details and seldom would make the like between some really broader inter-connected clearer ...?		practical (material) side of the science and seldom make the link with broader or bigger considerations. In other words, scientists prioritise material involvement over seeing 'the bigger picture,' which results in <i>lack of intrinsic awareness/ignorance</i> (one of the CAFG-GACTA's definitions of this Negative Emotion is "to invest oneself in enjoyment of the senses instead of focusing on one's spiritual goals" (Appendix B, 18).
6	What do you think the goals and values are that are most prominent in your work culture at the Australian Antarctic Division?	I still have a young and enthusiastic – and in some ways a naively enthusiastic – group who, in general, believe in what they're doing, enjoy what they're doing, are not too cynical yet about the constraints of getting things done. There is a degree of cynicism there, and by that I mean that some people have less tolerance for the bureaucratic overheads for example. In general the people that I interact with all have a strong environmental ethic, and I say that without exception, and that is probably a self-selecting, self-fulfilling thing.	Positive Mental Events/ Positive Perfections	Environmental ethics is generally representative of <i>non-violence</i> , a Positive Mental Event, due to principles of not harming the natural environment or its inhabitants. It is also represented by <i>morality/virtue</i> for the same reasons.  The Positive Mental Event of <i>diligence/enthusiasm</i> and the Positive Perfection of <i>energy</i> are both relevant due to the zeal shown by Riddle's work group.
8	Have you ever considered giving up your	I've interpreted it – it's not necessarily about becoming a monk - so by austerity, which is obviously the renouncing	Negative Emotions/	The Negative Emotion of <i>attachment</i> is relevant due to Riddle's desires to enjoy materially through his senses. Whilst he interprets sailing and

	<p>professional position as a scientist for a simpler life (<i>simpler life</i> here means renouncing material life for a life of austerity and spiritual self-realisation). Can you explain your answer?</p>	<p>material goods, and spiritual self-realisation, I've interpreted that as going off sailing or spending more time snowboarding or something that I would enjoy doing and get an uplifting feel from. Yes, absolutely. I've thought about doing all those sorts of things.</p>	<p>Negative Mental Events</p>	<p>snowboarding as spiritual activities, the Abhidharma sees them as pursuance of sensual enjoyment.</p> <p>The Negative Mental Events of <i>desultoriness/non-discernment</i> and <i>lack of trust/faithlessness</i> may also be relevant. This is due to Riddle's mind being absorbed in pursuing sense objects (<i>desultoriness/non-discernment</i>) and his <i>lack of trust/faithlessness</i> in cultivating more serious spiritual qualities such as the Positive Perfection of <i>renunciation</i>, or the Positive Mental Events of <i>non-attachment</i> and <i>non-deludedness/non-bewilderment</i>, which would enhance spiritual understanding.</p>
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TABLE P2-16. RINTOUL, STEVE

INTERVIEW QUESTION NO.	QUESTION	RESPONSE	ABHIDHARMA FACTOR REPRESENTATION	ABHIDHARMA FACTOR REPRESENTATION CLARIFICATION
3	Can you tell me anything about your own consciousness during your working day i.e. what usually goes through your mind during an ordinary working day?	In terms of day to day life, maybe the best way to describe it is a good day and a bad day. The bad days have been a bit more prominent in the last two years because I was playing very much a management role ... Lots of difficult problem solving, but for problems that inherit me I don't find that interesting – they're hard, and they're important but ?...? they matter to people. I'd rather find a creative solution to how changes in ocean circulation might affect the climate or penguin numbers than to find a creative solution to how to juggle budgets to allow something to happen. So I've retired from some of that, so that part is looking up. On a good day it's when I really – the reason I'm an observation oceanographer, somebody who goes to sea and makes measurements, as opposed to a computer modeller is that what I really enjoy is sitting down with a data set getting deeply into observations and trying to come up with a new idea about	Negative Emotions/ Positive Mental Events	<p>The Negative Emotion of <i>attachment</i> is relevant due to Rintoul's comments about bad days on which he had to engage in uninteresting research activities. According to the CAFG-GACTA, the function of <i>attachment</i> is to produce frustration.</p> <p>The Positive Mental Event of <i>diligence/enthusiasm</i> is also relevant, however, due to Rintoul's keenness to discover creative ways in which to problem-solve. The CAFG-GACTA defines <i>diligence/enthusiasm</i> as "inclination towards the wholesome. It is the mind intent on being ever active, devoted, unshaken ... and indefatigable... It is determination that is steady and aimed at producing tangible outcomes" (Appendix B, 4).</p>

		how the ocean works and how the ocean is interacting with those other aspects of the climate system I mentioned to determine climate.		
5	Do you have any thoughts on the idea that spiritual insight and wisdom should play, or do already play, an active role in contemporary scientific research such as physics and biology?	I'm not a religious person but part of the reason that I am a scientist is because I do believe there's an order to the world and part of what science is about is uncovering that order and figuring out how it works. At that level my beliefs or my sense that there is an order to the world is behind the fact that I'm a scientist at all. It makes it worth doing for me. Whatever the scientific conclusions that we reach, I don't think I would do my science any differently ?...? but if I was a devout Catholic or a practising Buddhist or ?...? I was a spiritual person in the sense of daily interaction with God in a mystical sort of way was important to me. I don't think that in the field I'm in that would make any difference.	Negative Emotions	The Negative Emotion of <i>lack of intrinsic awareness/ignorance</i> is relevant. Rintoul states that he does not think that spiritual considerations would make any difference to his research activities, even if he was a religious person. The CAFG-GACTA defines <i>lack of intrinsic awareness/ignorance</i> as "ignorance about what constitutes material and non-material considerations" (Appendix B, 18).
6	What do you think the goals and values are that are most prominent in your work culture at the Australian	There's an element of wanting to know how the world works and being the one to figure it out first. I think here there is a lot of respect within the group and so people do respect each other both for their science and as people and so it makes it a really enjoyable place to work	Positive Mental Events/ Positive Perfections	<p>The Positive Mental Events of <i>self-respect</i> and <i>decorum/consideration for others</i> are relevant in terms of respect amongst work colleagues.</p> <p>The Positive Perfection of <i>patience/forbearance</i> is also relevant within the context of the favourable working environment.</p>

	Antarctic Division?	where you can do science, but without this kind of back-stabbing or disagreeable ?...?. The values of the place in both the CRC and CSIRO are one of the most positive aspects of it, whereas there are other aspects of CSIRO which are not so wonderful.		
8	Have you ever considered giving up your professional position as a scientist for a simpler life ( <i>simpler life</i> here means renouncing material life for a life of austerity and spiritual self-realisation). Can you explain your answer?	Part of the reason that I moved here in the first place and have stayed is that in some aspects life is simpler here than it is in the US. Still I've got to work every day and I have a regular salary and it's a long way from the life of renunciation. There's a bit of an attraction there. I have spent time in various places around the world, India and the Middle East and so on and I've kind of toyed with the idea in some ways and in the end I feel like my life I think has a balance now. It really works for me and for my family, because I do have a regular wage coming in. There's some aspects of life for me and my family which are in a sense simpler than they would be if I had renounced more material things.	Negative Emotions	The Negative Emotion of <i>attachment</i> is relevant. This is supported by Rintoul's statement that he is attached to his regular salary and that the lifestyle maintained by his family and himself is now easier due to his monetary income. As the CAFG-GACTA states that <i>attachment</i> leads to frustration, Rintoul's notion that his involvement in material affairs creates a simpler lifestyle are indicative of the Negative Emotion of <i>lack of intrinsic awareness/ignorance</i> , by which the individual is confused about reality, which is "of the nature of mere mentation" (Appendix B, 18).

TABLE P2-17. ROBERTSON, GRAHAM

INTERVIEW QUESTION NO.	QUESTION	RESPONSE	ABHIDHARMA FACTOR REPRESENTATION	ABHIDHARMA FACTOR REPRESENTATION CLARIFICATION
3	Can you tell me anything about your own consciousness during your working day i.e. what usually goes through your mind during an ordinary working day?	I'd become totally overwhelmed with or over-saturated with the mechanics of the nuts and bolts and details and ?...? of doing the job – a vast array of stuff is going on ...It's trying to deal with things, get trials and experiments going, doing the paperwork and writing stuff up. The mechanical process from inside of doing the job that will ultimately will lead to actual research work and manifestation of that according to the main objective.	Negative Emotions	When the mind is <i>attached</i> to material considerations it produces frustration.
5	Do you have any thoughts on the idea that spiritual insight and wisdom should play, or do already play, an active role in contemporary scientific research such as physics and biology?	Should play. I don't know about should play, but I think it does. I don't know about should, I'll have to think about that – hear some arguments and be prompted. ... Human beings will have a sense for that, or maybe it's such a strong part of the human condition, some allusion to the greater being. It's all characterises our species and you could say that nature is like a outdoor church. You ?don't? have to go to a church, you can go to nature and you can get your spirituality from that, which I would agree with, rather	Positive Mental Events	The Positive Mental Event of <i>non-deludedness/ non-bewilderment</i> is relevant due to Robertson's "clear-sightedness as to what constitutes the illusion of the material realm of existence" (Appendix B, 4).

		than going to some abstract domain. People would sense that unless they were inert, they would sense that in any area where they go, particularly in the wilderness.		
6	What do you think the goals and values are that are most prominent in your work culture at the Australian Antarctic Division?	I think professionalism and work satisfaction, doing a good job maintaining the status quo. If you had to generalise, people here would probably get some element of satisfaction.	Positive Mental Events/ Positive Perfections	The Positive Mental Event of <i>diligence/enthusiasm</i> and the Positive Perfection of <i>energy</i> is relevant within the context of scientists wanting to 'do (-ing) a good job.'
8	Have you ever considered giving up your professional position as a scientist for a simpler life ( <i>simpler life</i> here means renouncing material life for a life of austerity and spiritual self-realisation). Can you explain your answer?	Not giving it up to that extreme – to that level. That sounds like going into the Himalayas and living in a cave. But to some degree, yes. To do something else that's different, like building a house of something and getting satisfaction of using your hands and creating something. Something like that. I certainly have but I'm so involved in stuff that's got no clear ending. It would be just too much to walk away from, and I can't break my income stream because I've got dependants and it's academic anyway. If I was completely single on my own – I'd even do that now, I'd be thinking in a few	Negative Emotions	The Negative Emotion of <i>attachment</i> is relevant, as Robertson is not prepared to renounce his material comforts. Whilst he states that he is prepared to give up his profession for a simpler life 'to some degree,' it is not considered significant enough to qualify as the Positive Perfection of <i>renunciation</i> .

		years maybe ?...? I'd do something else, but it's just dreaming.		
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TABLE P2-18. SOUTHWELL, COLIN

INTERVIEW QUESTION NO.	QUESTION	RESPONSE	ABHIDHARMA FACTOR REPRESENTATION	ABHIDHARMA FACTOR REPRESENTATION CLARIFICATION
3	Can you tell me anything about your own consciousness during your working day i.e. what usually goes through your mind during an ordinary working day?	I guess I'm fairly driven in a way, internally, and I'm constantly setting myself goals and deadlines and things like that and that's often what I'm thinking about. I'm not thinking of just about doing that ?...? right now, I'm thinking of trying to get it done so it fits into this bigger picture of trying to get things done. That's probably what's going through my mind most of the time, trying to piece all of that together in a planning sense, in most senses I guess.	Positive Perfections	The Positive Perfection of <i>energy</i> is relevant due to Southwell's efforts to carry out his work duties. The Positive Perfection of <i>determination/resolution</i> is manifest for the same reason.
5	Do you have any thoughts on the idea that spiritual insight and wisdom should	Insight and wisdom - I've thought about those words. Spiritual insight I'm not quite so sure about that. I can see how insight and wisdom could play a part. Insight probably at the beginning of the	Positive Mental Events	The Positive Mental Event of <i>non-deludedness/non-bewilderment</i> is relevant as Southwell states that insight and wisdom are both present within the scientific process. However, he refutes the idea that such insight is spiritual.

	play, or do already play, an active role in contemporary scientific research such as physics and biology?	scientific process to be able to make observations of systems around you or processes around you and to integrate all of the work that has been done before from other scientists and try and sift through all of that information and to sort out the wheat from the chaff to come to some kind of insight I guess on what the most critical issue is. Then that can involve a lot of insight and maybe there's no training on that. Maybe it's just a talent or an ability. Whether it's a spiritual insight, that's another matter – I'm not too sure about that. Wisdom to me more or less comes at the other end perhaps of the scientific process and that may be turning some kind of scientific result into – or interpreting that result – and then ?facing? the broader picture again perhaps. There's a fair bit of debate or discussion around some aspects of the scientific process that could involve wisdom. Like some of stuff I've been reading at present, there's a debate about some scientists - I guess this includes both insight and wisdom – who just go out and collect as much data as they can.		
6	What do you think the goals	I guess that the main goal would be sustainability in whatever impacts		Environmental ethics is generally representative of <i>non-violence</i> , a Positive Mental Event. It is also

	and values are that are most prominent in your work culture at the Australian Antarctic Division?	humans have on the Southern Ocean and Antarctica, sustainability through ?...? impacts program, through environmental management, through AMLR. They're all trying to, and this is in the mission statement as well, but I think there's a genuine underlying ethos I guess that most of us are trying to achieve sustainability in activities, in impacts.	Positive Mental Events/ Positive Perfections	represented by <i>morality/virtue</i> (a Positive Perfection) towards the natural environment and its inhabitants.
8	Have you ever considered giving up your professional position as a scientist for a simpler life ( <i>simpler life</i> here means renouncing material life for a life of austerity and spiritual self-realisation). Can you explain your answer?	It flashes past my mind occasionally. Sometimes I think I'd just like to go off surfing somewhere because that's my escape. I know from when I was a young surfer I'd go off and do that early in the morning and that was it. I didn't need any more of that for the rest of the day and I needed something that was I guess intellectually stimulating rather than physically, and surfing I could say was a spiritual kind of thing as well. Sometimes when it all gets too hard you just think, 'Oh wouldn't it be great to just go away and surf for a while'. In reality that wouldn't be enough and surfing is just the analogy. It wouldn't be enough for me and I think I'd need to be more involved in life beyond an inner life I guess.	Negative Emotions/ Negative Mental Events	<p>The Negative Emotion of <i>attachment</i> is relevant. Whilst Southwell states that surfing is a 'spiritual kind of thing' it does not qualify as such according to the Theravada Abhidharma. Southwell's response indicates that he is <i>attached</i> to material life, as he doesn't want to give it up.</p> <p>The Negative Mental Events of <i>desultoriness/non-discernment</i> and <i>lack of trust/faithlessness</i> may also be relevant. This is due to Southwell's mind being absorbed in pursuing sense objects (<i>desultoriness/non-discernment</i>) and his <i>lack of trust/faithlessness</i> in cultivating more serious spiritual qualities such as the Positive Perfection of <i>renunciation</i>, or the Positive Mental Events of <i>non-attachment</i> and <i>non-deludedness/non-bewilderment</i>.</p>

TABLE P2-19. TRULL, TOM

INTERVIEW QUESTION NO.	QUESTION	RESPONSE	ABHIDHARMA FACTOR REPRESENTATION	ABHIDHARMA FACTOR REPRESENTATION CLARIFICATION
3	Can you tell me anything about your own consciousness during your working day i.e. what usually goes through your mind during an ordinary working day?	I probably have a lot of little tasks in an average day from writing up a proposal for ship time to reviewing an article for a journal to writing some correspondence looking for money, and probably a part of me is trying to think about, more about what's the most innovative approach that I could be trying to work towards in my own science. So I think I probably try to keep a little bit of thought about what's my own intellectual contribution, and try to work that into my day. I am very pleased with my day if I actually get time to work on that.	Negative Mental Events/ Positive Perfections	<p>The Negative Mental Event of <i>attachment</i> is relevant due to Trull's involvement in mundane tasks such as economic pursuits.</p> <p>The Positive Perfection of <i>energy</i> is also relevant in terms of Trull's productivity and keenness to contribute towards scientific endeavours in general.</p>
5	Do you have any thoughts on the idea that spiritual insight and wisdom should play, or do already play, an active role in	I don't really know what spiritual insights are. I guess people have intuitions. I can think of those as some kind of subconscious assessment of how things are likely to work and then projecting them onto their physical environment. I'm certainly an agnostic and close to being an atheist and I don't really think	Negative Emotions	The Negative Emotion of <i>lack of intrinsic awareness/ignorance</i> is relevant. This is due to Trull's lack of intrinsic awareness of the spiritual significance of Antarctic science. Trull's lack of acknowledgement of any role of non-material factors in the manifestation and quality of physical phenomena is therefore <i>ignorant</i> , according to the Abhidharma.

	contemporary scientific research such as physics and biology?	that there's any intuition that comes to us from some more powerful being or greater force. So it's hard for me to think that - ?...? I don't believe in ?this? spiritual ...So from that sense I don't see any spiritual input to Antarctic or other science, but I do recognise that people's mindsets ?...? is influenced by their own beliefs in spirits or gods or higher consciousness or greater powers, that affects their minds.		
6	What do you think the goals and values are that are most prominent in your work culture at the Australian Antarctic Division?	I would say generally ?new? knowledge is certainly one of the top goals of myself and my colleagues. It was the goals and values wasn't it. I think another goal that I find that I'm interested in and many other people seem to, too, is to show that there is some great, to a degree of connectiveness between environmental systems on the planet and that is generally recognised ... I think that many of us are motivated to show that clearly through good science, because it somehow fascinates us. It's hard for you to speak about what fascinates others but for myself certainly.	Positive Mental Events	The Positive Mental Event of <i>concern/conscientiousness</i> is relevant due to scientists' desires to achieve accurate or good science. The CAFG-GACTA defines <i>concern/conscientiousness</i> as "to realise all worldly and transworldly excellences" (Appendix B, 5). It is also described as "concern with regards to things in the past. Concern with regard to things in the future. Concern with regards to things in the present" (Appendix B, 5).
8	Have you ever considered giving up your	No I like my life. I like my life in science. I occasionally would like to have shorter hours, more time with my kids,	Negative Emotions	The Negative Emotion of <i>attachment</i> is relevant due to Trull's devotion to his material life.

	professional position as a scientist for a simpler life ( <i>simpler life</i> here means renouncing material life for a life of austerity and spiritual self-realisation). Can you explain your answer?	but I would be giving it up just for ease of life and time with my family. I wouldn't be giving it up for austerity or spirituality. I've tried one ?...? ...spirituality once and I fell asleep. So I'm pretty much pretty happy.		
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TABLE P2-20. WOehler, ERIC

INTERVIEW QUESTION NO.	QUESTION	RESPONSE	ABHIDHARMA FACTOR REPRESENTATION	ABHIDHARMA FACTOR REPRESENTATION CLARIFICATION
3	Can you tell me anything about your own consciousness during your working day i.e. what usually goes through your mind during an	One is when I'm in the field in the Antarctic and the other is when I'm back here. The mindset is completely different obviously between the two and the two balance each other ...My time here when I'm in the office is basically a function just dealing with the day to day commitments, deadlines, writing proposals, filling reports and providing	Negative Emotions	Woehler has not answered the question. He has merely discussed what his activities are during different types of days. It may be assumed that he is unaware of his consciousness during his working day, as he has nothing to say on the matter. The Negative Emotion of <i>lack of intrinsic awareness/ignorance</i> is relevant.

	ordinary working day?	advice of whatever for meetings or people needing information. It's just the ongoing interaction with colleagues and the system in all aspects of work ...Conversely, when I'm in the field I can almost, but not entirely, put all that stuff to one side simply because I'm on station somewhere or on a ship somewhere and not nearly as approachable or able to be involved in meetings or anything like that.		
5	Do you have any thoughts on the idea that spiritual insight and wisdom should play, or do already play, an active role in contemporary scientific research such as physics and biology?	As far as I'm concern/conscientiousness it plays no role in my work whatsoever. One of the lessons I learnt when I was in the States doing my PhD was that if you can argue successfully in terms of conservation or some sort of concern/conscientiousness, then you have to have the best possible scientific information. That's the thing that's going to stand up to scrutiny.	Negative Emotions	The Negative Emotion <i>lack of intrinsic awareness/ignorance</i> is relevant, as Woehler is unable to perceive any spiritual significance whatsoever in the science he performs.
6	What do you think the goals and values are that are most prominent in your work culture at	So the people that I interact with are people who have shared common interests and involvement in ?bird? research. I think for the most part, with very, very few exceptions, there is very strong feeling of conservation ethic in the	Positive Mental Events/ Positive Perfections	The Positive Mental Event of <i>non-violence</i> is relevant due to the presence of environmental ethics. <i>Concern/conscientiousness</i> , another Positive Mental Event, is also relevant within the context of scientists' <i>concern/conscientiousness</i> about the state of the environment (conservation).

	the Australian Antarctic Division?	work of these people.		The Positive Perfection <i>morality/virtue</i> is also relevant within this context.
8	Have you ever considered giving up your professional position as a scientist for a simpler life ( <i>simpler life</i> here means renouncing material life for a life of austerity and spiritual self-realisation). Can you explain your answer?	The answer is no. In answer to your question, because ...(sic). One of the rewards that I have of the work that I'm doing is that I'm seeing a tangible improvement in what I perceive to be the conservation status in the way the Antarctic is managed, under whatever ?...? ?...? ... I see my contribution in the broad scheme of things to be one that I can provide advice that is having a positive impact on the environment around the place.	Negative Emotions/ Positive Perfections	<p>The Negative Emotion of <i>attachment</i> is relevant due to Whoeler's unwillingness to consider renouncing his material involvement for spiritual purposes.</p> <p>The Positive Perfection of <i>morality/virtue</i> is relevant due to Whoeler's desire to conserve the natural environment.</p>

TABLE P2-21. WRIGHT, SIMON

INTERVIEW QUESTION NO.	QUESTION	RESPONSE	ABHIDHARMA FACTOR REPRESENTATION	ABHIDHARMA FACTOR REPRESENTATION CLARIFICATION
3	Can you tell me anything about your own consciousness during your working day i.e. what usually goes through your mind during an ordinary working day?	I suppose a lot of the time I'd just be concentrating on what I'm reading or doing without much background thoughts at all. Often there's time pressures and how to achieve these things that are required and frustrations of wasting time on administrative stuff. From time to time an odd inspiration about things that might be happening in the ecosystem and re-checking that or ideas of better ways of analysing things.	Negative Emotions/ Positive Mental Events	The Positive Mental Event of <i>alertness/suppressiveness</i> is relevant. Wright states that he is aware of the type of thoughts he has, including how those different types of thoughts influence his work.  When the mind is <i>attached</i> to material considerations it produces frustration.
5	Do you have any thoughts on the idea that spiritual insight and wisdom should play, or do already play, an active role in contemporary scientific research such as physics and biology?	It should. I'm not sure that it always does. I mean a purely material view would say that it's not necessary. I would say it's not actually not necessary for most of the work that we're doing. I think it operates more at the interface between the scientist and his work rather than the conduct of the work per se. In the approach to the work and motivation and interpretation I think, rather than the doing of it.	Positive Mental Events	The Positive Mental Events of <i>non-deludedness/non-bewilderment</i> and <i>alertness/suppressiveness</i> are relevant due to Wright's intrinsic awareness of the role of non-material elements in his research.

6	What do you think the goals and values are that are most prominent in your work culture at the Australian Antarctic Division?	I think there's probably two main drivers. One is that – making the world a better place – and then the other is following personal curiosity and interest, which is the main driver for a lot of people. You wouldn't do it for the money or the lifestyle.	Negative Emotions/ Positive Perfections	<p>The Negative Emotion of <i>attachment</i> is relevant due to scientists' pursuance with stimulating their sense of curiosity, which constitutes material sensual enjoyment.</p> <p>The Positive Perfection of <i>morality/virtue</i> is also relevant due to scientists' desires to 'make (-ing) the world a better place.'</p>
8	Have you ever considered giving up your professional position as a scientist for a simpler life ( <i>simpler life</i> here means renouncing material life for a life of austerity and spiritual self-realisation). Can you explain your answer?	<p><b>Simon:</b> There's always a feeling of struggling to keep up with workloads and whatever. I often look at some friends who stop at 5pm and go home and forget about everything until the next day ...I keep toying with the idea of a simpler life, but by the same token when the idea of retiring comes up I find that very difficult to deal with.</p> <p><b>Elli:</b> Why is that?</p> <p><b>Simon:</b> Oh well, I like what I'm doing. I mean, I would certainly like more leisure time, and I don't seem to take holidays either.</p>	Negative Emotions	<p>The Negative Emotion of <i>jealousy/envy</i> is relevant within the context of Wright being envious of his friends who have a lighter workload.</p> <p>The Negative Emotion of <i>attachment</i> is also relevant due to his decline to give up his material lifestyle.</p>

## APPENDIX Q: Significant Statements by Interviewees According to the Buddhist... Theravada Abhidharma

- All descriptions of Abhidharma factors are taken from the CAFG-GACTA appearing in Appendix B.
- The name *Elli* appearing within transcripts represents the interviewer/researcher.

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*1. Adams, Neil: Meteorologist, Bureau of Meteorology*

There are two statements that are considered significant. The first is:

We're reaching that point where we're trying to put together a complete Earth simulation so it's understanding the process of this. The goals and values I see is a striving of that understanding. Trying to piece that jigsaw together. (Appendix M, 6)

This statement typifies many of the responses given by scientists to several interview questions, in terms of the great endeavour of scientists to try and understand the natural environment. It is affiliated with the Positive Perfections of *energy* and *determination/resolution*. Regardless of the means by which scientists gather knowledge and regardless of whether or not their methods are successful, their endeavours to try and learn the environment's real nature constitutes these Positive Perfections.

The second statement worth mentioning is:

The whole scientific process of putting forward an hypothesis and then setting about designing experiments that would prove or disprove that, when you start talking about a spiritual side of things you need to go and get a theologian to discuss those. It's not something that I believe is open to scientific pursuit. (Appendix M, 8)

Once again, this statement is highly significant in terms of the commonality of its purport amongst scientists. Stating that science can not determine spirituality and/or that science has nothing to do with religion, several scientists maintained the perspective that spirituality and religion do not share any common ground. According to the Abhidharma, such a conviction is affiliated with the Negative Emotion of *lack of intrinsic awareness/ignorance* as reality is "of the nature of mere mentation" (Appendix B, 18). In other words, the Abhidharma states that subjective and objective realities are integrally linked and therefore the Earthly manifestation itself has got everything to do with the individual's quality of consciousness. Scientists' perspectives that religion and science have nothing in common is therefore affiliated with the Negative Emotion of *lack of intrinsic awareness/ignorance* which describes the individual as being "confused about reality as it is" and "confusedness about the ultimate" (Appendix B, 18).

*2. Allison, Ian: Program Leader of Glaciology, Antarctic Climate and Ecosystems Cooperative Research Center/Australian Antarctic Division*

There are two statements considered significant in Allison's interview. Both address the Negative Emotion of *attachment*:

**Elli:** Okay. Question No 1: What inspires or excites you the most about being an Antarctic scientist?

**Ian:** I guess the place I guess the place itself – the size and the unspoilt nature of a lot of it. I never get sick of being in the Antarctic. I never get bored by new surprises,

new things you see there. Mostly just the scale of it and the immense power you see in nature in the raw. (Appendix M, 10)

This statement is considered significant due to its frequent use by interviewees. Several interviewees expressed their fondness of the Antarctic natural environment, in terms of their desires to enjoy its many natural wonders. Many such expressions were in response to Question 1, regarding what it is that inspires scientists the most about being an Antarctic scientist. The significance of responses is specifically that scientists' desires to enjoy the material realm through their material senses is a primary objective underpinning scientists' reasons for being Antarctic scientists. Such consciousness represents the Negative Emotion of *attachment* to, and prioritisation of, material considerations, rather than higher ethical and spiritual concerns.

The second significant statement is:

**Ian:** I think that's true and there are certainly ideologists in science and there are people who passionately believe in what they're doing and the problem they're studying and if they were having a hard time changing direction if all the evidence showed that what they passionately believed in was incorrect and the opposite applied.

**Elli:** Meaning that they're attached to their theories.

**Ian:** They're attached to their theories, or it may be ?...? that they have a very strong environmental ideals. (Appendix M, 12)

In this statement Allison confirms scientists' *attachment* to their scientific theories, representing a Negative Emotion. The statement is considered specifically significant in terms of its portrayal of contemporary scientists in general. Whilst other interviewees may not have overtly confirmed such specific *attachments*, their pursuance of research towards specific theoretical outcomes indicates *attachment* to specific material conclusions. Such activities comprise "speculation" about what constitutes the material world (Appendix B, 19) affiliated with the Negative Emotion of *opinionatedness/afflicted views*, according to the CAFG-GACTA. Although this is so, the above statement may also be representative of the Positive Perfection of *morality/virtue*, in terms of scientists' desires to act in the best interests of the natural environment.

### 3. Barmuta, Leon: Freshwater Ecologist, University of Tasmania

There is only one statement considered significant in Barmuta's responses:

My reasons for feeling that way, I just find aesthetically animals and plants really interesting and beautiful to look at and inspiring. My ?...? ?...? aren't necessarily cute or cuddly and that's the academic interest, my scientific interest. I find very stimulating things to think about and once you get your ?...? you get an aesthetic connection with those things as well. There's a lot of copepods out there but they can be beautiful in their own right as well, but I stop short of calling that a spiritual connection or a connection that's as deep as the connection I feel for my wife and my family. (Appendix M, 23)

This statement is considered significant because of what it implies in relation to Barmuta's appreciation of non-human living beings. He states that he appreciates his aesthetic connection with non-human living beings, but can not view them from the spiritual platform (although he can see his own family within such a light). Such consciousness represents the Negative Emotion of *lack of intrinsic awareness/ignorance*. One of several definitions given by the CAFG-GACTA for this factor is "ignorance about what constitutes material and non-material considerations" (Appendix B, 18) including what constitutes material and non-material aspects of Antarctic fauna.

As one of the corner stones of Buddhism is the spiritual equality of all living beings, which are explained as wandering from species to species through repeated birth and death (Snelling 2000, 10-1) the lack of awareness of animals' spiritual natures is deemed *ignorant*. The Negative Mental Event of *mental inflation* may also be considered relevant within the context of its description by the CAFG-GACTA as "the root of unconcern" (Appendix B, 9). If Barmuta and other scientists can not develop the same or similar concern for other living beings, as they do for their own families, then the influences of anthropocentrism may increase within existing environmental conservation programs.

#### 4. Bindoff, Nathan: Oceanographer, CSIRO Marine Research/University of Tasmania

The significant statement needing a mention is the following:

I've loved my job for twelve years or thereabouts and I would say that the things I've loved about it is the realisation of solving or tackling, tackling probably more than solving them, a variety of problems. I have thought about giving it up and I usually think about giving up for a simpler life when a load of administration bears down on me. So administration can be a kind of spiritual death, it's just exhausting and fatiguing. (Appendix M, 30)

This statement typifies several interviewees' statements, in which scientists divulged that they were frustrated by their lack of time to carry out their work duties in a relaxed and orderly fashion. Here Bindoff goes one step further by stating that an overload of administrative tasks can be a type of 'spiritual death.' Whilst it is the Negative Emotion of *attachment* that leads to frustration, the CAFG-GACTA states that the Negative Mental Event of *gloominess/dullness* may also be relevant. This factor is described as "the way in which the mind can not function properly and is associated with listlessness. It is heaviness of body and heaviness of mind. It is a state of physical inertness and mental inalertness" (Appendix B, 11).

#### 5. Bowman, John: Microbiologist, University of Tasmania/Australian Food Safety Centre of Excellence

There is one statement considered significant within Bowman's responses:

**Elli:** The second question asks, can you tell me about your original motivation (for

becoming a scientist)...

**John:** Personal achievement as well as – yes, personal achievement primarily. I mean obviously you need to have something to show for yourself in your life. It's where my life is heading and I was not totally happy with what I'd been doing before, essentially completely applied science to the point it was almost not science. Indeed, it was exceedingly applied and I wanted to do something a bit more interesting. (Appendix M, 33)

Bowman's response is considered significant as he emphasises personal achievement and personal interests for choosing to become an Antarctic scientist. A number of scientists responded from such a standpoint. According to the CAFG-GACTA, *attachment* is "self-satisfaction that interferes with the attainment of higher qualities" (Appendix B, 16). Bowman states that his motivations for becoming a scientist were personal and self-centred i.e. not based on higher ethical, spiritual or even altruistic considerations. His statement thus indicates *attachment* to enjoyment of the material pleasures that Antarctic science has to offer, affiliating his response with the Negative Emotion of *attachment*.

6. Burns, Gary: Principle Research Scientist, Space and Atmospheric Science-Australian Antarctic Division

In the following statement Burns is addressing the increase in dedication of scientists towards producing good scientific outcomes:

I think there's more dedication today. I can still point out, there might be a few people within the (Antarctic) Division that perhaps aren't that way motivated. The system has got them down and it's just become a job. But if you put how many there are you know are like that, to how many there were like that a while ago, or percentage-wise, it's improved. (Appendix M, 44)

This statement is considered significant due to its commonality within overall responses by all interviewees. The commonality lies within its inference that there is an increase in motivation on behalf of scientists to produce good science. Such sentiments are affiliated with the Positive Perfection of *energy*, as well as with the Positive Perfection of *determination/resolution*.

7. Church, John: Program Leader of Sea-Level Rise, CSIRO, Antarctic Climate and Ecosystems Cooperative Research Center

The following dialogue is considered significant:

**Elli:** Okay. Question No 3 – something a bit different. Can you tell me anything about your own consciousness during your working day? In other words what usually goes through your mind during an ordinary working day?

**John:** The main thing is how do I deal with all this bloody email... I don't know how to answer this question. I guess I'm some sort of practical, down to earth person. I have a huge international commitment.

**Elli:** International.

**John:** Yes, I'm on international steering committees, so balancing those with my obligations to my employer and actually producing results that are both relevant to science and to society and it's getting that balance and also there's also a family commitment. So is that the type of answer you wanted?

**Elli:** Yes.

**John:** I guess what drives me is getting the results but it's then a matter of balancing up all these competing demands, and I guess I'm not as efficient as I should be. (Appendix M, 48)

The statement is significant in terms of Church's frustration with his professional and personal commitments. The CAFG-GACTA states that when the mind is *attached* to material considerations it produces frustration. This premise of the Abhidharma appears confirmed according to Church's mood of being overwhelmed by his involvement with his many professional responsibilities. His statement also represents the Negative Mental Event of *indignation/wrath*, due to his underpinning mood of displeasure with his responsibilities. Even though he suffers such displeasure, he chooses to remain within his professional position, indicating that whatever his reasons are, he is attached to keeping his position. Although many interviewees did not express such strong sentiments, a small number of interviewees were decisively frustrated by their many work-commitments.

8. *Coleman, Richard: Research Scientist (Physical Sciences) Antarctic Climate and Ecosystem Cooperative Research Centre/University of Tasmania*

The following statement made by Coleman is considered significant for two reasons:

You really try to make the most out of the science opportunities. If you look at it in terms of the projects that I'm involved with, they are consuming something like a million dollars, or a million and a half dollars of taxpayers money in terms of funding the logistics for the projects. So I'm very conscious of that and trying to optimise the science return and basically what you said you would do, you can achieve. (Appendix M, 53)

The first reason for the statements' significance is its affiliation with the Positive Perfection *energy*. Almost all interviewees at some point in their interviews expressed their earnestness in producing good or high quality science within relevant parameters such as funding, logistics etc.

The second reason for the statement's significance is that Coleman is aware of his own consciousness regarding his commitments to the public that support his research. This awareness on behalf of Coleman represents the Positive Mental Event *conscientiousness/concern*, which is described by the CAFG-GACTA as increasing that which is wholesome, meaning (amongst other consideration) responsibility towards the public.

9. Davidson, Gary: *Earth Sciences Senior Lecturer at the University of Tasmania/Australian Antarctic Division*

The first significant statement made by Davidson is:

There's a lot of hurdles that you have to get around but at the end of the day in this job you are judged, although you have many duties, you're largely judged on your ability to convert research from thoughts into published works. (Appendix M, 63)

This statement is considered significant due to its specific contents. Davidson states that individual scientists are judged by their scientific output, specifically by their publications. The Negative Mental Events of *mental inflation* may be relevant. If scientists are pressured to enhance their own intellectual competencies by producing a certain quantity of scientific publications (as Burns suggested that they are [Appendix M, 45]) they may end up succumbing to the influences of *mental inflation*. Whilst this topic was not addressed by many scientists, a few did express such expectations from them by their professional organisations.

The second significant statement is:

Yes, I'm certainly concerned – when you see an animal that looks damaged you think, do they feel pain and then that relates to sentience and at what level they appreciate that pain. You never want to see an animal in pain but the sense of whether the animals – what is it all about and why do they go through this struggle. I look at it as they are dealing with circumstances and adapting to circumstances that are beyond their control in a lot of ways. (Appendix M, 65)

The contents of this statement are considered significant in terms of the degree of their representation of the Positive Mental Events of *decorum/consideration for others; non-hatred; concern/conscientiousness; and non-violence*, as well as the Positive Perfections of *morality/virtue* and *loving-kindness*. The Abhidharma places great emphasis on mental disposition in terms of compassionate behaviour towards all types of living beings. This statement by Davidson is highly representative of a quality of consciousness that acknowledges the suffering of non-human beings. His expression of compassion was shared by a small number of other interviewees.

10. Miller, Denzil: *Executive Secretary for the Commission on the Convention of Antarctic and Marine Living Resources*

There are two statements considered significant within Miller's responses. The first is:

**Elli:** ... In your opinion how or does the consciousness of scientists impact on the results of their work. Say the moment of consciousness ...?

**Denzil:** I actually think there's two answers to that. I think one answer to that is the answer that enthusiasm and what one does really helps in applying oneself in an appropriate way. I don't mean enthusiasm to the point of view of just going on and on and on about everything, but it raises your energy level, it raises your nervous energy if you like, it raises your vision – lifts your vision outward. (Appendix M, 70)

This statement communicates that Miller is aware of the role of qualitative differences in awareness (or consciousness) and their impact on the results of work. He indicates that enthusiasm, as well as specific activities, can make or break the scientists' whole scientific endeavour. Such awareness on behalf of Miller is represented through the Positive Mental Event of *non-deludedness/non-bewilderment* in terms of its definition as "clear-sightedness as to what constitutes the illusion of the material realm of existence" (Appendix B, 4). In this particular incidence, Miller has the positive mental quality of being able to see beyond material causes alone. This representation was not common amongst interviewees. The Positive Mental Event of *diligence/enthusiasm* is also relevant.

The second statement worth mentioning is:

Scientists are independently speaking and independently thinking and they're very often smart in many cases. They do in sometimes believe that science is infallible and therefore it's unquestionably correct. Well it's not. It's correct a good part of the time, if you think by the principles it isn't. I think one has to be conscious and certainly in reality I can't say it always works. One has to be really conscious of being objective, of making sure that the energy that you're using because you love your job, because you love what you're doing and you're genuinely intrigued by what you're doing is not subverted. (Appendix M, 70-1)

This statement is significant for a number of reasons. One is that Miller admits to the many potential imperfections of science, rarely discussed by scientists themselves. Such a statement made by the Executive Secretary of CCAMLR is significant in terms of his position within Australian Antarctic science as a whole. It is affiliated with the Positive Perfection of *truthfulness/does not deceive*. The statement is also significant due to the comment by Miller that scientists have to be 'really conscious of being objective' as well as aware of the 'energy' that that they use in doing their science. Such insights on behalf of Miller indicate the presence of the Positive Mental Event of *non-deludedness/non-bewilderment*.

#### *11. Morgan, Vin: Member of Ice-cores Program, Antarctic Climate and Ecosystem Cooperative Research Center*

The first significant statement made by Morgan is:

**Elli:** Question No 3: Can you tell me anything about your own consciousness during your working day? In other words what usually goes through your mind during an ordinary working day?

**Vin:** I think the answer to this question is no.

**Elli:** OK, valid response.

**Vin:** I don't really see what you mean. (Appendix M, 78-9)

Whilst the interviewer responded to Morgan's response with 'OK, valid response' in fact such a lack of awareness on behalf of scientists of their own consciousness indicates the presence of the Negative Mental Events of *gloominess/dullness* and *inattentiveness*. The CAGG-GACTA describes *gloominess/dullness* as "listlessness. It is heaviness of body and heaviness of mind. It is a state of physical inertness and

mental inalertness. It is associated with sluggishness, illusion and the desire to satisfy the material senses. It causes one to not perceive things clearly” (Appendix B, 11). The Positive Perfection of *truthfulness/does not deceive* may also be relevant, as Morgan does not try to pretend that he is aware of what goes through his consciousness during an ordinary working day.

The second statement worth mentioning is:

Yes. I mean the scientists are responsible now to governments or organisations because the majority of them are paid by governments, by tax payers money, so they’re responsible. They shouldn’t be allowed to just sort of mess around and enjoy themselves and not do any work. (Appendix M, 80)

This statement is significant in terms of what it says about Morgan’s sense of *morality/virtue*, with regards to his position as a scientist employed by the government. Whilst many scientists admitted to being Antarctic scientists largely due to the exoticness and/or awe-inspiring qualities of the Antarctic environment, as well as due to their innate sense of curiosity about scientific development, here Morgan states that responsibility is of utmost important in terms of overall science directions.

12. Nicol, Steve: Program Leader (Marine Ecosystems) Australian Antarctic Division/Antarctic Climate and Ecosystems Cooperative Research Center

The following statement is considered significant due to its notable representation of the Negative Mental Event of *resentment*, as well as the Negative Emotion of *arrogance/self-importance*:

Right now the way that I operate, because I’m not actually in a management role now, and so I have a large number of people who want things from me all the time. I find that, particularly when I’m working at the Antarctic Division, that almost my entire day is spent reacting to other people’s wants and needs. There isn’t a lot of time for consciousness, there isn’t enough time to actually plan to do things. You end up responding to other people’s needs, so if things go through my mind they’re generally in relation to the last person who bothered me, the next person who’s going to bother me, and if possible if I get a spare moment of time to actually try to do some of the research work as well. (Appendix M, 84)

*Resentment* is manifest through Nicol’s disdain towards those within his working environment who impact on his daily routine. Resentment is defined by the CAFG-GACTA as “bitterness at not having one’s own material desires fulfilled” (Appendix B, 6). *Arrogance/self-importance* is described by the CAFG-GACTA as causing “disrespect and frustration” (Appendix B, 17) which are both present within Nicol’s response.

13. Ramm, David: *Data Manager, Commission for the Convention on the Conservation of Antarctic Marine Living Resources*

Ramm's first significant statement is affiliated with the Positive Mental Event of *concern/conscientiousness*, as well as the Negative Emotion of *lack of intrinsic awareness/ignorance*:

The basic concern is at the level of populations, but I'm sure there are some people who are concerned about individual animals... from a CCAMLR perspective it's the populations that are important and the principles of conservation are based on the population as a whole and not allowing the population to fall below certain levels. The focus of our work is managing populations. (Appendix M, 94)

The statement's affiliation with *concern/conscientiousness* lies in scientists' concern and awareness of groups of animals, as well as some scientists' concern and awareness of individual animals. However, *lack of intrinsic awareness/ignorance* manifests through scientists' inability to aim conservation at individual animals who comprise populations. That CCAMLR aims to care for animals only within their collective whole, implies that they are failing in their understanding of the needs of individual animals. If the Positive Perfection of *loving-kindness* is to manifest within scientists' activities, then scientists must rid themselves of the quality of *lack of intrinsic awareness/ignorance* by acknowledging the needs and wants of individual non-human living beings. Unless such a vision can manifest amongst scientists, then the vision of anthropocentrism will unavoidably increase within the Australian Antarctic scientific community, resulting in an increase in exploitation of non-human living beings.

Ramm's second significant statement is affiliated with the Negative Mental Events of *shamelessness*; *lack of sense of propriety/inconsideration for others* (the CAFG-GACTA extends *others* to meaning non-human living beings); and *unconcern/unconscientiousness*:

Krill fishing is very patchy. They either catch huge amounts or they don't... ? The vessels search for krill and we try and work out on a particular day what the intention was – if the boat was simply relocating to another spot then they'll go past aggregations of krill and not stop, but if they were looking to fish then they make all sorts of decisions depending on the quality of the krill and the market values and how the boat's going. And if you're only looking at the catch rates then you miss out on a lot of information there. (Appendix M, 93)

*Shamelessness* is defined by the CAFG-GACTA as “the lack of embarrassment at improper thought and actions, which are determined by ethical considerations. Shamelessness fails to avoid the unwholesome” (Appendix B, 10) meaning that when an individual has no shame, they are unable to recognise that which is unwholesome. In this case the ‘unwholesome’ may be described as scientists killing animals, as well as killing the very individuals whom they are claiming to conserve.

14. Reid, James: Dean, Faculty of Science, Engineering and Technology,  
University of Tasmania

The only statement by Reid that will be discussed is the following:

I think people have quite different philosophical ideas even about things that are facts. There are still different points of view on how they can or should be interpreted and you can get quite strong differences of opinion. (Appendix M, 97)

This statement represents the Positive Mental Event of *non-deludedness/non-bewilderment*, due to Reid's acknowledgment that scientists interpret facts according to their own subjectivity, meaning that 21 scientists may produce 21 different theses on the same phenomenon. This affiliation is qualified by the CAFG-GACTA's description of *non-deludedness/non-bewilderment* as "discriminatory awareness to counteract the deludedness that has its cause in either what one has been born into or what one has acquired. It acts as a remedy for ignorance and accompanies the form intelligence that thoroughly analyses the true nature of objects" (Appendix B, 4). Such *non-deludedness/non-bewilderment* was uncommon amongst interviewees.

15. Riddle, Martin: Leader of Human Impacts Program, Australian Antarctic  
Division

There is only one statement that will be discussed:

OK. I've interpreted it (Question 8)– it's not necessarily about becoming a monk - so by austerity, which is obviously the renouncing material goods, and spiritual self-realisation, I've interpreted that as going off sailing or spending more time snowboarding or something that I would enjoy doing and get an uplifting feel from. Yes, absolutely. I've thought about doing all those sorts of things. (Appendix M, 108)

This statement is considered significant due to its commonality amongst scientists' responses to this particular question, Question 8. It is affiliated with the Negative Emotions of *attachment; lack of intrinsic awareness/ignorance; and opinionatedness/afflicted views*. Question 8 asked if interviewees had ever considered giving up their professional lives, meaning a more materially austere life, for the purpose of attaining spiritual realisation. Several scientists responded with 'yes' and then went on to give their own opinions of what spiritual realisation means (surfing, sailing, snowboarding etc.) even though it had been defined by the interviewer as meaning a life of austerity.

The CAFG-GACTA states that a *lack of intrinsic awareness/ignorance* "causes the individual to make mistakes in relation to his/her own spiritual welfare and that of others" and that it is "to invest oneself in enjoyment of the senses instead of focusing on one's spiritual goals" (Appendix B, 18). The Negative Mental Event of *restlessness/ebullience/distraction* is relevant due to its description by the CAFG-GACTA as "passion-lust that gets involved with things considered to be enjoyable" (Appendix B, 11).

16. Rintoul, Steve: *Physical Oceanographer, Program Leader of the Climate Change and Variability Program, Antarctic Climate and Ecosystems Cooperative Research Center*

The following statement is considered significant:

I guess I haven't answered it so much from the consciousness point of view. I suppose when things are good it's completely absorbing. That kind of level of concentration and being absorbed is really what's required to do it well. I think that's what probably what makes the more management job frustrating because there's a thousand different things happening at once and you never have a bit of time and space to really concentrate on any one thing at a time ?...? So consciousness-wise it leads to a kind of a scattered consciousness, which I don't enjoy. (Appendix M, 112)

This statement, as a typical representation of the Negative Emotion of *attachment*, was prevalent amongst scientists. The CAFG-GACTA states that *attachment* leads to frustration. It also states that "attachment is a mistaken conception that can arise towards any object that seems attractive: one's own body, wealth, social position as well as the bodies and possessions of others... Although attachment may superficially take on the aspect of wanting to benefit others, it is essentially selfish- only striving to satiate one's own desires... Attachment always results in suffering" (Appendix B, 16). Rintoul's suffering in this case is his inability to cope with the lack of sufficient time and space he needs to conduct his science in a manner that will not cause his consciousness to scatter. He suffers by his own *attachment* to material considerations, rather than non-material considerations. His predicament is relatively typical of other interviewees, according to their responses to this question, as well as to others.

The Negative Mental Event of *desultoriness/non-discernment* is also relevant, being described by the CAFG-GACTA as "to be a scatter-brain and belongs to the categories of passion-lust, aversion-hatred, and bewilderment-erring. The mind is scattered over the five desirable objects of the sensuous world" (Appendix B, 15).

17. Robertson, Graham: *Seabird Ecologist, Australian Antarctic Division*

The following response is considered significant:

I suppose I can answer that by saying people are meant to be objective and when someone does a research project, when someone sits here and works on either penguins or albatrosses, they're not working on geckos in Darwin, they're doing it for a reason. They particularly want to work on something here and usually it's ?...? about what they want to work on. If they want to work on Emperor penguins and they got told to work on rabbits, they'll probably just shrivel up and not be any good. So when you look at the directions someone might choose to take in their research, it's meant to be objective but I don't think it is. Right at the point source at the beginning it's not, it's highly subjective. People have a preference. (Appendix M, 121)

The statement's significance lies in Robertson's acknowledgement of scientists directing their research according to their interests, not necessarily according to higher ethical and spiritual considerations. Robertson's awareness of such realities constitute the Positive Mental Events of *non-deludedness/non-bewilderment* and *alertness/*

*suppleness*, with the latter being defined by the CAFG-GACTA as “awareness in which the mind is made to serve the positive” (Appendix B, 5).

A number of scientists confirmed that their research efforts were greatly determined according to their personal interests and curiosity. Such reasons for engaging in scientific activities are most prominently affiliated with the Negative Mental Event of *unconcern/unconscientiousness*, due to prioritisation of personal enjoyment over higher ethical and spiritual considerations, such as the welfare of all living beings. The contents of the statement are also affiliated with the Negative Emotion of *attachment*, due to scientists choosing to engage in science according to their material attachments/interests.

*18. Southwell, Colin: Ecologist, Australian Antarctic Division*

There are two statements considered significant:

That’s the way I see science is working but scientists are people and people are individuals and probably that’s one reason why science has evolved the way it is. If you put two different people together with the same concept, they will approach it in different ways. Science should impose some kind of standardised process or procedure but it doesn’t work that way. It should but it doesn’t and there are lots of different reasons for that – different philosophies but also different amounts of training. (Appendix M, 127-8)

Scientists can’t provide certainty because even the best scientific theory, every other scientist is trying to shoot it down. That’s the way science works in its traditional sense. So under traditional science philosophy what the public considers as truth, the scientist should be considering as the best hypothesis that is available right now, but maybe a better one’s going to come up. In that sense the current accepted hypothesis may not be true, it’s just the best right now. (Appendix M, 129)

Both statements are affiliated with the Negative Emotion of *opinionatedness/afflicted views* and the Negative Mental Event of *desultoriness/non-discernment*. The CAFG-GACTA states that *opinionatedness/afflicted views* is “associated with dogma and claim, and constitutes speculation about what is perishable and what is not perishable” (Appendix B, 19) i.e. speculation about the real nature of both natural and supernatural phenomena. *Opinionatedness/afflicted views* is also described as comprising “views of the transitory composite” (Appendix B, 19) meaning views of natural phenomena that are temporarily manifest. *Desultoriness/non-discernment* is described as occurring when “the mind is scattered over the five desirable objects of the sensuous world” (Appendix B, 15) i.e. lack of discernment is due to the mind being invested in satisfaction of (and therefore distracted by the demands of) the senses.

*19. Trull, Tom: Program Leader of Ocean Control of CO2-Climate and Ecosystems Program, Antarctic Climate and Ecosystems Cooperative Research Center*

There is one statement considered significant in Trull’s interview:

I do believe in the ability to use other aspects of your own brain, ?and? some people might call it – people who meditate and people who focus their minds on their thoughts in other ways, whether it’s through the science they do or the prayers they say or whatever, they do manage to focus their minds in a way that can produce an interesting result. I wouldn’t describe that as spiritual I guess. I would just describe that as techniques for clear thinking, or subconscious insights – you may not know where they come from – but they may be right. (Appendix M, 137)

This statement, whilst not representing specific statements made by other interviewees, does reflect the general mood of many Australian Antarctic scientists. It represents the Negative Emotion of *lack of intrinsic awareness/ignorance*, with the CAFG-GACTA stating that this factor causes “the individual to make mistakes in relation to his/her own spiritual welfare and that of others” (Appendix B, 18). Trull’s statement may also represent the Negative Mental Event of *desultoriness/non-discernment*, due to Trull’s inability to discern between material and non-material phenomena such as phenomena relating to consciousness. The CAFG-GACTA describes *desultoriness/non-discernment* as manifesting when “the mind is scattered over the five desirable objects of the sensuous world” (Appendix B, 15) i.e. when the mind is absorbed in material explanations of all types of phenomena.

20. Woehler, Eric: *Honorary Research Associate (Biology), Institute of Antarctic and Southern Ocean Studies/Australian Antarctic Division*

In the following statement, Woehler addresses his own consciousness:

There’s two types of ordinary working days. One is when I’m in the field in the Antarctic and the other is when I’m back here. The mindset is completely different obviously between the two and the two balance each other. I need the time in the field to undo the time sitting in front of a computer screen working here, and vice versa. I need to do the work in the field to justify my existence as a researcher ... It’s two very completely different mindsets and the routines are completely different. (Appendix M, 142)

The above statement is considered significant due to Woehler’s assertion that being in the field and being in the office constitutes two different types of mindsets or consciousness. According to the Abhidharma, variations in task-orientated activities do not necessarily result in variations in qualities of consciousness. Whether a scientist is counting penguins or writing up reports, his /her consciousness may be represented by the same Abhidharma factors, or just represented by the same Factor Contrast Group. This point is accentuated in the CAFG-GACTA’s statement that the whole of reality is “of the nature of mere mentation” (Appendix B, 18).

The Abhidharma does not discuss different material tasks as causing differences in consciousness or mindsets. The fact that Woehler has not addressed differences in his consciousness, beyond differences in his mundane work tasks, therefore indicates the presence of the Negative Emotion of a *lack of intrinsic awareness/ignorance*.

21. Wright, Simon: Senior Research Scientist (*Marine Microbial Ecology*)  
*Australian Antarctic Division*

There are two statements considered significant in Wright's interview:

I think so. I think there's probably two main drivers. One is that – making the world a better place – and then the other is following personal curiosity and interest, which is the main driver for a lot of people. (Appendix M, 153)

Probably the order changes and I suppose at the highest level it would be feeling that I'm doing something significant or worthwhile. When we're actually going away there's a huge excitement in actually being out there and seeing stuff. On the day to day level a lot of it is just working with good people, being stimulated and supported. (Appendix M, 155)

Both these statements are affiliated with the Positive Mental Events of *decorum/consideration for others* and *concern/conscientiousness*, as well as with the Positive Perfection *morality/virtue*. These affiliations are due to Wright's (and those of other scientists mentioned by Wright) desire to make the world 'a better place,' as well as doing something 'significant or worthwhile.'

The Negative Emotion of *attachment* is also relevant, however, due to Wright's desire for 'following personal curiosity and interest' and 'being out there and seeing stuff.' These qualities are indicative of Wright's choice "to prioritise and pursue sensuous, temporary things over eternal things" (Appendix B, 13) which constitute a description of the Negative Mental Event of *unconcern/unconscientiousness*.

## APPENDIX R: The Antarctic Animals Ethics Committee's (AAEC's) *Animal Experimentation Guidelines* (2006)

(<http://www.aad.gov.au/default.asp?casid=14440>) (Entered under 'Australian Antarctic Division 2006c' in the thesis reference list)

### **Scope of the Guidelines**

The guidelines cover only those life forms defined in the Committee's Terms of Reference as fish, birds and mammals and also cephalopods such as octopus and squid.

Research proposals involving human experimentation fall outside the scope of these guidelines, but will be assessed by the Human Experimentation Ethics Committee, email [hec@aad.gov.au](mailto:hec@aad.gov.au)

### **Revision of the Guidelines**

These guidelines are regularly reviewed. Field workers are urged to contact the Antarctic Animal Ethics Committee (AAEC) Secretary, c/- Australian Antarctic Division, 203 Channel Highway, Kingston, Tasmania 7050 (telephone 03 6232 3531, fax 03 6232 3415) email [aaec@aad.gov.au](mailto:aaec@aad.gov.au) with suggestions for improvements for future editions.

### **Relationship to the Australian Code of Practice**

Researchers are advised that the *Australian Code of Practice for the Care and Use of Animals for Scientific Purposes* which was published by the National Health and Medical Research Council, 7th edition 2004, remains the paramount code under which all Australian animal research must be conducted. These AAEC guidelines should be regarded by researchers as a technical appendix to the Code. The code can be obtained by writing to The Secretary, NH&MRC, GPO Box 9848, Canberra 2601, ACT. Internet: <http://www7.health.gov.au/nhmrc/publications/synopses/ea16syn.htm>

### **Important Points When Preparing a Research Application**

Researchers are reminded that the AAEC was established as a result of expressions of public concern at certain aspects of some projects conducted by researchers. The AAEC thus fulfils an important public purpose and exercises significant control over those projects which fall within its purview. Accordingly, researchers are encouraged to take into account these considerations when completing the appropriate questions in stage 2 of the Antarctic Research Application form.

This information is crucial to facilitate smooth assessment of the application by the AAEC. A few general points need elaboration in this regard:

1. When preparing a project proposal the breeding status of the population should be noted, and reference to this should be made in the proposal.

2. Care should be taken to ensure that sample sizes are the minimum needed to provide statistical validity.
3. Care should be taken to incorporate possible seasonal effects on the population under study.
4. In accordance with the general principle of reducing stress to wild animals, applicants are encouraged, as far as possible, to use populations which are in the vicinity of stations or field bases and which have some familiarity with humans.
5. Researchers must provide full details such as the numbers of animals, or quantities of isotopes (including activity rates) proposed to be used.

The AAEC will look for evidence in applications of attempts having been made to reduce the number of animals to be used in the project, to replace animal experimentation with cellular experimentation, and to refine field practices in order to minimise pain and distress as far as the objective of the project will allow. Researchers should balance the pain and distress to which an animal may be subjected against the scientific benefit resulting from the investigation.

Researchers are reminded that the information provided by them will be used to frame the necessary permits required under Commonwealth legislation. Accordingly, incorrect, insufficient or ambiguous information could lead to errors occurring in the permit process and this could result in breach of the legislation occurring once the project is underway.

Researchers should note that they are required, as a condition of the approval process for their research, to provide suitable information for other expeditioners on the impacts of, and reasons for, their proposed animal research. This information could be by way of ship/station-based lectures, distribution of information sheets, etc.

## **Preface**

Antarctica and its associated sub-Antarctic islands represent one of the last areas of the world in which natural phenomena and wildlife may be studied in a pristine, or near pristine, environment. Public concern about the conduct of research involving vertebrate animals extends to research programmes under the auspices of the Australia's Antarctic Programme (AAP), just as it does to such research in Australia.

The Antarctic Animal Ethics Committee (AAEC) has developed these guidelines to complement the *Australian Code of Practice for the care and use of animals for scientific purposes* to which all Australian researchers must conform. These guidelines apply to all ANARE programs which involve fish, birds or mammals, and for all programs that use ionising radiation.

The AAEC has been greatly helped by many researchers and research organisations who have contributed comments and suggestions for this document. It acknowledges this help and hopes that researchers and others with constructive comments to make will not hesitate to contact it.

## **Section 1 - Capture of Seals and Birds**

### **Movement around breeding wildlife**

The apparent tameness of some Antarctic wildlife can give a superficial and often misleading impression of the degree to which animals are disturbed by our presence. It is therefore important that researchers always take care when moving around both breeding and non-breeding animals.

It is an offence for a person to disturb wildlife while on foot, in a vehicle or a vessel, unless specifically authorised in a permit. To avoid disturbance, guidelines have been prepared by the Australian Antarctic Division which form part of the Environmental Code of Conduct and provide recommended minimum approach distances. However, if a person observes disturbance while adhering to these distances, a greater distance should be maintained unless authorised in a permit.

If you are authorised to approach more closely, move slowly and quietly. Stay low to the ground and if possible approach from down wind. Try to avoid sudden movements and keep your voice down. Remember that your movements around wildlife will often be viewed by off-duty station personnel and you could be in the position of setting the standard through example.

## **1.1 Capture of Seals**

Without exception this procedure is dangerous to both handlers and seals. It usually requires several strong operators working under experienced guidance. All operators should be completely clothed, including legs, arms and hands. The techniques used vary not only with species, but with age-classes of animals. At least one person experienced in the particular capture method should be present.

In order to reduce stress, capture should be rapid, and the pursuit kept to a minimum. Where possible, animals isolated from other seals should be selected in order to reduce the level of disruption to the group.

Equipment used for catching seals (particularly head bags) should be washed before being used on other species because of the possibility of transfer of diseases between species

### **1.1.1 Young pups**

For young pups of most seals it is possible to facilitate capture by grasping the rear flippers, moving the animal away from the mother or other seals if necessary, and using physical restraint. It has been found with Weddell seals that adult females will often ignore the researchers' handling of their pup provided the pup does not cry out, and that covering the pup's head with a hessian sack can result in the pup staying quiet. If some attempt is made to distract the cow whilst others try to quieten the pup and hide it from the mother's view behind rafted ice, day packs or the researchers themselves, it has been shown that she will often search elsewhere for her pup and not harass the researchers. It may be necessary for an additional operator to prevent attack from the mother, or other pinnipeds, with the use of a pole.

Physical restraint should only be used when a minor procedure is to be carried out, and it should be for as short a duration as possible. Care must be taken not to impede the respiratory or cardiovascular system of the seal and respiration should be monitored at all times. Restraint should be terminated and the seal released, if the animal is judged to be distressed.

A lightweight, long piece of PVC tubing with a tennis ball taped to the end has been shown to be effective protection when working with male and female elephant seals. If necessary, a gentle tap on the nose with the tennis ball can keep the cow away long enough to allow a pup to be

weighed, measured, tagged or blood to be taken. The tennis ball would also protect the animal's mouth and teeth should they bite at the pole.

A pole with a semi circle of metal on the end has been found to work well with female fur seals and some bulls to halt their advance without causing injury, however, with other bulls it is almost impossible to prevent them attacking regardless of the technique applied. In these cases, pups or cows may need to be removed from the harem to a point where the bull will no longer pursue the operator.

When working with crabeater and leopard seals, 17 mm thick marine-ply baffle boards placed between the mother and pup, or in front of the male, may provide some protection.

### **1.1.2 Physical restraint**

Southern phocid pups and weaners can be physically restrained by sitting astride the animal's shoulders and lifting the fore-flippers off the ground. If necessary a second operator can put pressure on the animal's pelvis.

Hoop nets are appropriate for fur seals of all age classes, possibly excluding mature bulls. Sophisticated net design and fabric are available from specialist manufacturers. Soft, strong net of a fairly fine mesh size should be selected to avoid catching the seal's teeth or cutting the seal's face and flippers. The net should be washed frequently to remove accumulated debris. Other net systems, such as 'Wally nets' can be used on larger animals such as mature fur seal bulls. These are large throw nets with a purse rope around the perimeter and generally at least four people would be needed in their operation. Chemical immobilisation can be administered once the seal is physically restrained. A good reference for several other methods of restraining fur seals is Gentry *and* Holt (1982).

Mature leopard seals need special treatment because of their great strength and agility. Attempts to restrain them with nets are dangerous to both investigator and animal (which may go back to the water with the net). Because of their lack of fear of people and apparent curiosity, leopard seals often approach an investigator and this may be mistaken for aggression.

### **1.1.3 Use of head bags**

Light-proof head bags should be used in all cases of physical restraint as they reduce the amount of struggling. Plentiful holes of sufficient size must be provided to ensure breathing is not impaired. If used in conjunction with sedation, nostrils and gums should remain visible and visual access to the eye should be achievable.

### **1.1.4 Chemical capture**

See Section 4.

## **1.2 Capture and handling of Birds**

### **1.2.1 Penguins**

Adelie penguins away from the nest are best captured with a bag on a long handled hoop. The bag should be made of a light-proof material (black). Remove the bird from the bag by first securing the legs with one hand and with the other gathering the body. The bird can then be held under the arm with an unrestrained head pointing backwards.

Wherever possible capture penguins away from the colony to minimise disruption to breeding birds. If penguins must be captured at the nest, try and select penguins occupying edge nests, rather than those in the centre of the colony. Where possible, work only on colonies with greater than 100 breeding pairs, as smaller colonies may be more susceptible to decrease when subjected to regular and repeated human disturbance.

Penguins should never be lifted by the neck, flippers or a single foot. Minimise the amount of time penguins are handled by having all necessary equipment organised and ready at hand and streamlining procedures as much as possible. Do this before any birds are first captured. This is particularly important for birds you have removed from a nest with eggs or small chicks. When weighing adult penguins use a cone shaped bag and when weighing chicks use a tightly woven linen sack.

Adelie penguins incubating can be captured by first holding the tail and tipping the bird onto its beak. The eggs can then be taken away so they are not broken when the bird is picked up. When removing a penguin from its nest, immediately after the penguin has been removed, nests should be covered with a cloth or bag weighted at the edges to prevent demolition of the nest by other birds (particularly important for Adelie penguins).

For nests with eggs or chicks less than 2 weeks of age a small esky with a warm (approximately 25°C ) water bottle is needed to 'store' eggs and chicks whenever the adult is being restrained off its nest. When returning adults to the nest, replace the eggs and/or chicks first and immediately release the adult close to, but not directly over the nest as this may result in accidental damage to the nest contents once the adult is released. Particular care needs to be taken when re-uniting adults with chicks older than 2 weeks since the chicks are both mobile and vulnerable to attack.

### **1.2.2 Other birds**

Other birds (skuas, etc.) should be caught and restrained according to the procedures laid down in the Australian Bird and Bat Banding Scheme's Bird Banders Manual.

To reduce the chance of injury to the bird, capture of flying birds at the nest should be done by hand, preferably without the use of gloves, to increase handler sensitivity. The use of nooses to capture surface nesting birds is particularly discouraged.

As for penguins, remember the following when handling flying birds:

- Do not handle birds by the neck, wings or a single foot.
- Reduce handling times by having equipment organised and procedures streamlined.
- Ensure the safety of nests and nest contents after adults are removed from active nests.

## **Section 2 - Killing Seals and Birds**

### **2.1 Killing Seal**

It is recommended that any person likely to be confronted with the need to kill animals should read the Report of the AVMA (American Veterinary Medical Association) Panel on Euthanasia. This document raises the ethical issues and reviews methods available for euthanasia of domestic and wild species.

#### **2.1.1 Shooting**

Shooting is an effective means of humane killing and can only be conducted by a legally licensed field worker.

It is recommended that only a rifle with a calibre of .222, or greater be used and that one or two practice shots be fired to confirm its accuracy. The use of a .22 rifle is not recommended, nor is a pistol of any calibre unless the field worker is not only skilled with its use but has also practised with that weapon on a target. A shotgun may be used if it is loaded with heavy shot (larger than size 1) or with a single slug. Again, the field worker must be skilled in its use and have practised with that weapon. A seal must only be killed by being shot in the head to destroy the brain - do not attempt to shoot it in the heart. Aim may be taken at either the side of the head, close to but behind the eye, or on top of the head midway between the eyes but 5-10 cms to the rear. The shot should be fired as close to the target as possible without prior disturbance to the animal but care should be taken that there are no large rocks beyond, which could cause a ricochet.

After the animal has been shot an artery in the neck should be opened with a sharp knife to ensure that the animal is dead and not just stunned. An incision in the mid-line of the chest, followed by severing the great arteries is also effective.

*Note:* Certain weapons must not be taken into Antarctica or the sub-Antarctic islands without the necessary authorisation in accordance with the *Weapons Ordinance 2001* which governs the possession and use of weapons in the Australian Antarctic Territory (AAT) and the Territory of Heard Island and the McDonald Islands (HIMI). Penalties apply for contravention of this requirement. Please contact the Permits Officer for details. It should be noted that before any weapons can be taken onboard the ship, the approval of the vessel's Master must also be obtained.

#### **2.1.2 Overdose of anaesthetic**

Chemical euthanasia usually involves the intravenous (IV) administration of sodium pentobarbitone but, if necessary, can be achieved with a gross overdose of an intramuscular anaesthetic agent. In young pups intracardiac injection may be achieved with less duress to the animal, depending upon the skill or knowledge of the operator.

Unless the seal is weak or moribund, physical restraint and IV access can normally only be achieved safely and without distress in immature phocids and, depending upon the skill of the operators, in female and immature otariids. For seals other than these the procedure should be as follows- A generous dose of an intramuscular sedative/ anaesthetic should be administered and allowed time to take full effect. The required dose of pentobarbitone should then be administered IV or, if a sufficiently long needle (30cm or greater, depending upon species) is available, intracardiac. Where peripheral circulation is compromised (shock, dive response, very deep anaesthesia) intracardiac injection is often more effective. Death should be confirmed before the operator leaves the site.

## **2.2 Killing Birds**

All birds can be euthanased by an intravenous or intraperitoneal injection of sodium pentobarbitone (Lethabarb). The dose should be at least 1 ml per 100 grams. Do not inject into other tissues. For larger birds such as penguins, giant petrels and albatrosses the technique is facilitated by first anaesthetising the bird using halothane by inhalation. Following anaesthetic induction sodium pentobarbitone should be given intravenously.

It is imperative that the death be confirmed by the absence of vital signs (cessation of breathing and heart beat plus loss of corneal reflex, (ie the bird does not blink when the cornea is touched). An animal in deep narcosis may appear dead but might eventually recover. If doubt exists ensure death of the unconscious animal by methods such as bleeding (exsanguination) or injection of potassium chloride into the heart or decapitation.

The carcass should be disposed of in a fashion that prevents the intoxication of scavenging birds by ingestion of the drug contaminated carcass.

## **Section 3 - Transport and Restraint**

### **3.1 Seals**

In the event of antarctic pinnipeds needing to be transported or restrained for prolonged periods, consideration should be made of wind and temperature, disturbance to the animal and prevention of injury to the animal and operators. Transportation or containment cages may be constructed of wood or metal but should be of sufficient strength, allow good visual and manual access to the animal. allow for rapid release of the animal even if the crate is overturned, have no internal protrusions and have good ventilation while still protecting the animal from disturbing visual stimuli. Transportation should be in accordance with the NHMRC Australian Code of Practice (7th ed. 2004) at Chapter 4.2 and with the current IATA regulations.

Transport or prolonged restraint should be conducted according to the advice of a veterinarian experienced in the transport of wild animals. Sedation should be used at the discretion of and under the direct supervision of the veterinarian.

During restraint of seals a major problem is the animal over heating. Hyperthermia can be caused in fur seals as a result of exertion and anxiety or calm, sunny conditions. Seals are able to shunt blood to their flippers when hot so regular monitoring of the hind flippers gives an indication of the onset of hyperthermia. The flippers should be doused with cool water whenever they feel warmer than human blood temperature.

### **3.2 Penguins**

Transporting penguins away from their colonies will inevitably cause distress and so should be avoided unless absolutely necessary and only undertaken if covered by a permit. The recommended procedure is to place penguins in a well ventilated cardboard box large enough to allow unrestrained movement (one penguin per box to minimise injury to the birds). Make provisions and preparations for transportation by using appropriate pet carriers.

Restraint within the box should not be necessary, but the penguin being transported should be watched at all times and the temperature of the vehicle maintained at ambient air temperatures. If the bird shows any signs of distress it should be returned to its place of capture immediately. Ensure pilots and/or drivers operate vehicles slowly and carefully at all times, and that noise is kept to an absolute minimum.

Sedation could be given after consultation with a veterinarian experienced in transport of wild animals or avian medicine.

### **3.3 Flying Birds**

Flying birds should be placed inside a cloth bag after capture and transported inside a well ventilated cardboard box. Flying birds should be transported this way with only one bird per bag. More than one bird can be placed in the cardboard box, but be careful not to overcrowd the box. Do not hold the bird in the bag with your hands, instead allow the bird to settle and sit in the bag on its own.

Birds should be watched at all times during transportation and the temperature of the vehicle maintained at ambient air temperatures. Make provisions and preparations for transportations by using appropriate pet carriers available from veterinarians in Australia.

### **Section 4.1 - Sedation and/or Anaesthesia of Seals**

The specific modifications to the respiratory system and cardiovascular anatomy and physiology of phocid seals which are associated with diving, present problems for the safe sedation or anaesthesia of these species. In particular, the dive response consists of apnoea and bradycardia which may cause anoxia in the vital tissues of anaesthetised animals, and changes in the peripheral circulation which can result in pooling of drugs in the circulation and dramatically reduced response to the administration of emergency drugs. Collapsible upper airways can obstruct air flow despite the apparent movement of chest wall and nostrils. Thermoregulation can be compromised by the administration of some drugs. Species idiosyncracies, changes in body condition, state of excitement of the animal, proximity to water, substrate, presence of conspecifics, weather conditions, age and sex, can all influence choice of technique and dose rate. Anaesthetic protocols for some species are still developmental, requiring a deep understanding of anatomy, physiology, pharmacology, anaesthetic monitoring and resuscitative techniques. Protocols for other species are well established and can be practised with safety by experienced field personnel.

It is recommended that:

- i. Where an established protocol is to be employed (>80 successful procedures in that species with less than 5% mortality), there be at least one operator with a working knowledge of the procedure and its associated problems in that species, patient monitoring, and relevant resuscitative techniques.
- ii. Where a technique is developmental (<80 successful procedures in that species or >5% mortality), there be one veterinarian in the party with experience in anaesthesia (preferably of wild animals) and a thorough knowledge of pinniped anaesthesia, and one operator with knowledge of the behaviour of that species.
- iii. Unless contraindicated, atropine should be used as a pre-medication, with due consideration to lactational status of animals, to decrease upper respiratory tract secretion and possibly prevent bradycardia.
- iv. During chemical restraint the following parameters should be monitored and recorded throughout the procedure: respiratory rate and depth, heart rate, gum colour (if sufficiently sedated), pupil size (if sufficiently sedated), rectal body temperature (if sufficiently sedated), depth of anaesthesia, drugs and doses administered and time to effect and recovery. Monitoring during chemical restraint has been discussed (Woods, R. 1994, pp 67-83). Those interested in detailed information on monitoring of anaesthetics in seals are referred to this document.
- v. The operator should be in possession of and familiar with the use of resuscitative drugs (ie reversal agents, adrenaline, doxapram) and equipment (endotracheal tubes, solid mouth gags and oxygen demand/resuscitation valve, oxygen, flow meter (optional) and nasal tubing (optional)). Indications for the use of supplementary ventilation are - apnoea, unproductive breathing, off pink or blue gums, dilated pupils. If the animal is too awake to allow safe tracheal intubation, it can be ventilated through a nasal tube by pinching off the nostrils around the tube, but this is much less effective. The operator should be aware that laryngeal spasm, apnoea, regurgitation and operator injury are all potential complications with tracheal or nasal intubation. The use of mouth to tube ventilation is much less effective than positive pressure oxygen and carries with it the risk of disease transmission (eg TB transmitted from pinnipeds to humans).
- vi. A summary of anaesthetic records is to be submitted at the completion of the season. This information is to be made available to future operators and permits should be issued on the condition that the operator possesses this information from at least the last 20 procedures on the relevant species and age/sex.
- vii. Remote injection techniques (darts, pole syringes, extension tubing) be used where physical restraint is deemed dangerous to the operator or animal (see physical restraint Section 1). Operators using these techniques should be properly trained in their safe use.
- viii. If a seal dies during anaesthesia, the Antarctic Animal Ethics Committee (AAEC) Secretary is to be notified immediately at [aaec@aad.gov.au](mailto:aaec@aad.gov.au). A post-mortem should be conducted to investigate the cause of death and a report forwarded to the AAEC Secretary as soon as is practical after the event, but no longer than three days after the death. Work with anaesthesia should cease until the Committee has considered this report and confirmed approval to proceed.
- ix. The operator must have a relatively accurate method for determining the mass of the seal prior to drug administration in order to calculate dose rate, with particular care taken to consider fat loss during the moult and lactation.
- x. The operator must have a means of re-establishing normal body temperature, (e.g. heat packs, ice packs, water, shade, etc.) if thermoregulatory problems occur.
- xi. The seal must be observed until all visible drug effects have dissipated. During this recovery time it must be protected from attack by other animals.

- xii. The operator must reduce, to a negligible level, the chance that the animal will return to the sea in a sedated or disoriented state.
- xiii. Neuromuscular blocking agents must not be used for anaesthetic purposes without appropriate prior general anaesthesia.
- xiv. Operators should be aware of the relevant first aid procedures in case of accidental injection of a human.

## Chemical capture

Air and carbon dioxide powered dart rifles and those which have sound modifiers may be used where circumstances require it and in the hands of a skilled operator. Fur seals and elephant seals have been darted routinely with blow pipes (Baker et al. 1990, Boyd et al. 1990). When darting is used, mechanisms must be in place to reduce, to a negligible level, the chance that the animal will return to the sea in a sedated or disoriented state.

An anaesthetics trial for leopard and crabeater seals was conducted during the 1996-97 season. This trial included the initial administration of low dose-rate anaesthetics remotely via dart guns to determine suitable dose rates. Once suitable dose rates had been established they were delivered via the dart gun method to minimise/eliminate physical contact and disturbance. See also table of [Guidelines for seal anaesthesia](#).

## Section 4.2 - Guidelines for seal anaesthesia (table)

SPECIES	ANAESTHESIA	REVERSAL
<b>Leopard seals</b>	<p>1.2 - 1.5 mg/kg Tiletamine/Zolazepam (100 mg/ml) in a 1:1 ratio administered intramuscularly via Telinject dart.</p> <p>Atropine (16 mg/ml) 0.015 mg/kg administered with dart.</p> <p><b>Note:</b> dose rate employed on majority of procedures is 1.3 mg/kg and this provides reliable anaesthesia for up to 35 minutes facilitating blood and biopsy collection, gluing of satellite tracking devices, and morphometric measurement collection. (Higgins, Rogers, Irvine &amp; Hall-Aspland Marine Mammal Science 2002, 18(2), 483-499)</p> <p>Recovery usually complete by 90 minutes post-darting.</p> <p>(NB Xylazine should not be used for this species (Mitchell P and Burton H Veterinary Record 1991, 129, 332-336))</p>	<p>For reversal 0.004 - 0.008mg/kg Flumazenil (0.1mg/ml) if required, intramuscularly (in the event of a seal going to the water) or intravenously (in the event of anaesthetic complications).</p> <p><b>Note:</b> this protocol is only partially reversal. Flumazenil reverses the Zolazepam component only.</p>
<b>Elephant seals</b>	<p>1) Zoletil 1mg/kg given by IM (intramuscular)</p> <p>(Woods, R. et al, Br. vet.J. 1996; 152, 213-224;</p> <p>Woods, R et al, Veterinary Record 1994, 135, 572-577,</p> <p>Woods, R et al, Australian Veterinary Journal 1995, 72, 165-171;</p> <p>Robin, E. et al, 1963, Am.J.Physiol. 205, 1175-1177</p> <p>2) Zoletil 0.5mg/kg given by IV</p>	<p>Administer respiratory stimulant: Doxapram 0.5-4mg/kg into the extradural intravertebral vein</p> <p>(Woods, R et al, 1996, The Veterinary Record 138, 514-517;</p> <p>Woods, R et al Australian Veterinary Journal 1995, 72, 165-171)</p>

	(intravenous) (McMahon, C R et al, The Veterinary Record 2000, <b>146</b> , 251-254)	
<b>Crabeater seals</b>	Ketamine 6mg/kg and Diazepam 0.2mg/kg given IM; Atropine (1ml of solution at 0.65 mg/ml) (Shaughnessy, P. Wildlife Research 1991 18, 165-168; and pers.comm.) ( <b>NB</b> : Midazolam at 0.25-0.35mg/kg may replace Diazepam, due to its more rapid and predictable absorption following IM, and its more rapid elimination from the body (Woods, R et al, Journal of Wildlife Diseases 1989, 25, 586-590))	None known
<b>Weddell seals</b>	Regime 1: Ketamine 3mg/kg and Diazepam 0.2mg/kg (The comment NB above also applies) (Gales, N and Burton H. Australian Wildlife Research 1988, 15, 423-433; Phelan J, Green K. Journal of Wildlife Diseases 1992, 28, 230-235; Bornemann, H Plotz, J. Wildlife Society Bulletin 1993, 21, 437-441) Regime 2: Administered intramuscularly - Midazolam (15-20 mg/ml) at a dose range of 0.25-0.4 mg/kg and Ketamine (150mg/ml) at a dose rate of 2.0-6.0 mg/kg and Atropine (16mg/ml) at a dose rate of 0.015mg/kg. Facilitates light sedation.	Yohimbine 0.06-mg.kg-0.5mg/kg (Bornemann H and Plotz J Wildlife Society Bulletin 1993, 21, 437-441) Reversal for Regime 2. 0.004 - 0.008mg/kg Flumazenil (0.1mg/ml) if required, intramuscularly (in the event of a seal going to the water) or intravenously (in the event of anaesthetic complications). <b>Note</b> : this protocol is only partially reversal. Flumazenil reverses the Zolazepam component only.
<b>Fur seals</b>	Ketamine at 7.3mg/kg and Xylazine at 0.62 mg/kg given IM. (Boyd, I. et al. Marine Mammal Science 1990, 6, 135-145) (Zoletil induces respiratory depression: Boyd, I. Et al, Marine Mammal Science 1990, 6, 135-145) <b>Note</b> : favoured method for fur seal anaesthesia is by gas. (Gales, N.J., and Mattlin, R.H. Marine Mammal Science 1988, 14, 355-361)	Flumazenil 1mg IM for every 20-25mg benzodiazopine used for complete reversal of these drugs or 0.05-1mg given IM during procedures on fur seals (Kareesh W et al Annual Meeting of the American Association of Zoo Vets Houston 1997, 291-295)

## Section 5 - Specific Procedures

### 5.1 Observation

The apparent tameness of wildlife is a superficial impression and studies have shown that birds and seals may be under stress even when they show no obvious reactions. The use of an aircraft or a vehicle in such a manner as to disturb concentrations (defined as more than 20) of birds and seals is regulated. This is particularly important when colonies are observed or studied from the ground or the air and, to help researchers meet their legal requirements, reference should be made to the following documents on the AAD website

- *Environmental Guidelines for Antarctic and sub-Antarctic Helicopter Operations;*
- *Operations Manual; and*

- *Guidelines for Antarctic Research Applications*

The following limits are in place for helicopters operating around concentrations of birds or seals:

**S76 (Sikorsky long range) -1500 metres minimum landing distance and overflight altitude**  
**AS350 (Squirrel) -750 metres minimum landing distance for landing and overflight altitude**

The only conditions under which these guidelines should be broken are where human safety would otherwise be at risk, or where you have an Australian Antarctic Division permit allowing you to fly lower or land closer. The pilots can and will deny your requests for helicopter operations if they feel safety would be jeopardised or wildlife disturbed (without the appropriate permits approval).

When using helicopters around wildlife make sure the pilots are aware of the conditions of your permit. Before you take off it is your responsibility to discuss with them the overflight altitudes, landing distances and flight paths you wish to use and, if possible, let them know in advance where concentrations of wildlife are likely to be.

The impact of helicopter overflights and landings on birds and mammals can be affected by such things as the breeding/nesting phase of the species, wind speed and direction, background noise in the colony, and potential habituation of the species to any regular helicopter operations.

## **5.2 Identification by Artificial Means**

Seals are frequently marked with flexible plastic tags. Metal flipper bands used to individually identify penguins should only be used where identification of birds is necessary between seasons for long-term studies. If individual birds need to be recognised within seasons, temporary colour marking procedures should be used. Tags should have a circular cross-section shaft and be capable of swivelling around the shaft. For phocids these should be applied to the rear flippers as they can normally be fitted without the need for physical restraint of the seal. Fur seals and other otariids can move their hind limbs underneath their bodies to support their weight, so for this reason tags must not be fitted to the hind limbs. Tags should be inserted in the trailing edge of the forelimbs, a procedure which requires physical restraint. To overcome the tag being torn out in the net, the net should be rolled up over the animal's body whilst it is still physically restrained, freeing the fore flippers so that the net only covers the animal's head and neck. The net can then be rapidly pulled away with minimal chance of tags catching. Double tagging of all seals is recommended to overcome the problems induced by tag loss. Physical restraint may be required for tag checking.

Artificial identity markers should be almost painless to fit, they should have no effect upon behaviour and physiology, they should not affect intraspecific relations, and must have no significant effect on survival. Colour marking is a useful technique, but researchers should be alert to any increased attack by birds. Velcro flipper tags may be used with penguins, but they should be removed, wherever possible, at the end of the investigation. Great care should be taken when fitting bands to ensure that growth can occur without the band becoming too tight. Every attempt should be made to recover bands before dispersal makes it impossible to locate marked birds. Metal web tags may be used for marking penguin chicks. Before attaching, the tag and pliers should be dipped in an antiseptic solution.

Inert transponders inserted under the skin via a needle are now available for use with seals and penguins. Physical restraint is necessary for their insertion and may be necessary for checking. Research was conducted over the 1996-97 season to determine the optimum insertion site for Adélie penguins and whether the tags are likely to move around the body. That research has led to the following recommendations for the tagging of birds with transponders.

Tagging implantation sites should provide:

- sufficient loose skin for the tag to be injected into;
- a location such where migration would not lead to the tag easily entering a body cavity;
- a position where the tag would not affect the movement of the limbs; and
- a location from which the tag would not get damaged or lost.

The preferred tagging site in Adélie penguins is midway down the back as there are no structures to be damaged during injection, damage to the tag is unlikely, and migration of the tag would need to be extensive for the tag to enter a body cavity or impinge on the function of other organs. Note that implantation over the sternum may risk damage to the transponder when birds toboggan on their bellies.

In all studies only the minimum number of individuals should be marked, consistent with the objectives of the study.

### **5.3 Radiotelemetry**

Radiotelemetry is fast becoming an important method of collecting information from Antarctic species. The term embraces both devices which transmit their data directly to a satellite, shore station or ship, and devices which store data for subsequent electronic removal. Devices should in no way interfere with the normal activity of the species, and should be attached with the least invasive method practicable. Fast setting glues are essential. Devices should be dark coloured and any colour marking of tagged individuals should be carried out in accordance with Section 5.2. Radio transmitter tags should be fitted in an identical manner to identification tags (see Section 5.2)

### **5.4 Surgery**

Only very minor surgical procedures of short duration should be conducted in the field, under the conditions discussed in Section 4. Such procedures would be limited to drawing a blood sample or taking a skin biopsy. Any major surgery should be conducted under normal veterinary guidelines, with facilities that provide asepsis, controlled temperature, gaseous anaesthetic machines, monitors of cardiovascular, respiratory and thermoregulatory parameters and recovery areas.

### **5.5 Collection of Body Tissues and Samples**

Techniques for use in sampling tissues, etc. from live animals require humane procedures and considered planning to ensure that the maximum scientific data are achieved with a minimum of samples. Only trained personnel should take tissue samples from live animals. Advice must be obtained from a veterinarian or others with demonstrable skill as to the techniques and drugs

appropriate to a particular procedure. Procedures which have the potential to cause considerable distress or which are essentially dangerous to the animal should be undertaken by a veterinarian. Tranquillisers and immobilising agents with poor analgesic properties are not an acceptable substitute for general anaesthesia when procedures that cause more than slight or momentary pain are used. Although aseptic techniques are difficult to achieve cleanliness in all surgical and sampling techniques is essential to minimise the potential for infections and to provide reliable biological samples in the field,

For repeated blood sampling from phocid seals a catheter should be inserted into the epidural vein (otariid seals do not have an epidural vein that is readily accessed); veins in the limbs are less easy to use on account of limb mobility and would necessitate immobilising the animal.

## **5.6 Removal of Stomach Contents from Seals and Birds**

While the loss of a stomach-full of food may be relatively unimportant to large pinnipeds which suckle their young on milk, it may be of great significance to penguins and other birds which feed their young by regurgitation.

Only those birds in good condition that are recently arrived from the sea should be selected for this procedure. All animals treated in this way should be colour marked to avoid their being flushed a second time. If there is any doubt about a bird's wellbeing during flushing operations, researchers should stop and choose another.

It is best to capture birds arriving at the beach if only food items are needed. Each nest from which an adult is captured for stomach flushing should be clearly marked to ensure that the nest will not be used again that season (tags should be removed at the end of the season). This will ensure that no bird is sampled more than once and that no chick loses more than a single meal.

Tubing used should be made of a substance that will not become rigid in cold temperatures, and therefore medical grade silicone tubing is recommended. The end of the tube that is to be pushed down the throat should have smooth edges to avoid damaging the oesophageal membrane. The length of tubing to be inserted should be marked to length before insertion.

Fresh water should be used in the flushing technique and should be heated until it feels warm to the hand as cold water will kill the bird being operated upon.

If a bird dies during, or as a result of, stomach flushing operations, a post mortem must be conducted to determine the cause of death and a report forwarded to the Antarctic Animal Ethics Committee (AAEC) as soon as it is practical after the event.

## **5.7 Euthanasia**

Animals injured as a result of human activity should be subjected to euthanasia, except when, in the view of the responsible person, there is a good chance of full recovery. The fate of animals injured as a result of natural phenomena must be left to the discretion of the responsible person.

If a seal pup is abandoned as a result of human interference then a decision should be taken to kill the animal if there is no chance of it surviving on its own. Should such an abandonment occur, the researcher must submit a report to the AAEC without delay.

Field methods of euthanasia must be as quick and as painless as possible and be compatible with the design of the investigation and the size and behaviour of the species under investigation. The choice of method, therefore, will vary with the species and the circumstance. Investigators in the field must always be equipped to handle euthanasia. While the method of euthanasia should be selected so as not to interfere with the objectives of the research, the welfare of the animal must take priority (See Section 2).

## 5.8 Environmental Ethics

For details of environmental management in Antarctica refer to Chapter 2 - *Environment* in the *Operations Manual* and the relevant Station Management Plan. Please direct enquiries to the Environment Officer, Environmental Management and Audit Unit, Australian Antarctic Division telephone 03 6232 3507 email [emau@aad.gov.au](mailto:emau@aad.gov.au).

The objectives of the environmental guidelines apply to all scientific investigation sites. The attention of workers using radioisotopes is drawn to the section of the *Code for Use of Ionising Radiation* which calls for a record of contaminated areas to be kept and lodged in the Australian Antarctic Division. Carcasses of isotope-treated animals must, wherever possible, be returned to Australia and disposed of in accordance with Section 10 of Part B of this document; other carcasses should be disposed of in the manner most appropriate to the objectives of the management document.

All scientific projects are subject to an Environmental Impact Assessment (EIA) in accordance with the *Antarctic Treaty (Environment Protection) Act 1980*. All Australian Antarctic activities must also comply with the new Environment Protection and Biodiversity Conservation Act 1999 (EPBC) Act which applies to all activities concerning Commonwealth lands and waters, including the AAT, subantarctic islands and the Southern Ocean. As well as the EIA, permits are required for some activities.

## Section 6 - What Constitutes an 'invasive' & 'non-invasive' Procedure

An **invasive** technique can be defined as any procedure which removes samples of any body tissue including blood, skin, fat, and stomach contents from a vertebrate animal, or which requires the administration of an anaesthetic.

A **non-invasive** procedure is one that is restricted to the exterior of an animal, such as the attachment of leg rings to flighted birds, flipper bands on penguins, or the temporary attachment of location recording/time-depth recording devices to birds or mammals. It includes the attachment of cattle ear tags in the rear flipper membranes of seals.

## 6.1 - Information Required on Projects Involving Animal Experimentation

The Antarctic Animal Ethics Committee requires the information/documentation outlined below to be lodged with your original research application. Please note that the revised application form

on the Worldwide Web allows for information to be provided/submitted separately for each species under study.

*Species:* Provide vernacular and Latin names of species of animals involved in study.

*Location:* Indicate station where work is being undertaken and/or precise location(s) of field work. You must also include detailed information on whether the area you propose to work in is a Specially Protected Area (SPA) or Site of Special Scientific Interest (SSSI).

*Population size:* Provide the best estimate of population size of the species at the location at which the experimentation is proposed.

*Experimental activity:* Describe the experimental activity proposed (e.g. tagging, weighing, stomach contents sampling, height of helicopter overflights etc.).

*Number of individuals:* List the number of individuals of each species to be involved in each experimental activity. Group according to sex, age and location.

*Anaesthetics:* Give types and dosages required and means of administration.

**In addition, the following information is required under the *Australian Code of Practice for the Care and Use of Animals for Scientific Purposes* (para 2.2.9). This information must be included in the relevant parts of Question 4.3 of your Antarctic Research Application. It need not be presented separately.**

1. Details of the experimental techniques, including surgical or other procedures to be used, doses of anaesthetic, analgesic, or tranquillising agents, methods to be adopted to ensure that anaesthesia is adequate, and the method, if any, by which the animals will be killed humanely.
2. Number and species of animals required, and justification.
3. Duration of the proposed experiment.
4. Details of animal care and housing during the experiment, including location.
5. Arrangements proposed for the disposal of the animals at the completion of the experiment.
6. Justification of the project in terms of potential value of the experiments in obtaining or establishing significant information relevant to the understanding of humans or animals, to the maintenance and improvement of human or animal health and welfare, to the improvement of animal management or production, or to the achievement of educational objectives.
7. Reasons why animals are necessary for the project and why techniques which do not use animals have been rejected as unsuitable.
8. Justification for any repetition of previously performed experiments.
9. Identification of, and justification for, all procedures which have the potential to cause pain or distress, and details of the steps to be taken to avoid or minimise the pain or distress.
10. Details of how the animals will be monitored during the experiments.
11. Details of monitoring procedures used to ensure that when neuromuscular and similar blocking agents are used, the potentially painful nature of any procedure is blocked by appropriate anaesthesia and analgesia.

12. Justification for experiments which may cause pain or distress, but in which anaesthesia or analgesia cannot be used. Such experiments include certain toxicological, pathogenic and animal production studies. The planned end-point and the reason for its choice must be given and justified. Death as an end-point must be avoided wherever possible and if unavoidable must be fully justified by the investigator. Measures to be taken to minimise pain or distress must be detailed.
13. Identification and/or justification for the use of any animal that has been the subject of a previous experiment.
14. Any features of the proposal which raise special ethical considerations.
15. Any health risks to other animals or to staff.
16. Expected commencement and completion dates.
17. A declaration signed by the responsible investigator(s) stating that they are currently licensed or authorised to perform experiments using animals (if required by legislation), and is/are aware of responsibilities set out in the *Australian Code of Practice for the Care and Use of Animals for Scientific Purposes* and in applicable legislation.

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## APPENDIX S: Responses to Interview Series Question No. 7

The name *Elli* appearing within interview transcripts represents the interviewer/ researcher.

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## 1. Adams, Neil

Neil: Yes, I think it's necessary. I certainly don't think anything should just be published because it was written. I'd rather know that it had gone under some sort of scrutiny.

Elli: Okay. So you think that it actually achieves maintaining rigour?

Neil: Look I don't know. I've only been publishing if you like for ten or twelve years and as sole author papers there's probably only eight or nine papers that I've written and they've all gone through peer review and they've all benefited from going through peer review.

Elli: Benefited in what way?

Neil: In just being a little bit more rigorous I guess. Like I said before, I tend to be a bit of a 'seat of the pants' person so I will write a little the way I feel about it to a certain extent but that needs to be pulled back in to say well here's the evidence. I appreciate the peer review. There's been a few comments I've had on some papers that you think well maybe they're not quite sure where you're coming from, but that's probably my problem in the way I've written it. Ninety-nine per cent of the time the comments have been quite valuable. I wouldn't want to have my name on a paper published that there were flaws in so from that point of view I'm more than – I mean it's always nerve-wracking to put a paper out to review. When it comes back and they say this is a load of rubbish, but I'd far rather go through that process and not publish than to publish it and have people tell you that it's a load of rubbish afterwards. So I appreciate the peer review process. How rigorous it is I don't know. They find two people, someone else to read it and say yes it was good or not. I certainly haven't found any of the process that would have lead me to believe that it was flawed.

## 2. Allison, Ian

Ian: I think it's a necessary process. It's often flawed.

Elli: What does that mean?

Ian: That you can send out a paper for three different reviewers and get three completely opposing opinions back. I don't see an alternative to the process and I think for it to work properly you need to have a good editor – someone who's managing that process and making decisions and directing both the reviewers and the authors to deliver on something that really fits.

Elli: Okay. As far as the rigour goes, you say it's not perfect ?...?

Ian: No it's not perfect.

Elli: It's not perfect.

Ian: No.

Elli: So if it's not perfect then it may not guarantee rigour but do you feel that ...

Ian: Certainly. It's not perfect in two ways. You can get reviewers that are completely wrong and reject a paper because they don't understand it and if the editor also doesn't understand where they're coming from you can reject a good paper. But you can also get reviewers who don't take enough care and something slips through that's probably faulty. The process certainly does help and you can see that. Most journals now will publish lists of reviewers who have really contributed to not just checking the process but improving the paper offering positive ideas to the authors.

Elli: Within science papers, is it mostly anonymous or is it mostly not anonymous?

Ian: It depends on the individual. It is always the case for it to be anonymous. Some people always say that they're happy to have their name released. I tend to say that.

Elli: So it's really up to the individual.

Ian: Yes, some journals won't release them under any circumstances but all journals will keep the reviewers name confidential. If you want it some will let you and say 'here you are'.

Elli: Okay. What's the general trend, do most ?...?

Ian: I would say it's about fifty-fifty. People tend to be quite happy to release their name if they feel they're making a positive contribution to the paper. They're saying to the author not that this is a "load of crap" but this is a good idea, however have you thought of doing this much extra. Often you will see the acknowledgement that says acknowledgement to a reviewer by name.

Comment [AAD1]: ??

### 3. Barmuta, Leon

Leon: That famous classic Churchill said – "Democracy is really cracky but it's the best got" sort of thing. I think that's probably my opinion on peer review. It's fraught with all sorts of problems but I think it's the best system that we can use at the moment. Any alternatives are always more or less a disaster. ?...? in Soviet science and things like that we you've had some sort of a god-like person at the top who dictates what's good and bad science. Peer review at it's worst can be subject to a lot of nepotism and petty infighting. I know from a colleague's experience from New Zealand ?in Victoria? trying to get support to try to go down and survey fresh water systems on Macquarie Island. Because he wasn't part of the in-crowd some referee's comments were just ridiculous. Things like 'Oh, if we let this person down there, they will contaminate the different streams with their nets because people from New Zealand and Victoria don't know how to ?wash? nets between sample stations'. Where does this come from...?has? this person actually been out with my colleague. Eventually he was able to get some support and go down there and do the work. When you see those sorts of things you think, well what is going on.

Elli: That scenario, was that like a personal vendetta?

Leon: Not so far as we know because generally Richard hadn't had anything to do with the Antarctic Division before, or anyone in there as far as he knew. It was back in the late 1980s ?...? ?...? general calls for scientific research and he had ?...? done some work on the lakes and nothing had been done on the streams at all. Nobody had done any work on the macro invertebrates side of things. He put together a fairly cheap proposal to go down and take some samples and bring them back. Then again, the best peer review can work really well. Actually my best experience with peer review was with this particular project in applying for support and the panel got back to us. We had a couple of good referee supports from ?...? one referee's report which was from left field and the panel said, 'well it seems like ?...? referee which isn't particularly helpful or constructive, can you nominate three other people who we might be able to pick one of those and see what they say as well. So we did that. We actually got positive, beneficial feedback to improve the proposals ?of? that process.

Elli: So there can be a lot of variations in ?...?

Leon: Yes.

Elli: [*indecipherable*] scientists ?...? projects and research.

Leon: Yes.

Elli: Any particular problems to do with peer review that you can think of as far as publications go?

Leon: Publications. I haven't tried publishing any Antarctic stuff yet because we're still working that out.

Elli: Just in general.

Leon: Just in general, again it's probably as good as we'll be able to get but there's a huge variation in the quality of reviewers and sometimes a little knowledge can be a dangerous thing in the hands of some reviewers. You just have to lump it really. I've had to give up on getting papers into what I would consider the appropriate journal because ...? ...? or what I consider to be an unfair peer review opinion and have to submit it somewhere else I suppose, which is the usual pattern.

Elli: ...? ...submit it another name.

Leon: Oh, you don't have to go to that extent but there's certainly a couple of papers I've had to submit to another journal instead of my preferred journal. In one of those instances four referees thought it was great research and worth publishing and so forth, but the editor ...? just a thin slip of paper saying it's not fundamental enough for our journal. That's after eighteen months of reviewing.

Elli: So there's quite a number of things that ...? ...? It's interesting to me because as we go through our training ...? We started school and had teachers, then we go to university and we have supervisors and when we get to this level of PhD or masters, that's it we're on our own. So somehow the academic community has decided that at this particular level we don't need supervision any more. Why have we chosen to stop at this particular level, but we have. So it's kind of interesting.

Leon: It is, yes.

#### 4. Bindoff, Nathan

Nathan: I have the view that if you don't publish you don't actually have anything to say. Whilst it's all very well to go to meetings and to talk verbally and to present results, it's not a replacement to actual scientific publications. The value of scientific publications is that they are in the literature, they do get read and people do comment on them and do request things, and I can tell you that you quite quickly forget the results – your own results. I think there is an imperative to actually publish your science. That's a must in my view, having a profile. That's not sufficient communication by a long shot. It's important that it's peer review because quality is actually important. Peer review means that it's been criticised, checked over and analysed by your peers and those checks, whilst they may not always be adequate and so on, they do put the pressure on you to be current in your field, they do put the pressure on you to do good work, and they do put the pressure on you to achieve some novelty and creativity in your work. So I think this is an essential part of being a scientist, not just simply Antarctic scientific research. I think it's important to communicate as well so you have to be dynamic and that means you do have to communicate through conferences, so peer review isn't as essential there, but it is a review process actually when you talk to your colleagues. It's also important to communicate more widely, so yes.

Elli: Okay. I just thought when you were talking, some people say that when one consults with somebody who is at the same level as themselves – level of knowledge or understanding that sort of thing – then you can end up with this what they call 'the

blind leading the blind', because you don't have an authoritative view on it. How does that concept sit with you in terms of ...

Nathan: No, no, I don't care about that. The point is that publications should be right as they stand at the moment so if for instance your peers agree that it's a good publication, and it's only a couple of peers by the way when you review. What they're really saying is that this paper has some interesting ideas in it and it's an interesting piece of work and it's relevant, okay. It could be completely wrong or fallacious or it could be, not deliberately so, misguided, but it's all possible. Peer review doesn't protect you from that, so if there was a scientific revolution going on that's fine. Sure enough three or four years down the track your piece of work will be discarded or forgotten as time goes by, by the following pieces of work in the evolution. Peers are there to ensure quality, and they hold up the science maybe because they control the quality a little bit but, boy, it wants to at least come up to the scratch of your peers. So you don't want sub-standard ideas. I think that's what's important about peer review. Grey literature can be of exceedingly variable quality and it isn't credible. Peer review's about credibility, so peer review's important.

## 5. Bowman, John

John: I think peer review for me is so engrained as a scientist. It is needed. There has to be some sort of evaluation at some level to screen out the nonsense from the things that are worth seeing. I mean, sure there's always going to be some compromises like some things might be excluded because of priorities or some sort of political stuff. And of course, if you're a scientist peer review is par for the course. It's something you have to live with, particularly if you don't like it.

Elli: (*indecipherable*) quote that there's a saying that ?...? I was thinking about that because I was thinking, in the education system ?...? from when we start at school all the way through college and university we have somebody supervising us ?...? we get to this level where we get out doctorate and that's it. There's no-one any more to supervise what we do so it's kind of assumed that once we reach that level then that's the furthest that we can take our knowledge. That's kind of, we've made it – once we're there we've made it so it's kind of an interesting thing that all of a sudden when we reach that level then instead of looking out we're looking at ?? being ?...? we're saying how do you see this ?...?our peers. So from one perspective it's kind of interesting to me, the process of peer review, whether it's foolproof.

John: Oh, it's never foolproof. Peer review is tripped up by so many different things. I mean things get through the system and others never get through, but other things get excluded because other people's rivalries or whatever. So it's never perfect but usually I think in the end it works for the most part. It's just people attach a hierarchy to it which is not so good, particularly the journals now everything's got a score as you've probably seen in citation index and it's all numbers now

Elli: Which is all based on peer review as well isn't it.

John: More or less. It's all based upon, I suppose there's an elite aspect to it. For example if you're working as a scientist in Bangladesh, it's not likely, you'll get a paper in a journal like Nature.

John: ... Elli: So do you think there's a culture thing for us there as well? You were saying ?...? if a scientist from Bangladesh publishes something or makes ?? he or she may not ?...? publication because he comes from a country that is considered less technologically advanced.

John: It depends on the nature of that discovery. I mean it's possible that the discovery is within the technological capacity. It could be still very major and still could get a good journal as a result, but the probability is not very high because for sciences these days it's become a lot more technological, particularly in biology and physics, it's all driven by new technology and that costs money.

Elli: I suppose it's very competitive as well.

John: Oh yes. Competition it is – it depends on the fields very much, what you're doing. I mean, when I went to Antarctic there was no-one really doing anything at all in Antarctic Microbiology, only some people pottering around here and there, but I felt that I had no competition, and I didn't. Since then more people are doing similar things. I think there's still lots of room. It just depends on what you're doing. I think certainly certain areas have a lot of competition, but I that's something not worried about.

Elli: No. I was thinking though it may actually play a very important role in deciding which papers get published, because if you get ten papers submitted that have all looked at the one specific thing, as compared to only two or three, then the people who are in the group of ten are going to be less likely to get a publication.

John: #2 You can't assume things haven't been done or there was already knowledge out there. That's another one of these things that seem to be a phenomenon of the times. Since everything is data-based and people forget about the old material. This is something, the old lady that tried to come and talk to me, June Olley, has mentioned because she actually sees this happening – she has read a lot of stuff over many years and she has noticed that some people are rediscovering things because they're not looking at the literature. I think that could become more common?perhaps, But of course with the more sophisticated science it's possible, I mean there's more details obtained but maybe the fundamental truth is the same as what's been previously seen, but by less technological means. But you just have to go through that obstacle course. I think scientists do need to have a bit of imagination to really try to do something new. It's not like there's new ideas popping out in people's heads all the time. You've got to have imagination that's got to be doable. So it's a bit of a balancing act. So somehow most people manage eventually. I think some of the best scientists tend to be very good at that. Lateral thinking and all that sort of thing.

Elli: Would you say that the desire to discover something new is the motivation in?...? I mean, I can imagine that there would be different motivations why scientists want to discover something new. One motivation might be to make a name for themselves for example. Another motivation might be that they are aware that there is a need to learn about something in particular in a particular field.

John: Or you could have both.

Elli: Or you could have a combination of both.

John: I think you can be proud about some of the things you do, especially if people cite you, then you know that people are taking notice of your work. To me that's probably the best feeling of success, that people actually read your work and are interested in it. That's what really I think motivates most scientists. I mean obviously some of it goes to some people's heads a bit more than others and they might get a chip on their shoulder, but I think that's a fairly rare thing generally speaking. I mean most people are realistic enough not to act like that.

## 6. Burns, Gary

Gary: Yes. #1 The concept of peer review is great and it's a pretty good system but the bit that I'd never get accepted by my colleagues – I've actually thought long and hard about that. Perhaps I'll demonstrate ? by what I say. I like the concept of elevating the peers, the reviewers in a process of having a paper accepted. I reckon that if you're selected to review a paper, you should have access to more ~~that~~ than is in the paper, it should be your responsibility to see if you agree with the approach, and you should almost have published with every paper a page comment of what extra things the reviewer's looked at, what he thought might have been done a bit better but why he has approved the paper for publication. So I would like to see the review process have more of you know the referee who has done it should be able to say something about the paper. Then I also think we've got to get out of this habit of wanting to put out a paper for a paper's sake, and we've got to take the pressure off us that says you've got to produce so many papers a year. I think we ought to form a union or do something that says 'we're only going to be lead author on at most two papers a year, which means - I'm not asking any of my colleagues to spend time reading my distilled thoughts unless I've put six months of my thinking time into writing that, so that we cut down the amount of literature that we've got out there and we've put more of an effort into distilling our wisdom into a way that saves the people who have to read it the time of assimilating it. I would like to see both those things but I can never see them happening. The same way as democracy is the best system we've got for politics at the moment, I think the peer review system is the best we've got at the moment.

Elli: At the moment. So do you feel that there pressure on scientists to produce more than two papers a year?

Gary: I've managed – yes there's pressure too.

Elli: Or is it expected.

Gary: Yes, it's expected. And I think it's reasonable to expect a certain level. I mean, I'm relatively high up in the pay and academic scale within Antarctic division and in my performance of appraisal I have listed that I am meant to put out one lead author paper a year and one as a co-author, and I think that's a reasonable expectation. I might be able to do a little more, but that's a level that I'm comfortable with and that's been an agreement. And I think there's a general thing in society that that's about the level that we want to aim at. But over-emphasising that is just not the way to go. I like my Prof. who was my PhD supervisor. He said, you know we've got all these little ways that people like to try – it's amazing – everyone wants to assess scientists, and I want to take this into the other area later on so I'll blab a bit. But he said, you know the best way to assess a scientist is actually how many free meals he gets shouted by his colleagues. You know, how many conferences he gets invited to because people want to hear him talk and expand on the subject he's doing. That sort of does the complete picture and I don't want people to start counting ?those things? But in a way it's other scientist's view of scientists, your colleagues view that in a way helps you or makes you feel good but you generally should be self-motivated as well. Look, on that side of things there's a lot more review and assessment of scientists. I think that rather than refine how you deal with scientists, take what is a good scheme and apply it elsewhere. Apply it to the administrative side. Like, we had the Antarctic Science Advisory Committee – I keep blabbing that I want the Antarctic Administrative Advisory Committee and I want to chair it. I want the administrators to go through a similar sort of rigor with the way when they change the

process that they should have to put out what they're trying to do, what outcomes they expect, how they're going to judge whether it's successful. They put it out to some other people that are, you know sort of peers, to look if they think that's a good idea and then let's assess it, so that we can look at the process. I mean, I think there's more to be gained through outcomes by applying that sort of process that we've got at the moment within the science across to other areas than there is by trying to refine the science where it is at the moment. I think the scientific approach to that is close, even maybe a little over the top in places, but there's more to be gained I think going that way than trying to refine the scientific one at present.

Elli: Okay. So in particular when you're meaning to apply that system ....

Gary: Of review and assessment.

Elli: Yes to other areas, you're specifically speaking about other organizations, or other areas of society that are somehow connected with science ...

Gary: No. I think it's something that you could do in industry. But the first thing I really am thinking of I guess is the areas adjacent to me. I think that's the sort of approach we want in our government organizations for the administrative part of things.

Elli: Even those areas that have nothing to do with science.

Gary: Yes. Well they all have an impact on society. I mean, I think there's some aspects of that – local councils. I think they aspire to that type of thing.

Elli: It's a very interesting idea.

Gary: I think it would work.

## 7. Church, John

John: Peer review is important. Yes, I'm a strong supporter of peer review I guess. All our science results get peer reviewed, applications in many areas get peer reviewed, not in all areas actually. Again I think the group I'm in would strongly support peer review and would probably say there ought to be more of it.

Elli: Okay, so do you think it actually achieves – keeping Antarctic science rigorous.

John: It certainly helps and the problems we face in Australia and Antarctica research is the limited size of the community. Therefore we need to engage with the international community to peer review properly.

## 8. Coleman, Richard

Richard: Yes. This is a standard way of doing things and there's no easy system in terms of evaluating other's work, but I think the peer review system has worked well for the Antarctic work that I've been involved with. Everybody that puts in applications is expected to review other's proposals and I think that if done professionally, then it's an excellent system.

Elli: OK. So you think that it's something that works.

Richard: Yes. I think there are probably some individuals that if they know the groups that are probably competing against each other, the peer review system can be abused. Some people can be fairly ambitious and be ruthless in assessing proposals and in this case the reviews are done more on a personality type issue rather than on a professional level. I think however that this is a rare situation.

Elli: OK. On other question I ?...? There's a saying that goes 'the blind leading the blind', so I was thinking about peer review. I was thinking ?...? education system one always has a teacher or a supervisor and you get to the level of a doctor or somebody of that qualification and then you actually stop having somebody above you so far as science goes. Of course sometimes we have a chief scientist but largely when you get to that kind of level then it's really the understanding is that that's pretty much as far as you can go in scientific understanding. So I was thinking that if we look at peer review then how will you really know if all the scientists that on this doctorate level, what if they're ?...? about something?

Richard: Yes, interesting question. I think statistically it wouldn't work that way. I think the more you actually learn, for me, it seems the less you understand. You certainly gain a lot of understanding, but there's always more problems to solve, so that you make an incremental change to some areas, but it just opens up others. So under peer review you certainly have more experienced scientists typically evaluating the work of others, or those less experienced. So that the main criticism I guess that you could level that way is that if they're all just ticking the box or they're not really understanding the critical elements or fundamentals of the problem, then it won't work. But the alternative of selecting somebody has to be done in some way and peer review is what I would consider a more fair and equitable way of doing it, rather than allowing somebody else, perhaps one or two key people, to nominate who would get the grant.

Elli: So again we come down to the experience thing. So there might be some (*indecipherable*)

Richard: Well, it could be that the positions of chief scientists or no matter who it is, I think there's certainly somebody that's more expert in the field. I think in terms of the peer review system if you regularly get, for example, an ARC or grant application to review, you develop a fair degree of familiarity with picking up the good science in the proposals. But it's not only on what science is proposed, you are also typically evaluated these days on performance, so that itself is whether people are publishing in high quality journals and if they are producing the science in the previous grant that they said they would do. Obviously the science results might not be the most brilliant, but they've at least got themselves together to produce outcomes.

Elli: OK. Now as you were saying before, ?when you first answered on this question? you said it works. You think the system works, so I suppose if somebody did publish something ?...? peer review and it ?ended up being wrong? ? discredited, it would be thrown out.

Richard: Yes. I think people publish and put it in the international arena so that it is open for peer review. We've had work ourselves, done with John Hunter, and David Pugh and others, published on sea level rise estimates that has been attacked by people that were from a non-science type background, but still this still enabled healthy debate on what we had been investigating.

Richard: It's been open to scrutiny at some level.

Elli: Yes sure. That's interesting. So it was coming from a non-science....

Richard: Yes. Well the person was a high school teacher, but with an avid greenhouse interest, so we were largely attacked through his own website and through mailing lists.

Elli: But you as far as the scientific ?merit of that work? went? you weren't discredited on ?...?

Richard: This person had actually written to a journal trying to put forward his arguments and his work went through a peer review system and his arguments were, from a science point of view, thrown away by independent journal reviewers.

Elli: Thrown away.

Richard: Yes. And then the comment was, well you scientists stick together and won't take any notice of somebody without a Dr in front of their name, but that certainly wasn't the case.

Elli: OK. I'm sure they ?...? non-science bodies that (*indecipherable*)

Richard: I think just getting back to this peer review system, it brought up another problem where again we were criticised. I think generally in some science arenas peer review is done on an anonymous basis. In other areas, it's done where people actually know the authors and you're given the option of saying whether you want the person whose paper you are reviewing to know your identity as a reviewer. So again it's done on a fairly open basis.

Elli: Most of the review process is anonymous though isn't it?

Richard: Not completely anonymous. You actually get to know who the authors are on the papers that you typically review and their names are not normally made anonymous. It is more the case that the reviewer can choose to be anonymous or not to the authors. I think in the social sciences area, the whole review process tends to be completely anonymous. In the sciences area that I've been involved in, it is the reviewer who is anonymous by his/her choice.

Elli: Is that (*indecipherable*)

Richard: I think so, yes. So I guess potentially because of freedom of information you can ask to see details of reviewers.

## 9. Davidson, Garry

Elli: Well, that kind of leads us into the next question: Do you have any thoughts on the process of peer review as a means by which to ensure rigour in Antarctic scientific research, or geophysical scientific research that is connected to Antarctica?

Garry: Sure. The peer review comes in two parts I guess in Antarctic scientific research. It's always been present when you want to publish your work and it ensures rigour because other people are providing their professional opinion if their idea of where the science is compared to your perception of how you've advanced it. It's a very important continual process of yard-sticking. The other part of the process of peer review is in the granting process where it's mostly peers who might, usually anonymously, make a judgement on what you say would be a good idea in terms of advancing the science. That was quite soft in Antarctic science for many years. It was sometimes only done internally by scientists down there who – it's a little bit like our institutional research grant scheme here – often they won't really know a lot about the area that you're trying to talk about, but more recently they have tried to go down the road of going to peers that are expert in a much wider group of fields and identifying those, which is quite involved. I think that's good. It has two effects. It lets the wider world know of what's going on down in Australian Antarctic science and it just means that the work is likely to make a contribution to the wider scientific literature. If you're flawed in what you set out to do it's not likely that you're going to make a solid contribution to world science. I think it's important in both of those areas.

Elli: So within the context of both of those areas, would you say that peer review ensures that rigour will be there.

Garry: Yes. It doesn't ensure it, but it makes it more likely. There are many competing things. There are people who will peer review but they don't peer review thoroughly because of time constraints. There are people who peer review who don't do it thoroughly because of inexperience. There's many problems now that most of our fields are growing so fast that there are very few people who are actually on top of it. Although it's an imperfect process I think it is the best that we can offer within our limited resources. Nobody pays you to peer review it's a purely voluntary process.

#### 10. Miller, Denzil

Denzil: I think peer review is per se a good thing. I do think that it's important. It's important to bring scrutiny to your own work in terms of what you do, but it's also important to ensure that there's at least some form of standard across science that's documented and presented in the public domain. I suppose I'm in a minority in some ways. I believe two things – if I'm asked to peer review a scientific article I will peer review it to the best of my ability and if that means I have to become completely and utterly ruthless I will, but I will always identify myself. That's not necessarily the norm. Now if you are prepared to criticise, constructively or destructively it doesn't matter, then you should be prepared to be made accountable for that. I cannot abide the peer review process as a screening process, either to get people to agree with you or to get people to fit into some kind of channelled, structured thinking. The end result might be that but at least provide an opportunity and don't hide what you are or who you are because you may have something to learn from the mistakes that you see having being made. They may not be mistakes at all – you may not just be intellectually capable of seeing the reasoning behind them, so you kill this thing. We are in many cases forced into the position if you have a lot of peer reviews to do that you do cut corners. You do say, well this is a paper that I really can't be bothered with – it's got nothing, it doesn't follow that, it's written badly, whatever, whatever – no, send it away. If you don't identify yourself you have no comeback. So it's gone, you've killed it, whatever it is. It's a very, very difficult thing but as a general standard I think it's essential. I really do think that

Elli: The whole process in general.

Denzil: Yes. I think if it's done properly – if it's done as a constructive process, and the opportunity is given for dialogue between the referee and the author and it's not seen as a way of holding back or pushing people back. If someone challenges your ideas, what a compliment. Don't see it as, 'gee what right to they have – I'm going to make sure this paper doesn't get published because it questions what I've done'. Well then go and do something else – go fishing, because you're going to make a whole bigger contribution to science than you are taking that attitude.

Elli: Okay, so as far as rigour goes, do you think that it ensures rigour?

Denzil: I think it does. Most referees take their job very seriously, so therefore they do apply a rigour and one of the hardest things for a referee is to actually put yourself, when you're writing a scientific article, in the shoes of a referee that might be refereeing it. You can referee a paper and you do a really good job on it, and you know when you've done a good job on refereeing a paper, but you're almost incapable of applying the same principles to your paper. That comes with experience – that really does come with experience. When you get there I think that helps

everybody, it helps you and there's a benefit, it's not a cost, it's not all outgoing. You learn from having been challenged or you learn from looking at problems and ideas and equally you can provide input on things and notions it brings fulfillment. That's the only reason I can think of. It distils down the essence of what's going on and that brings rigour into it.

Elli: Do you think that that requires something more than just experience though?

Denzil: It requires a lot of things, I think experience is one. Experience makes it easier, I don't think it's alone. I think awareness, I think confidence in oneself, I think confidence in what one does, confidence in the work, philosophical distance of being able to perceive the value of what's being done rather than what it actually is. All those kind of things. I think it would probably be a list of a hundred things – I've only named a few. I'm sure there's a large number of things that would impact on all of us I'm absolutely sure of that.

## 11. Morgan, Vin

Vin: Or in any scientific research of course.

Elli: Yes, that's true.

Vin: Peer review's under a bit of a cloud because a few poor scientific papers that have come out and that have been picked out. Peer review is in some trouble because everyone's under time pressure a bit. It takes time to do a really good peer review of a paper and so if you spend a short time reviewing a paper you do a fairly ordinary review. Reviewing papers of course is not a bad thing to do. You need to read other people's papers that are in the field, so reading a paper carefully to review it is not a bad thing - that's how the system presumably should work. The problem is that it isn't clear, and it still isn't really clear to me even after all this time puddling around reviewing papers what you should be reviewing. Should it just be the science, should it be the language?? You have to make a judgment. If there's obvious errors in the paper like ?...? equivalent of 2 plus 2 equals 5. That's very easy, you can say that's wrong. But I'm not sure that a reviewer should really question too many of the conclusions that have been put forward by a person who wrote the paper unless the reviewer really feels that they can say that they're wrong. Any reviewer can say that they think it's a good idea, they can say they think it's a nice paper and it's got nice ideas. There's a history of course of papers having got knocked back by reviewers who've said 'no this is a stupid idea, it's completely against everything we know in science, and then, often a long time later the paper was shown to be correct. The reviewers were just wrong. So I don't think it's the reviewers place to actually put their opinions into the review like that.

Elli: So can I just jump back now. We were talking before about the need for more research into qualitative sciences when we look at things like drawing conclusions, so you don't think if there was more research into that factor then it should not be research within the system of peer review. It should more be research within the actual science methodology process. Because if science as we know today really does rely on peer review, that is really not what makes the scientist ?...?. ?...? scientist is for others to review his or her work. But if you're thinking that it's not the role of a peer reviewer to criticise the conclusions that have been drawn, then perhaps you're suggesting that that kind of research into qualitative influences, it should be done on another level, in a more fundamental ?kind of way?

Vin: No. I think it has to be done and actually I think the peer review system the way it goes is probably, although it's not a super good system it's probably the best, we've got. It has to be done - the scientist who writes the paper comes to these conclusions and the reviewer can make judgments on them, and it's just a balance. If the reviewer really thinks the scientist has made a totally lunatic ... no that's wrong, because in some of these old cases the reviewer really did think that the scientist had made a totally lunatic conclusion and after a long time, I mean a very long time in many cases, they were turned out to be right. I don't know what the answer is to that. Unless I really thought I understood it very well and I was very sure, I wouldn't say something shouldn't be published because I didn't understand how he'd sort of got there in doing it...into the conclusion.

Elli: So to summarise, would it be fair to say that you are saying that the peer review system is not perfect, but it's the best system that we've got or it's the only system that we've got.

Vin: Well, it is about the only system we've got. Yes, I mean you can't think of anything else. There needs to be some sort of reviewing system, well except of course of the world wide web where you can put up anything you like.

## 12. Nicol, David

Steve: Again, it's one of these things that if you look at individual cases you can obviously pick out flaws. If you give me something to review, I can decide if I want to can it or whether I want 'it' to go ahead based on any number of criteria I want to. You can make a '...' judgment, 'God I don't like this person and I'm going to destroy this particular paper', and you can do that. Or of the same paper you can say, 'I like this person, I like this area of work, I think this is a neat approach, I'm going to give it glowing remarks and it will go ahead'. There's very few papers that you have make that sort of split decision about so you can actually - generally you have to make a decision about which you're going to go. How you do that is based on a huge number of factors, so that's for an individual case. If you give me a single paper and I will make a decision at some point after having read that paper, 'well this flies, it doesn't fly or it's going to require a bit of work before it flies'. So those are the sorts of decisions you make when you review a paper - that's for an individual reviewer. The value of it is that there will be somebody else looking at it and they have to make exactly the same sorts of decisions and usually there will be say three people doing that and they will all think differently. They will all have different prejudices, different experiences of the authors and so on. It's 'all' a statistical process so that you will get to the right answer by involving a number of people. So for an individual case, if you have say three referees, you'll probably get the right answer out of it - this is a useless piece of work, or it's a very good bit of work. Then if you put the whole process into the wider context of peer review more generally, again you'll find that overall the peer review process will come up most often with the right answer in that this particular piece of work should be published and this one shouldn't. You could always pick holes on it in a case by case basis, but if you actually got all the papers that had been reviewed in 2004 and you had some sort of quantitative measure of whether it should have been published or not, you would probably find that the majority of papers that had been submitted that should have been published were published, and the majority of papers that shouldn't have been published weren't published. It works in the bulk.

Elli: It's not ?...?

Steve: Of course it's not ?...? because it relies on people to do it. It is something that – again it comes down to this sort of balance thing. It's not an exact science. You're relying on people to make value judgments on particular pieces of work and sometimes they get it right, sometimes they get it wrong, but by using a variety of people you're more likely to get the right answer than you are to get the wrong answer.

Elli: So as far as rigour goes, would you say that it works to more or less ensure rigour.

Steve: Yes, and the other thing you have to ask is what's the alternative. Nobody seems to have ever come up with a better alternative. Yes, it does ensure rigour far more than the alternative, which there isn't any ?...?. You publish anything and that does not ensure rigour at all.

### 13. Ramm, David

Okay Question No 7: Do you have any thoughts on the process of peer review as a means by which to ensure rigour in Antarctic scientific research?

David: Yes I think it's essential to have peer review. Whether it be through publications and journals or contracting others to review work. I think it's an important process.

Elli: Do you think that it does ensure rigour in the science?

David: I don't know about *ensure*, but it certainly enforces rigour. The reason for hesitating about 'ensure' is that some of the science is fairly basic because of the lack of information.

Elli: Very basic, did you say?

David: Yes. I guess 'ensure' rigour – I think it's an important process and definitely improves the research that's being done.

### 14. Reid, James

James: I think it's necessary. I think one issue with Antarctic work is it's probably quite common to get ?...? ?...? ... people who might not be exactly in the same technical specialty. Everyone's got their own ?...? – say, glaciologists ?...? All of those people have got different strengths and sometimes there is a bit of trade-off with that ?...? a more general audience and to your specific research area. Just because, if you ?print? something, and the reviewer misunderstands it, say, or isn't exactly in that field, it might not be the greatest review I suppose. That can really seriously effect the publication schedule for a start and it can knock things completely on the head. You have to be a bit careful where you're submitting articles to. That ?is? written for the audience ?...? ...?...? general problems with peer review. You can get three people with three reviewers. One will love it, one will think it's OK and one will say this shouldn't even be published and that's ?...? idea, everyone having a different philosophy about stuff and I think editors in general are pretty lazy when it comes to that. You get letters to say you should address the comments of your reviewers ?...? ?I just like to say? well I like reviewer one. He said he loved it ?...? guidance as to how you should deal with that situation.

Elli: This is ?...? ... idea of peer review (*indecipherable*)

James: I also think that a lot of reviewers don't really live up to the obligations of peer review ?...? ... they have really valid comments and they justify the comments and

you get other reviews where they'll rubbish something and not provide any evidence, or just say everyone knows this and from that point of view I suppose ?...? anonymous peer review it's very ... If you get something like that ?...? It basically means another year till it gets published. You have to do something ?...? ?...? I think a lot of reviewers (*indecipherable*) ... some really great reviews in the past ?...? proper job and others ?...? ... two sentences I still don't think it's a great review.

Elli: ?...? ... do you think, as the system is now, (*indecipherable*)

James: I think it does. Often reviewers will bring your attention to things ?...? ... broader or different technical background and they say this is exactly what we see in some other field, which makes it all the more relevant, and sometimes they can suggest better ways of doing things. I think it can be a really great way of improving the quality of research.

Elli: It can be, but is it necessary?

James: I don't think it necessarily is. I think everyone's had negative experiences with peer review.

#### 15. Riddle, Martin

Martin: I can't see any alternatives to it. I see it as an essential – absolutely essential component of science. Without it, what would you have? You would have the majority of people putting out work that wasn't quite as good as it could be but still pretty reasonable. For those majority you wouldn't get the improvements, the slight incremental improvements, that peer review brings. Then there would be a minority of people putting out stuff that has no basis in anything because there was no constraints on what they were putting out. It seems to me such an essential part of structure that we work within that I can't actually see beyond it. I can't see any alternatives. No, that might just be blindness because I'm too close to it.

Elli: So you think it actually does ensure rigor?

Martin: It increases rigor. I mean it's only as good as the reviewers that are nominated to each paper ... for our? protection or whatever. The only way you would improve it would be by having more reviewers for each application or for each paper so you have more opinions, which is still peer review. How else can you do it? I mean there has to be some test before something gets out there and has the authority of publication. There has to be some test to determine whether what is being said has any foundation to it. Whether the methods were reliable, whether the interpretation of the results are credible.

Elli: Peer review is the only or the best.

Martin: As I say, maybe because I'm so close to the system I can't think of another. What is an alternative of peer review – send it to people who don't know anything about the field? Peer review – there are two components to it. One is the 'peers'; that basically means people who actually know something about what you're professing to write about. 'Review' means look at it. If you didn't send it to peers but you sent it to a random selection of people, that would be interesting.

Elli: Yes, in ?real? society.

Martin: Yes, but if you sent it to peers but asked them to do something else apart from review it - I can't think of what else you're going to do [laughter]. I can't see any alternatives to be honest.

16. Rintoul, Steve

Steve: I'm strongly in favour of it. I think it's probably got some imperfections but I don't know what the alternative is in the sense that I think most scientists when they get something to review take that responsibility extremely seriously. I suppose I don't know for sure because we don't talk about how we review other people's papers because it is supposed to be a confidential thing. Most of us feel that to some extent your credibility is on the line every time you review a paper or a proposal so that you spend a fair amount of time and effort making sure that you're both fair but critical because if we're not critical to each other's work, then the progress of the science is slowed.

Elli: Alright, so do you think that it actually does ensure rigour as such?

Steve: I'm strongly not of the view that there's any sort of conspiracy or that personalities come into it very often. I know that it does happen sometimes and I think it ensures rigour to the extent that other scientists are in a position to be able to judge the merit of the science by what's in the proposal or the paper. It's not failsafe so it's possible to write a paper in which you confiscate something or you make up data or something like that and there's no guarantee that peer review will catch that. It does have the possibility that it could be abused by personal vendettas or whatever but that's why people go to multiple reviewers. In the US system where there are many more people and it's even more competitive I think national science ...? and proposals go to fifteen reviewers and they're trying to look for a common ground between those fifteen. I think that largely it works and the papers that I write and that I read – I know that the papers that I write have largely been improved by the peer review process.

17. Robertson, Graham

Graham: I haven't thought about it too much but I'm not sure how else you could do it. Peer review's good. I don't have any problem with that at all. It's like science ...? what else would you have. Are you leading to something else I'm missing?

Elli: Well, I'm mainly curious just to find out how scientists look on the process because throughout our lives, from when we start school and then we go to university we always have a supervisor and then finally we come to ...? somewhere around there and then all of a sudden we don't have anyone to oversee our work any more. Really the scientific community runs on peers at that level so we're assuming that once a person reaches that level, then that is the best level of knowledge that anyone can get as far as how we investigate the environment and the decisions that we make according to the environment. It's just interesting because we kind of stop at that level.

Graham: So why have anyone review your work?

Elli: Well, I'll tell you one little thought that I've had that came up with this question was, there's a quote that goes 'the blind leading the blind'. Now I'm not assuming that that is what's happening with the scientific community but it was brought up and it's an interesting query because the scientific community rely on each other, which are basically peers at the same level of knowledge.

Graham: That could be like ...? Well, that's possible. I don't know what you'd replace it with, and you're right. Having peer review can create more

objectivity I guess and scrutinise methodologies and interpretations and it's like getting other people's opinion and it's often a lot better, in terms of being a closed loop sort of thing. I often think of that too how if you put some of the papers that you publish in this discipline, into another discipline completely how they would stand up because some disciplines in biology or ecology, there're almost intractable. It's really hard to get decent information. Even down south people often and I think well you've really got to understand the scientific method. It's best not to go down to Antarctica and do them, it's best to go onto a rock platform and work on limpets, or in an agricultural system where everything's retractable. You can manipulate things and handle things and use proper experimental designs and use the scientific method properly. That's what ?...? in my area at least is use the scientific method - understand what it means - so you end up be ruthlessly objective in the way you interpret data and you're transparent in what's wrong with it and all of that. If you put the information out to some other group of people entirely they might have a totally different view of it. I guess people who read your papers, they're also doing similar things and they're aware of the constraints of you adding new methods or the animal you couldn't catch or something and they can have a different way of evaluating it. If you took it to some clinical scientist who works in a lab and ?...everything? they might say, well I think your data hasn't really supported your interpretation. Whereas someone in this field might think, Oh (s---) it's virtually impossible what he's done and he's done it in ...I often think ?...? management ?...? I alluded to if the fishing industry ?...? if they're getting their commercial industry ?...? - their capacity to make a living - if they could employ consultants who are trained in science but also think like lawyers, then they could take us apart on some issues. ?...? what you're alluding to, they could take us apart, if they make literal interpretations because we often gloss over those things sometimes. So I think I agree what you're alluding to.

#### 18. Southwell, Colin

Elli: No, that's fine. Okay. Question No 7: Do you have any thoughts on the process of peer review as a means by which to ensure rigour in Antarctic scientific research?

Collin: This one struck me as an odd question. It seems very different from the others.

Elli: It is. I put it in there, I'd already written out the other questions and then I realised that I'd left ?...? I'm actually doing separate ?chapters? within my thesis specifically looking at the process of peer review, so I put that question in last because I was curious to see how scientists themselves have any ideas on peer review.

Collin: Well, it will be interesting to see what other scientists think. I would have thought - all scientists would think that it's essential, I would have thought. I don't know. I see it as a replacement for what we should be doing to ourselves. We should be reviewing ourselves all the time but in reality we can't do it objectively because we are doing our own work, we can't see beyond our own work. I think to keep us as honest to ourselves as possible that peer review is really critical. It doesn't necessarily mean that peer review is successful because you have maybe three reviewers, sometimes two, and you can have three reviewers and get three different answers, for reviews you can get three similar reviews but that doesn't necessarily mean that those three people are right. You could have got the fourth one, it could've been very different. I think it is really essential as a check.

Elli: So do you think that it actually does ensure rigour in science?

Collin: No it doesn't ensure it a hundred per cent, it helps. Just going back to one of your earlier questions about a scientist bringing their own consciousness into their work, then a reviewer will bring their own consciousness into their review, and you have three different people, they could have three different philosophical backgrounds to how science is undertaken, or three different types of training, set of experiences. Even with the same training you can probably have two people with the same training that have a different set of experiences thereafter and they will form different views on how things could be done. It's not perfect in any sense. There's no way you could come up with any perfect system. There's no doubt from my experience that well I'll get back reviews and probably secretly curse them because it involves work and you've got to go back and re-think things and nobody, once you've reached a point of view and written it up, I don't think anyone would honestly say they'd look forward to reviewing it or writing it again. In my experience I've been pulled up for things that in retrospect I think, 'yes okay it could have been done better, I didn't see that point of view, this was written poorly'. All those kinds of things that can come up in a review. Not necessarily everything. As a scientist you should have the right, and you do, to defend a position and an editor may have to take some kind of adjudicating role if there's a difference of opinion that can't be resolved. I think the philosophy of peer review is really important and peer review doesn't stop just at submission and acceptance of a paper. Again, the paper I was reading last night about 'spirits' results was a reply to another paper, so that's effectively a peer review after publication. I guess when we write a paper and we set it in a context and we're doing a literature review and you look at all the previous work that's been done, in some ways you're peer reviewing that work after that work has been published in trying to see if there are any deficiencies in the work or not, or misinterpretations or whatever.

Elli: ...? to think that in what they call ...? sciences, peer review for general articles it's sometimes anonymous and sometimes not.

Collin: Yes, well in my experience there's generally no place for you to say who you are as a reviewer.

Elli: As a reviewer.

Collin: Yes, you can do but you don't have to sign your name. There's no place for you to say 'Oh, gee I have to tell them who I am here'. There's no requirement placed on the reviewer to say who they are, generally.

Elli: What about the author, is that always kept anonymous or is that ...

Collin: No, the author's always there.

Elli: So ...?

Collin: ...? the reviewer. You always know who the author is but the author usually not, probably, know who the reviewers are.

Elli: Okay, that's different from the social science

Collin: Is it?

Elli: Yes. ...? published but I think most social science journals don't know who the person is who has written the article and that is, from my understanding, to ensure that the reviewers down to ...? ...?

Collin: That's a good idea I think.

Elli: Yes. If they get one paper and it's by a Professor 'so and so' and they get another one that's from an undergraduate student for example, they might favour the other ...?

Collin: Yes, absolutely.

Elli: Even though the content ...?

Collin: I'd never thought of that because I've only worked in hard sciences and that's the way it works. I've never thought about it.

Elli: Yes, I'm not sure about that but I know that it is at least to some extent that way ?within social? sciences.

Collin: Because when you review an article, often you'll know that person because they're working in your field and you've met them at a conference or whatever. Often you could have some kind of professional or personal relationship, whatever it is, and you may or may not want to influence that in one way or another, subconsciously, or maybe consciously. If you know the authors then you have that opportunity to go beyond your job as a reviewer whether you mean to or not.

Elli: Yes.

Collin: So I don't know. For some reason I've never thought of it operating that way but it does make sense.

Elli: Well, like I said, it's definitely that way at least to some extent within social sciences, I don't know to what extent.

Collin: Okay.

Elli: Okay, anything more on that topic before we move on?

Collin: Not that I can think of off hand, no.

#### 19. Trull, Tom

Tom: I'm positive about peer review. I think its good that it remains anonymous. I think it would be even better if the work that was submitted could be anonymous, so you didn't even know who was writing the paper. I think science is one of the best regulated endeavours on the planet and it kind of makes me laugh when somebody ?...? will say we want you to use a business model for corporate governments, and I'm thinking well to be honest science ?...? are very detailed and no other field that I know of do you have so much oversight of what you do. Is it ?stifling? to innovation and things like that? It certainly doesn't allow you to leap and do something that you're not well trained to do probably, although I think in Australia there's a greater trust in scientists ?...? ... try new things and then the crunch comes for the scientists themselves ?...? can get their work published. There's two stages in peer review - there's proposals and there's papers. I find the proposal process, which is completely ?...? dominates North American science funding, it means it's very hard ?...? ?...? done before. In Australia it's less so - it's becoming more so but to some degree, you know I came to this position and I'd never done any marine science before and they gave me a job. Probably it was a bit of a risk but it seems to have worked out OK. To me, to make my answer shorter, peer review - I think it's a good thing.

Elli: I heard a quote the other day - you can tell me what you think.

Tom: Okay.

Elli: There's a quote that goes 'the blind leading the blind'. I was wondering about this in terms of peer review because in one sense if the highest quality that you can get on something if somebody's ?...? peer then what is to say that that level is ...well, I mean when we go through the schooling system you have a supervisor, somebody in an authoritative position to supervise you until you reach the level where you are now at a doctorate level, so do you feel - I suppose in relation to that ...

Elli: ... when one obtains the highest academic level that is available through our schooling system or our tertiary system, that that is an adequate level, because that is really the level that peer review exists on.

Tom: Well, if anything I'd just argue that we ought to get to peer review sooner and the passages of people through the system, I think the goal of education is to get to the point where you can think for yourself. In alternative views there are chief scientists, national chief scientists, and I guess I feel that the real purpose of peer review is to make sure that the work done is not flawed in some way that makes that bit of work not useful as a building block, to build a ... of science. That is probably best done by people who are peers rather than superiors because they're close to it. It's really hard to have someone who ... is this brick well formed. Probably where the peer review process is weakest is what do we ...? It's very good ... brick well formed but now what should we do with them. If you leave that to peer review ... [laughter]. And that actually is where the input from outside science is absolutely essential and it's where scientists have ... of course nobody likes to be told what to do, so they resist that, but it is sort of a social process where people are saying, what have you've done with my tax money.

Elli: That's really the role that the government, I know has taken upon itself, and governments are supposed to be representative of the people. It doesn't always work in that way but that's how it is ...?

Tom: Yes, that's how it works and I don't think we're likely to get away from a system like that. There seems to be a lot greater role of chance or ...? People seem to rise in politics not necessarily because they're wise. It's hard to rise in science without being a good scientist. You need to be more than a good scientist to rise very far but at least you have to be a good scientist, but the politicians whose basic job is to obtain consensus and act on it, 'It seems' like you to get in there without necessarily being particularly wise about that and that's probably the process of how you get there. So peer review in politics seem to need more improvement than peer review in science at the building block stage so we would only get truly great leaders at the top. I really think it's rare for me to have encountered a highly placed scientist who wasn't actually a really good scientist. I just haven't. I met chief scientists of different nations ... sometimes they're not the *very* best but they're usually pretty damn good. So I think peer review works both in terms of selecting building blocks that are solid enough that we should retain them in the structure and identify people who are skilled in science. So pretty much I'm positive about it. I have had stuff rejected too! [laughter] That's important, right. If you've never had anything rejected you think 'Oh the system works well' – but I have had stuff or I've got stuff that I couldn't get published and I actually think it's some of the best science I've done and never got it published.

Elli: Maybe the time wasn't right.

Tom: Yes, maybe the time wasn't right or maybe it wasn't as good as you think it was or maybe ...? proved correct in a long time, but I'm still pretty positive about peer review.

## 20. Woehler, Eric

Eric: I mentioned already before in the interview about the role of peer review in terms of ...

Eric: ... the work is deemed to be legitimate. If I was going to be a little bit more cynical I'd say that it's not a hundred per cent foolproof system obviously and I think anyone who pretends that it is, is denying reality to some extent. In the most extreme example somebody could potentially nominate five of their best friends to be referees

for a research proposal or for writing a paper or something. They know full well that they're going to get sympathetic reviews from their mates when the thing goes out for review, be it a research proposal or a paper that's been submitted to a journal. I think the reality is, in most cases, the peer review process is working reasonably well.

When there are the odd well advertised instances of scientific fraud or plagiarism or whatever, that they are relatively high profile and that they are sufficient, I would like to think, to discourage most other people from trying similar things, be it forgery or plagiarism or whatever, or fraud. I don't think it's a hundred per cent absolute but the fact that when there is instances of somebody claiming somebody else has perjured them or plagiarised them or stolen data, the system is pretty quick in responding.

Simply because I think at the moment it is something that people are sensitive to and I think it's something that institutions have to be seen to be free of any question about the work. It doesn't have to be necessarily scientific research it can be humanities or whatever else ?...? whole question of research. I think in the absence of anything else I think it's probably the best system that we've got available to us to ensure some degree of checking.

Elli: Rigour?

Eric: It's not just rigour but it's also just – it's possible. Let's say the scenario ?that's? not far removed from reality. The discovery of the ozone hole only came about because somebody didn't believe the satellite information. The satellite data that showed the ozone hole but it then dismissed as a sense of error as opposed to being a real gap in the ozone layer. Conversely if somebody tried to publish something that was too far from the accepted mainstream I suppose there is potential that it won't get through the scientific peer review process. ?...? absolute but as I said it's the best process that we have available to us at the moment.

Elli: So would you say that it prevents really radical ideas or it filters them but it also allows a little bit of diversion from the mainstream for the purpose of ?...? so that science can grow and develop ...

Eric: Sure, peer review has two purposes. One is that it has to be sufficiently new to be worthwhile publishing. There's no point in publishing something that's already out there all over the place, except in some cases when we had things like review or synthesis articles where you just need to actually review/summarise a wide body of data into a single focal paper. Yes, it also has the role of making sure that when Joe Blow puts out a paper it ?...? ?...? that there is some way of checking that there is an element of truth in what's been written. There's plenty of examples where people have forwarded scientific hypotheses and theories that were shot down at the time but later proved to be correct. Is that an example of the peer review process being too rigorous? I don't know. The boundaries are fuzzy and you can't set hard and fast rules about what constitutes the peer review process and what is deemed to be acceptable or not. That's where the editor of whoever – let's say we're talking about a scientific paper, that's where the editor relies on the advice from two, three, four or five reviewers who say, 'is Joe Blow using illegal substances or is it something that we should publish'.

## 21. Wright, Simon

Simon: Oh, I think it's essential. Not only in Antarctic research, in all research ?...? Peer review, transparency. It's very easy to make mistakes or hang onto an idea that

other people may disagree with or be able to put a different perspective on it. It's an essential part of the whole process.

Elli: Okay. So do you think it actually does ensure rigour or ...

Simon: I think it improves the quality. It certainly doesn't stop the bad stuff getting through and – I mean everyone knows about cronyism – people preferring colleague's work and I'm sure there's a lot of discrimination against third world researchers

Elli: So it's not perfect.

Simon: No, by no means but it's a good system in principle.

## APPENDIX T: Bhaktivedanta's Lectures and Letters Cited in the Thesis Text

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ITEM T1: Bhaktivedanta Swami Prabhupada, Abhay C. 1966. "Bhagavad-gita Lectures 4:19, New York, August 5, 1966." In <i>The Bhaktivedanta VedaBase</i> . Database, version 4.11 (1998). Los Angeles: Bhaktivedanta Book Trust .....	2
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Prabhupāda: So this is the process of ceto-darpaëa-mārjanam [Cc. Antya 20.12], to cleanse the material dust from the mirror of our mind. The whole process is to dust out the dirty things which we have accumulated by our material association and therefore to revive our spiritual consciousness, or Kṛṣṇa consciousness. From Bhagavad-gētā we are studying about the process of life by which we can revive our Kṛṣṇa consciousness. There is no need of external help for reviving Kṛṣṇa consciousness. You have got Kṛṣṇa consciousness dormant in yourself. It is the quality of the self. So the, we have simply to invoke by this process.

Kṛṣṇa-bhakti nitya-siddha sādhyā kabhu naya. This Kṛṣṇa consciousness is an eternal fact. It is nothing that by this organization we are imposing upon you something extra. No. It is within you. It is within every living entity. Any living entity—never mind whether he is human being or animal... When Lord Caitanya was singing this Hare Kṛṣṇa Hare Kṛṣṇa Kṛṣṇa Hare Hare, He was passing through jungles, forests, and the tigers, the elephants, the stags, and all, I mean to, forest animals, they joined. They joined. It is such a thing. Of course, it depends on the pure-hearted chanting. As we become... This is the process. As we become advanced in this chanting method, similarly, our heart becomes freed from all the dirty things of material contact. So even the animals can be captivated by this chanting, what to speak of human beings. So in our practical life Kṛṣṇa advises how to invoke this Kṛṣṇa consciousness. He says,

yasya sarve samārambhāu  
kāma-saikalpa-varjitāu  
jñānāgni-dagdha-karmāḇā  
tam āhuḇ paḇḇitāḇ budhāu

(loud conversation going on in background) Ask them to stop. Why do they come and talk nonsense?

Yasya sarve samārambhāu. You are not forbidden to execute your duties. We are not after stopping the general process of material activities. That is not our mission. The whole thing is that we have to act everything in Kṛṣṇa consciousness, Kṛṣṇa consciousness. Just like... It is very easy to understand. Everybody has got some vocation of his life. But what is their consciousness? Their consciousness is that “I am engaged in this business, I am engaged in this service, because I have to maintain my family,” “I have to maintain myself,” or “I have to satisfy the government,” or “I have to satisfy somebody else.” This is our consciousness. Nobody is free from such consciousness.

Everybody must have some consciousness. Without consciousness, nothing can be done. One who has no consciousness, he cannot do anything nicely. If his consciousness is disturbed, then his work cannot be... Just like a madman. A madman cannot do anything nicely because his consciousness is disturbed. So we, similarly, if we change the process only, that “I am, to satisfy Kṛṣṇa...” Just like we are doing everything, with that idea, to satisfy somebody else, or at least myself, for my

satisfaction. This process has to be changed to Kṛṣṇa consciousness. That should be done. This process has to be changed into Kṛṣṇa consciousness. Therefore Lord Kṛṣṇa says, *yasya sarve samārambhāu*.

(aside:) Those who want to come, we can invite them. Come inside.

*Yasya sarve samārambhāu*: “Whatever activities you may do, do it,” but *kāma-saikalpa-varjitāu*, *kāma-saikalpa-varjitāu*: “don’t be carried away by *kāma*.” *Kāma* means for your own satisfaction, *kāma*. The word, Sanskrit word *kāma*, is used for lust, for desire, for sense satisfaction. So Lord Kṛṣṇa recommends that, “Don’t do it for satisfaction of your senses, for satisfaction of your lust, or for satisfaction of your desires.” That is the whole thing. Whole teaching of Bhagavad-gītā is based on this principle.

The whole instruction to Arjuna is that Arjuna wanted to satisfy his senses, his senses. He wanted that, that by not fighting with the opposite party, who were composed of his relatives, brothers and brother-in-laws and father-in-laws and so many relatives. So he did not want to fight. And therefore this instruction of Bhagavad-gītā was needed by Kṛṣṇa. The whole basic principle is this. Now, that was Kṛṣṇa’s, Arjuna’s own satisfaction of the senses. Arjuna did not want to fight. Materially, it appears very nice that he is giving up his claim of kingdom for satisfying his relatives. Oh, he’s very good man. But Kṛṣṇa did not approve it. Why? Because the basic principle was Arjuna decided to satisfy his own senses. Externally it appeared very nice. But anything which is done for the satisfaction of his own senses, that is *kāma*, *kāma*, lust, desire.

Here it is prescribed that you can do anything. There is no harm. Whatever your business, or vocation, occupation, you are engaged, that has not to be changed. That has not to be changed. Simply your consciousness has to be changed. That’s all. *Kāma-saikalpa-varjitāu*. How? How that consciousness can be changed? Now, *jñānāgni-dagdha-karmāḥam*. That consciousness, transferring the present self-interested consciousness to Kṛṣṇa consciousness, requires knowledge. Requires knowledge. And what is that knowledge? That knowledge is that, “I am part and parcel of Kṛṣṇa. I’m not different from Kṛṣṇa. I am part and parcel. I am the superior energy of Kṛṣṇa.” That is knowledge.

Knowledge means to understand something. How this tape recorder is manufactured, if we get some knowledge, technical knowledge, that is not knowledge. That is a, of course, to have some, our occupation executed. That knowledge is temporary knowledge. But real knowledge is... This is real knowledge. The real knowledge is that when one understands convincingly that “I am part and parcel of Kṛṣṇa.” Kṛṣṇa, or God. When we say Kṛṣṇa, you should understand the Supreme Lord, the Absolute Truth. Kṛṣṇa is the technical word which is meant for indicating the Absolute Truth, the Supreme Personality of Godhead, the whole, the whole pleasure, the whole attraction. These are the meaning of Kṛṣṇa.

So we are all part and parcel of the supreme pleasure, and our pleasure... Just like my hand. This is my hand. Now, this my hand can take pleasure when it is attached with my body. My hand can take pleasure when it serves my body. It does not take pleasure by serving your body.

(aside:) This is a formality.[?] Sit here.

So therefore, because I am part and parcel of Krsna, my pleasure, my happiness, is dependent by serving Krsna just like my senses are satisfied when they are used for my purpose, not for your purpose. This is the whole, I mean to say, philosophy. I cannot be satisfied by serving you. I can be satisfied by serving me. So that me, I do not know. That is Krsna. That is Krsna. So when we begin to serve Krsna, because we are part and parcel... Always remember, the part and parcel, we are. Mamaivāṅgo jéva-loke jéva-bhūtaṁ sanātanaṁ [Bg. 15.7]. In the Fifteenth Chapter you'll find, "All these living entities, they are My eternal part and parcels. Now they are detached. Now they are detached. By material contact, they are detached." So we have to... The whole process is that we have to attach again. Now we are detached. Now we have to attach again. That is Krsna consciousness.

That Krsna consciousness is within you because you are originally, eternally the part and parcel of the Supreme. Artificially, I am trying to forget it. I am trying to live independently. That is not possible. We are not independent. If we want to live independently, that means we voluntarily become dependent on the influence of material nature. That's all. Actually, we are not independent. If I think I am independent of Krsna, then I am dependent on the influence of material nature. Just like, if I think that I am independent of government regulations, then I become dependent of the police force. My dependence is neither in this way or that way. So that is our mistaken. Everyone is trying to be, become independent. That is called māyā. That is called māyā, or illusion. Nobody can be independent. Individually, community-wise, society-wise, or nation-wise, you can extend even universal-wise—nobody can be independent. We are dependent. And this is called knowledge. When you come to the sense, that "I am dependent; I am not independent," this is called knowledge.

Now we are misguided. Jīānāgni-dagdha karmāḥam. In other place, you'll find, Krsna says,

bhoktāraṁ yajña-tapasā  
sarva-loka-maheṣvaram  
suhṛdaṁ sarva-bhūtānāṁ  
jīatvā māṁ cāntim ācchati  
[Bg. 5.29]

Now, people are planning for peace in the world, but they do not know how to formulate that peace formula. You know. The United Nations are trying for the last twenty years or more than that for peace, but there is no peace actually in the world. The war is going on because they do not know.

The formula is in the Bhagavad-gētā. The Bhagavad-gētā says that bhoktāraṁ yajña-tapasāṁ sarva-loka-maheṣvaram [Bg. 5.29]. "I am the proprietor of everything. Whatever you are doing, I am the ultimate beneficiary. I have to take the result." Just like a laborer works in a factory, but who is the proprietor? The ultimate proprietor is the, the proprietor is the ultimate owner of the... So everything, whatever we do... Jīānāgni-dagdha-karmāḥam. Now, we are thinking that "This thing I am doing, I am the proprietor of this thing." That is a misconception. When we understand that

everything, whatever we are doing, the ultimate proprietor is Kṛṣṇa, that is Kṛṣṇa consciousness. That is jñānāgni-dagdha-karmāḥam.

So we can have simply... Just like in office. In office so many people are working. Hundreds of people are working. Everyone is conscious that “Whatever we are acting, whatever profit we are making, that belongs to the proprietor.” Then there is peace. As soon as the cashier thinks, “Oh, I have got so much money. I am the proprietor,” then whole trouble begins. This consciousness, Kṛṣṇa consciousness... If we understand that “I am a very rich man. I have got so much bank balance. I can use it for my sense gratification,” that is kāma. That is kāma-rāga. But if we understand that “Whatever I have got, it belongs to Kṛṣṇa,” then I am liberated person. I am liberated person. This is Kṛṣṇa... You, you’ll have the same money under your custody. It doesn’t matter. But as soon as you think that “I am the proprietor of this wealth,” then you are under the influence of māyā. And as soon as you think that “Kṛṣṇa is the proprietor of all these things,” then you are free.

So kāma-saikalpa-varjitāḥ, jñānāgni-dagdha-karmāḥaḥ tam āhuḥ paṇḍitāḥ budhāḥ: “One who thinks like that, one who is situated in that consciousness,” paṇḍitāḥ budhāḥ, “he is learned, and he is actually a man of knowledge.” This is the whole process. Tam āhuḥ. Tam, he is known as the paṇḍita. Paṇḍita means one who knows things as it is, not to take a thing wrongly. So that consciousness has to be invoked, not only individually, but also community-wise, society-wise, nation-wise, all over the world. Then there will be peace. If you want real peace.

bhoktāraḥ yajña-tapasāḥ  
sarva-loka-maheṣvaram  
suhṛdaḥ sarva-bhūtānāḥ  
jñātvā māḥ çāntim ācchati  
[Bg. 5.29]

We are just trying to be philanthropic, altruistic. And we are trying to become friend of my countrymen, of my society, of my family, but that is a wrong conception. Real friend is Kṛṣṇa. I can work on His behalf. How I can work? You try. If you actually want to do something good to your family, then you try to make all the members of your family Kṛṣṇa conscious. Then your life will be successful. If you want to make them otherwise, without Kṛṣṇa consciousness, then you will be serving, not serving, you will be rendering them disservice. Because any knowledge will not help your wife or children. Any knowledge, any amount of knowledge, will not help his real problem. What is his real problem we do not know. The real problem is... That we do not know. The real problem is janma-mātyu-jarā-vyādhi.

The Bhāgavata says, pitā na sa syāj jananī na sū syāt: “One should not try to become father. One should not try to become mother.” Why? Na mocayed yaḥ samupeta-mātyum: “One who is unable to save his children from the grip of material nature.” That should be Kṛṣṇa consciousness. If you are a responsible father, then, if you are completely in knowledge of Kṛṣṇa consciousness, then your duty will be that “These creatures, these innocent creatures now, who are playing in my, at my home as my children, as my boys, now this life should be the last installment of his transmigration from one body to another. I shall train these boys in such a way that after this body he

will have no more to go into the cycle of birth and death.” That is Kṛṣṇa consciousness.

That means you have to make yourself expert. Then you can help your children also. Then you can help your nation also. Then you can help your society also. If you are yourself ignorant, then andhā yathāndhair upanēyamānās te ’pēṣa-tantryām uru-dāmni baddhāu.

Just like a person who is, I mean, tightly bound-up, hands and feet. Suppose we are sitting here, some people, twenty-five gentlemen, ladies, and all our hands are tightly bound-up by some rope, and if I want to make you free, although my hand is also tightly bound-up, is it possible? No. At least my hand should be free. Then I can open, I can untie, your bindings by the rope. So unless one is free man... And what is that freedom? One who is Kṛṣṇa conscious, he is free man. And nobody is free man.

daivé hy eñā guëa-mayé  
mama mâyā duratyayā  
mām eva ye prapadyante  
mâyām etāa taranti te  
[Bg. 7.14]

Everyone is under the spell of material influence. Nobody’s free. And one who is, who has surrendered unto Kṛṣṇa, one who has taken Kṛṣṇa consciousness, mâyā has nothing to do. Mâyā cannot touch. Just like when... If you come in front of the sunlight, there is no question of darkness. There is no question of darkness if you place yourself in light, sunlight, not this artificial light. This artificial light may be extinguished at any time, but sunlight is not like that. So Kṛṣṇa is just like sunlight. As soon as you come in front of sun, oh, there is no darkness. So there is no ignorance. So there is no mâyā. Mâyā means illusion.

So jñānāgni-dagdha-karmāëa tam āhuù paëðitaà budhāu. In this way, we have to become budha. Budha means learned, learned. And you’ll find in the Tenth Chapter of Bhagavad-gétā that the Lord says who is budha. And what are the symptoms of budha. Budha means learned. What are the symptoms? What are the symptoms of mahātmā, great soul? And what are the symptoms of budha? That is described in Bhagavad-gétā. It is said that

ahaà sarvasya prabhavo  
mattaù sarvaà pravartate  
iti matvā bhajante mää  
budhā bhäva-samanvitäu  
[Bg. 10.8]

Budha, this word, the very word, again is used, budha. So budha, one who is learned, one who is actually in sense, he’s not nonsense, he’s called budha.

So budha, what are the symptoms? The symptoms of budha is that ahaà sarvasya prabhavaù: he knows that Kṛṣṇa is the fountainhead of all emanations, everything, whatever we find, everything. Anything, whatever you see.

Now, take for example, take for example the material world. The most prominent thing is, I mean to say, unity between man and woman. Now, one can inquire, “Wherefrom this attraction comes between male and female?” Not only the human society, but also in animal society, in the bird society, in any society, every living being... This is a fact. So somebody criticizes, but those who do not know Kṛṣṇa, that Kṛṣṇa had so many girlfriends. So they are... Some people are criticize. But one does not know that where we get this idea of having girlfriends unless the tendency is in Kṛṣṇa? Because you can have nothing here unless that is in Kāñḍā. But here it is perverted. It is polluted. And Kṛṣṇa, it is pure consciousness, pure spiritual. That is the difference.

So one who does not know, they want to avoid something. Nothing is, I mean to, can be, can exist in this material world unless it is in Kṛṣṇa. Janmādy asya yataḥ [SB 1.1.1]. So these things have to be studied very scientifically and from books like Bhagavad-gītā, Śrīmad-Bhāgavatam, and when he is perfectly learned, then his symptom is that he becomes a, a pure devotee of Kṛṣṇa. Ahaḥ sarvasya prabhavo mattaḥ sarvaḥ pravartate [Bg. 10.8]: “I am the source, fountainhead,” Kṛṣṇa says. “I am the source and fountainhead like, of everything. One who understands this science, then he takes to Kṛṣṇa.” How? Now, budhā bhāva-samanvitāḥ, with full knowledge, and he becomes a devotee of Kṛṣṇa.

Similarly, so far mahātmā... Mahātmā is a Sanskrit word which is used for great soul. That is also described in the Bhagavad-gītā.

mahātmānas tu māṇasaḥ pāṇḍava  
daivēaḥ prakāśim ācīṣṭaḥ  
bhajanty ananya-manaso  
jñātvā bhūtādīm avyayam  
[Bg. 9.13]

Mahātmā. Who is a mahātmā? Who is a great soul? Great soul is he who is under the influence of the superior nature.

There are two kinds of nature: superior nature and inferior nature. Now we are under the influence of this inferior, material nature. And that, by Kṛṣṇa consciousness, we shall be transferred into the superior nature. Just try to understand: a person in the prison, a person outside the prison. The government’s influence is in both the places, outside the prison and inside the prison. But outside the prison, the government’s rules and regulation is superior. And inside, that is inferior. So influence is there. Similarly, either in the material world or in the spiritual world, wherever you, you are, your position is marginal. You can transfer yourself either in this, under the influence of this inferior nature, or you can transfer yourself under the influence of superior nature. Your position is marginal.

Now, you are given... Because Kṛṣṇa is full independent, and because you are also part and parcel of Kṛṣṇa, therefore you have got the quality of independence, to make your choice whether to be under the influence of this inferior nature or to become under the influence of superior nature. But because we do not know what is that superior nature, therefore we have no other alternative than to remain in this inferior nature. This is the whole position.

Because in the world there are many philosophies. They are informing that “There is no other nature. This nature, which we have experienced, it is troublesome. Make an end of it and become void.” Oh, you cannot be void because you are living entity and eternal. Na hanyate hanyamāne çarére [Bg. 2.20]. Your change of body does not mean that you are finished. No. You are continuing. Väsäsi jérëäni. Because I change my dress, that does not mean that I am finished. So I am eternal. If I have to finish the... If I have to get rid, out of the influence of material nature, then I have to seek: “Where is my place?” If we know or do not know, then we prefer: “All right, whatever it may be, inferior or superior, let us remain here and rot.” So Bhagavad-gétä gives you information of the superior nature: yad gatvä na nivartante tad dhäma paramaà mama [Bg. 15.6], na tad bhäsayate süryo na candro na pävakaù.

So we have to become Krsna conscious by scrutinizing, studying, this authoritative book, Çrémad Bhagavad-gétä, without having fashionable interpretation, as it is. What Krsna says, He says for all the time. It does not change.

Just like the verse which we are just now discussing, He says that “It does not matter in whatever occupation you are. Simply you have to change your consciousness. You are now guided by the consciousness of self-interest, of sense gratification.” Self-interest. Not exactly self-interest because we do not know what is our self-interest. Rather sense interest, not self-interest, but sense interest. Whatever we are doing, we are doing for satisfying the senses. This consciousness has to be changed. We have to satisfy Krsna. That consciousness has to be invoked and then our life will be successful. Thank you very much. If there is any question, you can put. Yes.

Mr. Goldsmith: It’s not dedicated to Krsna?

Prabhupäda: Yes.

Mr. Goldsmith: The work is not dedicated to Krsna.

Prabhupäda: Yes.

Mr. Goldsmith: How, specifically, how can you do this?

Prabhupäda: Yes. Now, this consciousness, “How can I do it?”, this is also Krsna consciousness, that one is ready. (laughs) Now, just like anything which we do or act, we take some consultation. Just like you are a lawyer, and anything has to be done lawfully, we have to take your consultation because you are expert. Similarly, you have to take consultation from the person who is Krsna conscious. It is simple thing.

Mr. Goldsmith: Well, first of all, if you want to find peace, don’t you have to believe that war is wrong, any kind of war?

Prabhupäda: Yes.

Mr. Goldsmith: The Bhagavad-gétä teaches that there is a good war and a bad war.

Prabhupäda: Yes.

Mr. Goldsmith: And a little bit like, later on, the Crusades.

Prabhupäda: Yes.

Mr. Goldsmith: It was a holy war, and it was looked on as a good war and existed for a good purpose.

Prabhupäda: Yes.

Mr. Goldsmith: Krsna believed that it was all right to kill the enemies of Arjuna because it was a righteous war.

Prabhupäda: Yes.

Mr. Goldsmith: Now, if you have a philosophy like that, can you find peace?

Prabhupäda: What do you mean by peace then?

Mr. Goldsmith: Absence of war.

Prabhupāda: Not necessarily. Not necessarily. Absence of war is not peace. Just think over. Suppose now there is no war. Do you think that everybody is in peace? Ask any individual person that “Are you in peace? Are you in peace of mind or peace of...” No war is not only the cause. There are many other causes which disturbs our peace. War is one of the causes. So simply if you stop war that does not mean peace is guaranteed. No. War is one of the disturbing things of peace. But there are many other disturbing things, many, incalculable, which will disturb you. You see? So we have to take relief from all disturbing position. War is one of the items. And that can be done when you are Kṛṣṇa conscious.

Mr. Goldsmith: Well, how can it be done if you’re Kṛṣṇa conscious and Kṛṣṇa Himself was a proponent of war?

Prabhupāda: You are speaking of war. The war has nothing to do...

Mr. Goldsmith: Well, the Bhagavad-gētā starts out with a war.

Prabhupāda: Yes, but... That’s all right, but that war was a necessary thing. You cannot, I mean to say, completely eradicate war from the social life. Just like government maintains the law and order force. There is necessity. Why the government maintains so much police force and military force? There is necessity.

Mr. Goldsmith: Well, if you believe, if you believe that it’s necessary...

Prabhupāda: When the... Yes.

Mr. Goldsmith: Then that’s the end of the discussion because if you believe it’s necessary, then Kṛṣṇa believes it’s necessary.

Prabhupāda: Yes, yes.

Mr. Goldsmith: Then...

Prabhupāda: Everything is necessary, but whole... Our position is that, so far our material existence is concerned, that there are so many things that... But one thing, or the four things, janma-mātyu-jarā-vyādhi, that we are under the entanglement of repeated birth, death, diseases and old age, these four things does not depend on war or peace. Suppose there is no war. Can you get free from diseases? Suppose there is no war. Can you get free from death? Suppose there is no war. Can you become, remain a young man all the time? No. Your problem is these four things. You have to solve that thing. Janma-mātyu-jarā-vyādhi-duḥkha-doṣānudarçanam. Bhagavad-gētā says that this war or no war, that is no question. So long the human society will be there, there will be sometimes fighting, sometimes peace, sometimes... That is another thing.

The whole problem is that a learned man sees that “My problem is that I don’t want to die. Why there is death? I don’t want to be old man. Why I, there is old age?” These are... These are the problems. Real problem, these are the problems. Janma-mātyu-jarā-vyādhi-duḥkha-doṣānudarçanam. A learned man, a man of real knowledge, he should see that “I am...” Not only war. Suppose there will be excessive heat. Oh, I am so much disturbed. There is no peace. Oh, there is excessive snowfall, cold. Oh, I am disturbed. So there are so many disturbances. So we have to get free from all disturbances. Because I do not want it, my nature does not tolerate these things, but I have been forced to tolerate.

That is your problem. That can be solved by Kṛṣṇa consciousness. We are talking the wholesale solution, not a particular thing. There are so many disturbing things, especially they are under the headings of these four principles: janma-mātyu-jarā-vyādhi-duḥkha-doṣānudarçanam. So... Mad-dhāma gatvā. Just the other day we

discussed the *çloka*, that *tyaktvä dehaà punar janma naiti mäm eti kaunteya*: [Bg. 4.9] “Now, one who becomes Kṛṣṇa consciousness, then the result will be that just after quitting this body, he comes to Me, no more coming to this material world.” So long you’ll be in the material world... Material world means so long we’ll have this material body, we’ll have to face so many disturbances. War is one of them. Suppose there is, perpetually, there is no war. Do you mean to say there will be perpetual peace? No. There are so many other things. At once, if there is some upheaval in the Atlantic Ocean, the whole thing is swallowed up, your beautiful New York City will be no more there. There are so many natural disturbances. What to speak of war, what you have...

Mr. Goldsmith: Bhagavad-gétä speaks of war. It started out with a war.

Prabhupäda: No, what... Bhagavad-gétä says... Bhagavad-gétä does not say that stop war. Bhagavad-gétä says stop your repeated birth and death. Bhagavad-gétä is not concerned with the war principle. The war will remain so long the human society is there. How can you stop it?

Mr. Goldsmith: Well, some people don’t believe that it’s necessary.

Prabhupäda: Some people, they foolishly believe. Because, so long the human society will continue, there is no history that there was no war in the history. So war there will be.

Mr. Goldsmith: Well there’s never been in history that everyone has accepted Kṛṣṇa either, and yet you...

Prabhupäda: No, you do not think that... Of course, when you are Kṛṣṇa conscious, when you are not in this material world, then there is no question of war also. My point is that war is not only the only disturbing principle. There are many other disturbing principles. So we have to make a wholesale solution of all principles. That is the point.

Kṛtänänanda: War is only a symptom.

Prabhupäda: Yes. War is also one of the... Just like a man diseased, he eats something, sometimes say, “Oh, doctor, I am feeling some headache.” “Oh, all right, take some, this pill.” Just like I see advertisement, “Oh, you are feeling strain? Take this pill.” “You are feeling this? Oh, take this pill.” Just like Post Office. Just like Post Office. All letters should be given to the post box, and it will go in different places. So doctor is prescribing like that. But a real doctor he’ll see what is the disease there. And if that disease is cured, then he’ll have no headache, no leg, pain leg, no, nothing of the sort. So if we... Kṛṣṇa says, *tyaktvä dehaà punar janma naiti mäm eti kaunteya*: [Bg. 4.9] “If you become Kāñëa conscious, the result will be that after finishing this term of your body...” We have got different terms of body. “So this term of body, you come unto Me.” *Yad gatvä na nivartante tad dhäma paramaà mama* [Bg. 15.6]. So our problem is that. We are not going to adjust here. Here any kind of, any amount of adjustment will not make us happy. That is a fact. Because this place is like that. So we have to completely get free from this repeated birth and death of the material world and go back to home, back to Godhead and live peacefully with eternal life, knowledge and bliss. That is the whole thing Bhagavad-gétä is teaching. Kṛṣṇa’s business is not to stop war or this or that. Any other question? (end)

ITEM T2: Bhaktivedanta, Abhay C. 1968a. "Letter to Aniruddha, Los Angeles, 14<sup>th</sup> November, 1968." In *The Bhaktivedanta VedaBase*. Database, version 4.11 (1998). Los Angeles: Bhaktivedanta Book Trust.

My Dear Aniruddha,

Please accept my blessings. I beg to acknowledge receipt of your letter dated Nov. 7, and I am very glad to know that you are working in San Francisco equally with the same enthusiasm as I saw you here when I was in Los Angeles last year. Perhaps you have heard it that for the time being we have no temple. The landlord in Hollywood Blvd. did not like our devotees to stay there, and he returned \$450 so that we would move our articles there from the storefront. So the Deities are here in my apartment, so I do not know how we shall find out a suitable place. And when there is a nice suitable place for our temple, then I shall consider whether you are to come back. For the mean time, you work in San Francisco, and try to organize sales of our Back To Godhead as many as possible. I have not heard anything from Cidananda since a long time, and I hope he along with the other devotees are all well. I understand that on the average you are collecting \$22 a day, so this is nice, just go on trying to increase. Whenever the Indian community invites you to go and take Prasadam, be always kind with them, and go there and chant Hare Krishna. They are vegetarian, so whatever Prasadam they prepare you offer to the Deity and enjoy it.

Regarding your questions: Your first question, "Are great sages put under yogamaya or maya? Also are all the eternally liberated souls under yogamaya?" Yogamaya means the mercy of the Supreme Lord which connects a devotee in the transcendental loving service of the Lord, and mahamaya means the external potency of the Lord which puts a conditioned soul into illusion that he will be happy by material adjustment. So great sages who are impersonalists are also under the spell of mahamaya, because a conditioned soul in the material world wants to improve his material position as exalted as possible, and the concept of becoming one with the Supreme Lord is the greatest illusion for them. Because it is a fact that nobody can be equal or greater than the Supreme Personality of Godhead, and as such, anyone desiring to become one with the Supreme means that he is still in the trap of maya. On the other hand, a humble devotee who may not be a great sage, but simply by his implicit acceptance of the Lotus Feet of the Lord as the goal of his life means that he is under the protection of yogamaya. I think this will clear the idea.

Your next question, "Is there a difference between Arjuna's body and his soul, and how does this apply to all Krishna's eternally liberated souls described in the scriptures. Is Arjuna always the same in his appearances with Krishna or is a new soul taking his body each time?" Yes, there is difference. Therefore he forgets his past activities. Just like we forget ourselves while dreaming because our subtle body acts at that time differently from the gross body. Similarly, by changing this body or transmigrating from one body to another, we forget all the activities of our previous body. The associates of the Lord, even though they have a different body, or even though they forget the activities of their past body, still they are associates of the Lord. These explanations are given in the Bhagavad-gita as it is.

Your next question, "Is a pure devotee eternally liberated and if so is he at any time a conditioned soul? We are eternally conditioned, but as soon as we surrender to

Krishna do we then become eternally liberated? When Lord Christ appeared he seemed to be conditioned in his growth. Was he a specific incarnation or a conditioned soul who became liberated?" You are not eternally conditioned. You are eternally liberated but since we have become conditioned on account of our desire to enjoy materialistic way of life, from time immemorial, therefore it appears that we are eternally conditioned. Because we cannot trace out the history or the date when we became conditioned, therefore it is technically called eternally conditioned. Otherwise the living entity is not actually conditioned. A living entity is always pure. But he is prone to be attracted by material enjoyment and as soon as he agrees to place himself in material enjoyment, he becomes conditioned, but that is not permanent. Therefore a living entity is called on the marginal state, sometimes this side, sometimes that side. These are very intelligent questions. And I am very glad that you are putting such intelligent questions and trying to understand it. It is very good. But best thing is that one should know he is in conditioned life and try to cure it. When a man is in diseased condition he should try to get out of diseased condition without harassing his brain when the disease has begun. But it is to be understood that the disease is not our constant companion, it is temporary. So the best thing is to cure the disease, and not waste our time to find out the date when it began. Forgetfulness of Krishna is the disease, so let us keep ourselves always in Krishna Consciousness, and get out of the disease, that is healthy life. Yes, Lord Jesus was jivatattva. He is not Visnu tattva. When a jiva tattva becomes specifically empowered by the Lord, he is called saktayavesa avatara. Lord Buddha and Lord Jesus Christ were in this group of saktayavesa avatara.. But they were not in conditioned state when they appeared; they came to teach here.

You should all read very carefully Srimad-Bhagavatam and Bhagavad-gita, and you should be able to answer all questions like this, and only in rare cases approach me. But it is important that our students must be able to answer all questions for becoming preachers.

Arati is performed at 1 1/2 hour before sunrise to awaken the Deities. Each offering is made by moving it in 7 big circles, starting at the Lotus Feet of the Lord, and going clockwise round. First of all, burning camphor or ghee (5 fires if possible) is offered in this way, slowly circling them before the Lord. With left hand bell is being rung, and with right hand the offerings are made by circling. Next burning dhupa is offered. Then water is offered in a conchshell. Then a nice handkerchief is offered. Then a nice flower, as a rose. Then the Deities are offered a fan, nice peacock feather fan. And the last item is the blowing of the conch shell three times. Throughout arati there is bell ringing, cymbals, mrdanga, gong, harmonium, etc.

Hope you are all well, and please keep me informed on the progress of the temple there.

Your ever well-wisher,  
A. C. Bhaktivedanta Swami

ITEM T3: Bhaktivedanta, Abhay C. 1968b. "General Lectures, Montreal, October 26, 1968." In *The Bhaktivedanta VedaBase*. Database, version 4.11 (1998). Los Angeles: Bhaktivedanta Book Trust.

Prabhupāda: Why people are forced to commit sinful activities? This point is also discussed in the Bhagavad-gētā. Arjuna inquired from Kṛṣṇa, "What is that thing which forces a man to commit sinful activities?" Just like the same example that one man is seeing practically that one who has committed something criminal, he is punished. And he has heard it also from authorities, from lawyers or from respectable gentlemen, that "If you commit such and such sinful activities... If you steal, then you will be imprisoned for six months. If you cheat, you'll be imprisoned for such and such period. If you commit murder, then you'll be hanged." These things are taught some way or other. Either in religious scripture or by lawbooks or by morality or ethical principle, they are taught to the human, civilized human society. And he sees also practically that "This man has committed this kind of criminality, and he is punished." And again why does he commit? That is the problem. So kāma eṇa krodha eṇa rajo-guṇa-samudbhavaḥ. Kāma and krodha. Kāma means desire, lust. Kāma. And when the desire or lust is not fulfilled, then there is krodha. Krodha means anger. There are so many cases of criminality, when the lust is not fulfilled, one commits some criminal action and he is punished and so many things happen. So kāma eṇa krodha eṇa rajo-guṇa-samudbhavaḥ. As we have discussed many times that we are in this material world controlled by the three modes of material nature. Three qualities: goodness, passion and ignorance. So goodness... Yes, passion and ignorance are the causes of our bondage. And goodness is also cause of bondage, but in that platform one can see things as they are. Goodness. Prakāṣa. Just like at night we cannot see, but in daytime we see. But seeing is not all. Unless I am convinced of something, even seeing... Just the same example: one man is seeing that a criminal person is punished; still he is committing criminal act.

So Çukadeva Gosvāmī's question is that suppose a man commits some sinful activities and he executes some atonement. In atone... This atonement is prescribed in every religion... (child sounds in background) (aside:) This is disturbing. Attention is diverted. Yes. So just like in the Christian church, they have the atonement process, confession. So suppose if you go weekly in the church and confess your sinful activities and it is excused, but again, next week you again commit the same sinful activities. Then what is the use of that confession and atonement? If you make it a business that "The whole week I shall commit sinful activities, and on Sunday I shall go to church and confess it, then everything will be balanced, squared-off account," that is all right. Then again from Monday you begin the sinful activities. So is that very good business? So Parékṇit Mahārāja's question is that, that the atonement is there. But if one commits atonement and again commits sinful activities, then what is the use of such atonement? It is just like... He gave the example, kuṅjara-snānavat. The elephant takes bath very nicely in the water, and as soon as he comes on the land, he takes dust and throws over, all over the body. So what is the use of taking bath? Similarly, if I am accustomed to commit sinful activities and for that reason I confess and make some atonement, then what is the use? That is the question of Parékṇit Mahārāja. He's very intelligent. If I do again and again and again the same thing and make some atonement... So in every religion there are processes of atonement, prāyaścitta. In Hindu religion also there is such thing. Every religion such thing is

there. But the purpose of such atonement is to bring the man, criminal man to consciousness. He should be conscious of his sinful activities. That is the idea. Just like a child has committed some wrong and he comes to the father. The father sees that he has done something wrong. So the child confesses, “Yes, father, I have done it. Please excuse me.” “All right. Excused.” The father says, “Don’t do it again.” Second time, again he commits the same thing. The father or the teacher says, “Oh, again you have committed?” “Yes. Please excuse me. I shall not do it again.” “All right. Excused.” But if on the third time again he commits the sin, what the father and the teacher will do? He will slap him. Yes. Just to teach him, “Nonsense. I have warned you twice, thrice, and again you are doing that? No more excuse. Now punishment.” This is natural. So if I go to God, if I go and confess, “Father, God, Supreme Father, I have done these sinful activities. I am confessing,” “All right.” The father excuses. If you make it a business, that “I shall do it and confess,” then what will be the result? The result will be punishment. That is natural consequence. So people should come to the understanding that “These sinful activities I shall not do.” But he is forced to do, impelled by the quality of passion and ignorance. That is answered in the Bhagavad-gētā. Why does he so, as if being forced by some agent? That is answered in the Bhagavad-gētā that rajo-guëa-samudbhavaù. Kāma eña krodha eña rajo-guëa-samudbhavaù.

So we have to come to the platform of goodness from the platform of ignorance and passion. Then our life will be successful. Our life, the human form of life, is meant for changing the platform of activities. The animals, they cannot change their platform (of) activities. A tiger, however you instruct it nicely, it is not to be tamed. It is not... Because it is animal. It cannot change its, I mean to say, activities. But a human being, if he is trained... Therefore for human being there is system of the schooling. The children are... [break] They are advised to go to the church, to go to take moral instruction. It is for the human being, not for the animals. Because the human form of life can accept and make his path clear. His present activities, path, is very hazy. He does not know where he is going, what is his destination of life. That he does not know. Therefore education, training, and all so many things there are in every civilized human form of life so that he may come to the platform of goodness. And not only that goodness. One has to surpass that platform of goodness and come to the platform of pure goodness. In this material world it is very difficult to stand on the platform of goodness pure. Even a good man sometimes commits some mistake, commits some blunder in the material world. Because you should always remember that there are three modes of material nature—ignorance, passion, and goodness. Even you are on the platform of goodness, the other two qualities may be studied. Because it is the kingdom of mäsya, or material nature, these things are very prominent. Sometimes goodness is prominent, sometimes ignorance is prominent, sometimes passion is prominent. In this way sometimes they are mixed up.

So three into three equal to nine. Nine into nine equal to eighty-one. Therefore you will find manifestation of eighty-one kinds of qualitative living entities. And they are divided into 8,400,000 species of life. These are very scientific studies. Try to understand it. And this human form of life is the chance to get out of this entanglement. These eighty-one, again if you multiply eighty-one by eighty-one, then it becomes huge quantity. So in this way these qualities are mixed up, colors. Just like three colors, blue, red and yellow. You mix and you produce multi-colors. If you are expert in color mixing... All these picture, whatever you are seeing, there are only

three colors—blue, red and yellow—and you mix, varieties of color. Those who are artists, they know it very well. Similarly, these three qualities, three colors. The yellow is sattva-guna and the blue is the tamo-guna and the red is rajo-guna. These colors, they are representation of these three modes of material nature. Redness means passion, and blue, black, that means ignorance, and yellow, yellow is goodness. Therefore you see Kṛṣṇa and all others, they're in yellow dress. Of course in the spiritual world there is no such distinction. There is variety, but there is no inebriety. That is spiritual world.

Just like here you see Kṛṣṇa is in love with beautiful young girls. The same thing is here also. We are also accustomed to love beautiful girls, or beautiful girls accustomed to love beautiful boys. So the same thing is going on there in the spiritual world. It is simply reflection. The real thing is there in the spiritual world. It is simply shadow. The same loving affairs in a shadowy, hazy form is represented here. Originally it is in the spiritual world, in Kṛṣṇa. Kṛṣṇa is not to be supposed old man. God is never an old man. In the Brahma-saṁhitā it is stated,

advaitam acyutam anādim ananta-rūpam  
ādyā purāṇa-puruṣa nava-yauvana ca  
[Bs 5.33]

God, Kṛṣṇa, He's the original person because from the original father, you can take, from whom everyone has come. Therefore He's the oldest. Advaitam acyutam anādim ādyam. Ādyam means the original person. Man is made after God; therefore God is original person. So that person ādyam, acyutam, anādim, nava-yauvana ca. Nava-yauvana ca means He is always a young man. Just like you are all young men, attractive. Young life is attractive. So that youthful age is always in the spiritual world. And as the youthful means joyful life, ānandamayo 'bhyāsāt... All young boys and young girls, they are after joyfulness, but they are being frustrated in this material world. That is the inebriety. The spiritual world means these things are there, but without any inebriety. Here we love. A boy loves a girl; a girl loves... But they are frustrated. After few days it is broken. Or if it is married, then again there is divorce. He finds another husband; she finds out another... Like that. These things are not there. Rādhā-Kṛṣṇa, the love of Rādhā and Kṛṣṇa is never broken. Never broken. That is the significance of the spiritual... They are eternally enjoying the loving affairs. And if you qualify yourself, then you leave this material world, this interaction of the modes of material nature, and be implicated in such things and you become free, that is Kṛṣṇa consciousness. It is very nice. Try to understand Kṛṣṇa consciousness. As soon as you become Kṛṣṇa conscious perfectly, you are no longer living in this material world. You are in the spiritual world. That is stated in the Çrémad-Bhāgavatam:

samāçritā ye pada-pallava-plava  
mahat-pada puṇya-yaço-murāre  
bhavāmbudhir vatsa-pada para pada  
pada pada yad vipadā na teṇām

Very nice verse. What is this? It is said, samāçritā ye pada-pallava-plavam. The lotus feet of Kṛṣṇa is compared with a very nice boat. Boat. Just like lotus flower. His everything is like lotus flower. One who has accepted this boat... Because this

material world is a great ocean of nescience, darkness. This is the nature. Just like at night you see, this space is a great ocean of darkness. That is the nature. Therefore it is called tama. This world's nature... Here we require the sunlight, the moonlight, the electricity; otherwise it is dark. By nature it is dark. So you are put into the darkness. There is no light. But there is another nature, which is full of light. Therefore Vedic injunction is tamasi mā jyotir gamaṇ: "Don't remain in this darkness. Try to come out to the light." That is spiritual world. That is spiritual world. Jyotir gamaṇ tamasi mā. Don't remain in this darkness.

So the whole process is how to get out of this darkness. How to get out of this darkness. That is stated in the Bhagavad-gētā: yad gatvā na nivartante tad dhāma paramaṁ mama [Bg. 15.6]. The world of light is the kingdom of God, or Kṛṣṇaloka. Everything. Because just like you find day. What is this day? Day means a planet which is called sun globe appears. That is day. That means when your, this planet, world planet, turns and comes in front of the sun, it is day. Actually, it is darkness, but when we come in front of light, it is day. So there, in the spiritual planet, all planets are illuminating. This is an example, a sample, the sun. Sun is the only planet within this universe which is illuminating. All other planets are reflection of the sun. The moon, the stars, they are simply glittering, reflected by the sun. They are dark, just like this planet is dark. So similarly, in the spiritual sky all the planets are illuminating. None of the planets are dark. Therefore the whole sky is illuminating. There is no darkness. Just get an idea. Of course, it is not possible to explain what is the spiritual world from the material world, but from the śāstra... Just like you read geography. If you want to go to India, you get some idea that "India is like this. The shape is like this, the climate is like this, the people are like that." So you simply get an idea. But actual experience you'll get when you go to India. Similarly, the, we have got all these explanation in the śāstras what is that spiritual world, but we cannot conceive at the present moment the spiritual world. But you can conceive it. When you are advanced in Kṛṣṇa consciousness, then you'll be able. Because everything will be revealed. Spiritual knowledge cannot be acquired by these blunt senses. It is not possible. Just like people do not take much interest in our movement because they cannot understand. The senses are so blunt that they are not receptive. Just like a child. A child, it is not receptive; therefore it is in its own business, crying or something want, talking. Similarly, our senses, our present senses, they are incapable of understanding what is God or what is God's kingdom. They cannot understand. It is not possible. The senses are blunt, ignorant. Ignorance and passion, the covering. But if you come out of this ignorance and passion, you come to the platform of goodness, then you can understand a little. Not fully. Then again you have to surpass, transcend the platform of goodness, which is called suddha-sattva, without any tinge of material qualities. That position. Just like we are on the surface of this planet. There is chance of being covered by the cloud. There is clear sky sometimes, sometimes covered. But you go above, little above, say, seven miles, or just you go by plane seven miles above, then there is no chance of cloud. Everything is sunlight. Everything is sunlight. Similarly, so long you remain in the lower platform of ignorance and passion, it is very difficult to understand what is the science of God. Therefore you have to come to the platform of goodness, and there you'll understand what is sun, what is sunlight, without any interruption. So for that reason, just like you have to go by some plane, by some machine seven miles up to be completely in pure sunlight, similarly, you have to attempt... You have got... Kṛṣṇa, or God, has given you the senses, the mind, the intelligence. You have to use them. If you use them for

gratifying your senses, then you go down and down and down to the animal life. And if you use them for understanding God and His kingdom and your life, your relationship, that is also possible. So both way you can use your intelligence, your mind, your senses. Both ways.

So this Kṛṣṇa consciousness movement is to engage the mind, the senses, the intelligence always in Kṛṣṇa. Then there is no chance of materially being contaminated. Just like if you keep yourself always in the sunlight there is no chance of coming down into darkness. The darkness cannot penetrate light. Light can penetrate darkness. This is our practical experience. You cannot make sunlight dark, but your darkness can be lighted by sunlight. Similarly, if you keep yourself in Kṛṣṇa consciousness, there is no chance of coming *māyā* and attack you. No. That is not possible. But if you forget Kṛṣṇa, then *māyā* immediately will catch you. Just like side by side there is darkness and light. If you keep yourself light, there is no darkness, and if you keep yourself in darkness... So you have to use your intelligence. God has given you intelligence, mind, senses, and you have to utilize them. If you utilize, then you become free from these clutches of *māyā* or being covered by the three modes of material nature, ignorance, passion, even goodness. Even you become a very good man, moralist, that is also a bondage. That is also your bondage. You may have good knowledge, you may be a very good philosopher, you can understand, you may be a very learned man to understand what is this world, what is this, how it is working—very great scientist, advanced, educated man. That is goodness. But that is not the cause of your being freed from material contamination. You have to go above goodness.

Goodness is the qualification, is the symbolic representation of becoming a *brāhmaṇa*. You have heard this name *brāhmaṇa*. The *brāhmaṇa* means qualified man in goodness. That is the *brāhmaṇa*. And *kṣatriya* means qualified man in passion, and *vaiśya* means qualified man in ignorance and passion, and *śūdra* means qualified man in ignorance. These are the natural division of human society. In the Bhagavad-gītā you'll find it is said, *cātur-varṇyāṁ mayā sṁsthāṁ guṇa-karma-vibhāgaṇā* [Bg. 4.13]. By the division, qualitative division and their engagement, there are four castes. You sometimes criticize that India has got caste system. Everywhere the caste system is there—everywhere, throughout the whole universe. Because the three qualities are ruling. So some of them are in goodness, some of them are in passion, some of them are in ignorance, and some of them are in mixed-up qualities. So mixed-up qualities means *vaiśya*, and pure goodness is *brāhmaṇa*, and pure passion is *kṣatriya*, and pure ignorance is *śūdra*. So these divisions you'll find everywhere throughout the universe. It is not that... But in India also at the present moment this caste system has become a hereditary. No. It is not hereditary. A *śūdra* can become a *brāhmaṇa*—if he qualifies himself. Just like a policeman can one day become the learned judge of high court if he qualifies himself. There is chance. There is educational facilities. You educate yourself. You become doctor of law, you also one day. You become one day president. Everyone is open. Similarly, the chance is open for everyone how to become the supreme man. Supreme man means one who understands God and his relationship. He is supreme man. All others, they are below the supreme man. The supreme man is the first-class man, and the others, who are below God understanding, or Kṛṣṇa consciousness, they are second class, third class, fourth class, fifth class, like that. This is the classification. So below the third-class, fourth-class man, *śūdras*, they are called *caṇḍālas*. *Caṇḍālas*. *Caṇḍālas* means fifth-grade man. The fifth-grade man

also can be elevated to the first-grade man. That is the instruction of Çrémad-Bhāgavatam.

kirāta-hüëāndhra-pulinda-pulkaçä  
äbhéra-çumbhä yavanäu khasādayäu  
ye 'nye ca päpä yad-apāçrayäçrayäu  
çudhyanti prabhaviñëave namaù

God is so powerful. Just like sunlight is so powerful it can sterilize any infected thing. Any infected. Infection, we are afraid of being infected. But if you come to the sunlight, no infection. No infection. This is scientific. Similarly, whatever your qualification may be, however you may be impelled by the qualities of this material nature, if you come to the sunlight of Kṛṣṇa consciousness you become immediately purified. There are many instances among my students, how they have become immediately purified.

So we have to take to this process. Then there will be no more force that you commit criminality. No. There will be no chance if you become pure by Kṛṣṇa consciousness. It has to be attained by tapasya. That is said tapasä. Tapasä means voluntarily being regulated. That is tapasä. Brahmacharyeëa [SB 6.1.13]. Brahmacharyeëa means controlling the sex appetite. That is a brahmachäré. Tapasä brahmacharyeëa çamena ca damena ca. Çamena means keeping the mind, equilibrium, without being disturbed. The process of meditation is meant for keeping the mind in equilibrium. That is çama. And dama, dama means controlling the senses. My senses are always dictating me, “Oh, you take this. You enjoy this. You do that. You do that.” And I am being driven by. We are all servants of the senses. So we have become servant of senses. We have to transform to become servant of God. That’s all. That is Kṛṣṇa conscious. You are already servant, but you are servant of the senses, and you are being dictated and being frustrated. You become servant of God. You cannot become master. That is not your position. You have to become servant. If you don’t become servant of God, then you become servant of your senses. That is your position. So those who are intelligent, so they will understand that “If I have to remain a servant, why I shall remain servant of the senses? Why not of Kṛṣṇa?” This is intelligence. This is intelligence. And those who are foolishly keeping themselves as servant of the senses, they are spoiling their life.

Thank you very much. (end)

ITEM T4: Bhaktivedanta, Abhay, C. 1972a. “Srimad Bhagavatam Lectures 1:2:10, Bombay, December 28, 1972.” In *The Bhaktivedanta VedaBase*. Database, version 4.11 (1998). Los Angeles: Bhaktivedanta Book Trust.

Prabhupāda:

kāmasya nendriya-prétir  
lābho jéveta yāvatā  
jévasya tattva-jijñäsā  
nārtho yaç ceha karmabhiù

This verse we have been discussing for the last few days, it is very important, especially for the modern civilized man, that they're after simply sense gratification, inventing so many things simply for sense gratification. So Rūpa Gosvāmé says that sense gratification is required, but not simply we shall devote our life for sense gratification. There is another business. Kāmasya nendriya-prétir [SB 1.2.10], lusty sense gratification, not for, there is demand. The sense demands some satisfaction, but not for..., for the sake of sense gratification. Just like sex life. Sex life, there is demand, but that should be utilized for begetting nice children, not for sense gratification. Dharma viruddha kāmāḥ ca aham asmi. Kṛṣṇa says in the Bhagavad-gétā, "Sense gratification which is not against the religious principle, that is I am." Sense gratification is there, is also. Just like the Rādhā-Kṛṣṇa. That is cin-māyā. Cini means home(?); mithuna means dual, couple, the spiritual couple. Similarly here also, the same spiritual our duties are there, but because it is covered by this material body, it is perverted. So, just like when you are diseased, we cannot enjoy life; that is forbidden. If one is suffering from tuberculosis, and if he wants to enjoy sex life, that means he is bringing death. Similarly, in this material condition of life if we want to aggravate our sense gratification process, then we invite very from..., very quickly death. Death means, spiritual death, to become more and more entangled in material things.

Therefore Bhāgavata says, Sūta Goswami says, that this life, human life, or the purpose of the Vedic civilization, they are not meant for kāmasya nendriya-prétir [SB 1.2.10]. Kāma, that should be utilized for better purpose, not for sense gratification. The real business is jévasya tattva-jijñāsā. Life should be engaged simply for tattva-jijñāsā, to understand the Absolute Truth. The whole Vedic literature, Vedic knowledge is meant for understanding the Absolute Truth. Kṛṣṇa says, vedaṁ ca sarvair aham eva vedyam [Bg. 15.15]. The purpose of studying Veda means to understand Kṛṣṇa. And vedānta-vit. Because people are very much proud, especially Māyāvādé philosophers, they're very much proud of becoming vedānté. So the Vaiñéava philosophers... (aside:) Stop that. ...Everyone is vedānté. Çré Rāmānujācārya, he is also vedānté. Madhvācārya, he is also vedānté. Nimbārka, he is also vedānté. Without understanding Vedānta, where is the question of spiritual advancement? So Vedānta does not mean it is the monopoly of a certain class of philosopher. No. Actually Vedānta, this vedānta-bhāñya understanding of Vedānta, it is Çrémad-Bhāgavatam. Bhāñya brahma-sutranī. And this bhāñya, this commentary, is given by the author Himself. The purpose of Vedānta is known to the author. Therefore if he personally gives the commentary, that is very perfect. Kāñéa also says, vedānta-vit vedānta kād cāham: "I am the compiler of Vedānta, and I am the knower of it." That is, Vyāsadeva is incarnation of Kṛṣṇa. Therefore Kṛṣṇa says, "I, I am the actual knower of Vedānta." So whatever is said by Kṛṣṇa in the Bhagavad-gétā, that is no a..., against Vedānta-sūtra, or what is spoken in the Çrémad-Bhāgavatam, that is not..., that is actually following the Vedānta-sūtra.

Now, here it is said that jévasya tattva-jijñāsā. Vedānta-sūtra begins with this word: athāto brahma jijñāsā. So nartho yaḥ ceha karmabhiù. Generally people are very much attached to karma-kāēōa, offering, performing great sacrifice. It has become now a fashion to call vikñā(?) yajña, this yajña, that yajña. But actually real purpose is tattva-jijñāsā. The nartho yaḥ ceha karmabhiù, this performance of yajña is a karma,

prescribed duty. Yajña, dāna, tapaù, kriyā, yajña, performing yajña. But in this age, no other yajña can be performed perfectly. It is not possible. First deficiency is there is no yajnic brāhmaëa. Formerly, the brāhmaëas were so expert that by mantra they ignite fire, and they would test, putting one animal in the fire, they would take and make it again alive. That is the test of the mantra. By mantra, an animal, animal put into the fire, comes out again with rejuvenated life. People think that gomedha yajña, açvamedha yajña are made for killing the animal. No. It was testing the mantra of the Vedas, whether actually being pronounced. That was the test. Just like in biological laboratory, the medical practitioner, they test with animals to observe the physiological and anatomical conditions. Similarly... But they cannot give life, they simply kill. But here in the Vedic yajña, the animal was put in the fire and it was again taken alive. Because such yajnic brāhmaëa is not there in this Kali-yuga, therefore the all the yajñas are forbidden. Açvamedhaà gavāmbham [Cc. Ādi 17.164].

Açvamedhaà ga... uh, pāla-paitākaà devareëa sutot, sannyāsam pāla-paitākam. Even sannyāsa is also in this age. Karma-sannyāsa. That is called karma-sannyāsa. The Vedic principle of sannyāsa is to give up this karma—karma means yajña—and take sannyāsa. But vaiñëava sannyāsa is tri-daëëé sannyāsa. They, that means the living entity is offering his body, mind and words for the service of the Lord. So tri-daëëa sannyāsa can be accepted in this age, not otherwise. There are so many. So Bhāgavata says, na artha yaç ceha karmabhiù, that this is not the purpose. Real purpose is, to perform yajña means to satisfy the Supreme Personality of Godhead Viñëu. But this process of yajña is not possible in this age. Therefore çāstra gives injunction: kalau nāsty eva nāsty eva nāsty eva gati anyathā, harer nāma harer nāma harer namaiva kevalam [Ādi 17.21], saikértana-prāyair yajñaiù yajanti hi su-medhasaù. These are the injunctions.

krsna-varëaà tvisa krsnaà  
sāigo pāigāstra-pārñadam  
yajñaiù saikértana-prāyair  
yajanti hi su-medhasaù  
[SB 11.5.32]

Su-medhasaù, those who are possessing nice brain, not dull Because the yajña was performed in the Vedic yuga, so we have to perform yajña again the same style—that is not possible. You cannot get even the ghee, and so many things, that is not possible. Therefore çāstra says, yajñaiù saikértana-prāyair yajanti hi su-medhasaù: those who are intelligent persons, they perform the saikértana yajña, as it is being done here. Saikértana... No other yajña is possible to be done in this age, but this can be done, and anyone can take part in it. We have seen practically, even the small children, they are also doing. This is real yajña. And tattva-vijñāsa... This saikértana-yajña and tattva-vijñāsa means hear something from Çrémad-Bhāgavatam, Bhagavad-gétā. That makes your life perfect. Jévasya tattva-vijñāsa nartho yaç ceha karmabhiù. No other karma... No other karma-kāëëëya ritual. Simply this yajña should be performed.

Now, unless we take to tattva-jijñāsa, we cannot get out of this material clutches. Inquisitiveness: “What is the Absolute Truth?” Now Çrémad-Bhāgavata directly gives you information what is tattva-vit, what is that Absolute Truth. That Absolute Truth is described here, vadanti tat tattva-vidas tattvam [SB 1.2.11]. Tattva vidaù. Tattva vidaù means one who knows the Absolute Truth. You cannot understand what is Absolute

Truth who is not tattva-vit. Tattva-vit means one who knows the Supreme Personality, he is actually vedaṁ ca sarvair aham eva vedyo. So by studying Vedas, if one comes to the point of understanding Kṛṣṇa, then he is tattva-vit. Otherwise partial. That is explained here. Vadanti tat tattva-vidas tattvaḥ yaj jñānam advayam [SB 1.2.11]. Tattva-jñāna, there is no difference, tattva-jñāna, but there are different angles of vision, angles of..., brahmeti paramātmēti bhagavān iti śabdyate, but the different capacity. This I have explained many times. Just like from darkness you come to the light, tamasi mā jyotir gamaṇi, come to the light. So the example is, just like you are in dark room, and your friend or you want to come to the light, come to the sunlight. So this tattva-jñāna, light, is also the sunshine, has connection with the sun. And paramātmā, brahmeti paramātmēti and bhagavān.

So tattva-jñāna, those who are trying to understand the Absolute Truth by mental speculation or mental exercises... There are many parties, they are, they are called theosophists and many others, they are trying to understand. So those who are trying to understand the Absolute Truth by their own knowledge, not from the knowledge of the Supreme... Our process is avaroha panthā, descending process, and the Māyāvādē philosopher's policy or system is ascending policy. I want to understand the Absolute Truth by exercising my mental power—that is called ascending process or inductive process. But our process is deductive process. We, Kṛṣṇa says, mattaṁ parataraṁ nānyat kiñcid asti dhanāñjaya [Bg. 7.7]. We take it, we immediately take it, that Kṛṣṇa is the Supreme Personality of Godhead. We are not going to search out who is the Supreme. Because we are hearing from the Supreme, Kṛṣṇa, then our business is finished: "Here is the Supreme." So this is very natural. You are searching after the Supreme. This is one process, by your own dint of knowledge, and another person is getting the knowledge directly from the Supreme—he is perfect. This is perfect process. Evaṁ paramparā-prāptam imaṁ rājarñayo viduḥ [Bg. 4.2], Kṛṣṇa says in the Bhagavad-gētā. The perfect knowledge received from Kṛṣṇa. From Kṛṣṇa the knowledge was received by Brahma. From Brahmā the knowledge was received by Nārada. From Nārada the knowledge was received by Vyāsadeva. From Vyāsadeva the knowledge was received by Madhva Muni. In this way, paramparā-sūtra, the same knowledge was received by Mādhavendra Purī. From Mādhavendra Purī, Ēṣvara Purī received the knowledge. From Ēṣvara Purī, Lord Caitanya received the knowledge. From Lord Caitanya, the six Gosvāmīs. In this way there is a paramparā system, handing down the knowledge from disciplic, from disciple to disciple, evaṁ paramparā. That is perfect knowledge.

So those who are trying to understand the Absolute Truth by exercising their, exercising their limited knowledge... After all, we are living entities. Our knowledge is always imperfect. That we do not admit, but actually it is so because our senses are imperfect. I am very much proud of my eyes, but I cannot see as soon as the electricity, light, is not existing. I cannot see. Then what is the importance of my eyes? My eyes can see under certain condition. When there is sunlight, then I can see. At night I cannot see. Then what is value of these eyes? So people say that "I cannot see." So what is the value of your eyes? Because you do not see, the fact cannot be zero. Therefore it is called śrūta paramparā, śrotriyāḥ brahma-niñōham [MU 1.2.12]. We have to receive the absolute knowledge by the śrūta paramparā, śrotriyāḥ brahma-niñōha. Just like Kṛṣṇa said, sa kālenaha yoga nañōaṁ parantapa: "Because that process of hearing from the right person is now broken, therefore I am speaking the same truth, Bhagavad-gētā, again unto you, because you are My very dear friend and

devotee.” So our process is that. We understand, we try to understand the absolute [break] ...imperfect, my knowledge is not perfect. But because I hear from the dear friend and devotee of Kṛṣṇa, therefore whatever I speak, that is perfect. I am not manufacturing. I may be imperfect—I am imperfect; actually I am imperfect—but I am carrying the message, Kṛṣṇa. Kṛṣṇa says, “I am the Supreme Personality of Godhead”; we say, “Kṛṣṇa is the Supreme Personality of Godhead.” Kṛṣṇa says that “You surrender unto Me”; we say, “Just surrender unto Kṛṣṇa.” So therefore, because there is no difference between Kṛṣṇa’s statement and my statement, therefore our knowledge is perfect. Personally, I may not be perfect, but because we are carrying the message of Kṛṣṇa and presenting as it is, therefore it is perfect. This is our process. That is the recognized process, Vedic process, *çrōta paramparā*.

So those who are anxious to understand the Absolute Truth by dint of imperfect knowledge, this is right conclusion. If your senses are imperfect, whatever your knowledge may be, that is imperfect, because you are gathering knowledge from..., by imperfect senses. You know the story of studying..., blind man studying an elephant. So blind man is going, somebody is catching the leg. So they, “Oh, elephant is just like a pillar, a column.” And somebody is studying the tail, somebody is studying the trunk. So different knowledge, because they have no eyes. And one who sees the elephant as it is, he can understand that elephant is neither column, nor a trunk, nor this; he is a complete body. Similarly, those who are trying to understand the Absolute Truth by dint of blind knowledge, they come to the understanding of impersonal Brahman, *brahmeti*. That is also truth, just like you touch the elephant, a blind man touching the elephant, but because he hasn’t got eyes he is concluding that elephant is like, just like a column. But he has touched. Similarly, either the impersonalist or the yogi or the bhakta, they have come to the Absolute Truth; therefore it is called *advaya-jñāna*. There is no difference between impersonal Brahman and localized *Paramātmā* and the Supreme Personality of Godhead. There is no difference, but still there is difference. This is called *acintya-bhedābheda-tattva*: inconceivable one and simultaneously different. The same example can be given, that when the sunshine enters into your room, it means that sun has entered, but at the same time the sun is far, far away from you. Similarly, to understand Brahman means the Absolute Truth is *sac-cid-ānanda-vigrahaṁ, eṣvaraṁ paramaṁ kṣāṇaṁ sac-cid-ānanda vigrahaṁ* [Bs. 5.1]. If you simply try to understand impersonal Brahman, then you simply understand *sat aṁśa*, the eternity; *paramātmā*, *citāṁśa*; and *ānandāṁśa* is *Kṛṣṇa*. *Ānandamayor bhyāsāt*.

Kṛṣṇa is the supreme bliss. We therefore see Kṛṣṇa always enjoying, *jaya rādhā-mādhava kṛjā-bihāre*. That is Kṛṣṇa. He is always in company with *Rādhārāṣī*, and *kṛjā-bihāre*, and enjoying Her company in different *kṛjās*. And *gopé-jana-vallabha*, He is very dear to the *gopés* or the *gopas*, *gopé jana*, in *Vāndāvana*. *Gopé-jana-vallabha giri-vara-dhāre*. And because He loves the *gopés* and the inhabitants of *Vāndāvana* so much, as soon as there is some danger, He is prepared. He lifted the *Govardhana* Hill for them. They did not know except Kṛṣṇa. *Indra*, the demigod *Indra* wanted to punish the residents of *Vāndāvana*, because on the word of *Kṣāṇa* they stopped *Indra-yajña*. So *Indra* became very angry: “Who is this boy, cowherd boy? He has stopped my *yajña*.” So the demigods become very angry if the particular type of *yajña* is not performed. But Kṛṣṇa proved that “Your anger is not even comparable with the, My little finger’s end, that’s all.” So this was compromise; therefore this is *Indra-yajña* story, *Govardhana* Hill *pūjā*. So *gopé-jana-vallabha giri-vara-dhāre*. And

yaçodä-nandana. When you address Kṛṣṇa as the son of Yaçodä, He becomes very, very glad. If you address Kṛṣṇa, “Oh, paraà brahma paraà dhäma [Bg. 10.12],” as Arjuna did, “paraà brahma paraà dhäma pavitraà paramaà bhavän çäçvataà puruṇam adyam,” they’re all the Vedic hymns, they’re praying for Kṛṣṇa, but Kṛṣṇa is very, very pleased if you address Kṛṣṇa as yaçodä-nandana, nanda-nandana, rādhā-mādhava, He is so pleased. Immediately responds. He likes it. Because the Supreme Personality of Godhead is always worshipped by everyone as sublime, but nobody wants to chastise you, but He wants to be chastised also, and that power is given to mother Yaçodä. He wants! He disgusted some, that “Everyone praise Me; nobody comes to chastise Me.” You see. “Ah, here is another devotee, ‘Yes, I am prepared to chastise You.’ ” Just like in Vaikuṇṭha there is no fight, but Kṛṣṇa wanted to fight. Therefore some of His devotees, Jaya and Vijaya, they came as Rāvaëa, and he fought with Kṛṣṇa, Rāmacandra. Otherwise, who can fight with Rāmacandra? He is also devotee when he is satisfying. Kṛṣṇa wanted to fight, the devotee is prepared, “Yes, I shall fight You.” And He’ll kill you. This is (indistinct); this is devotee.

So these are tattva-jñāné, tattva-jñāna, kṛṣṇa jñāna. These are truths. People should devote to understand this tattva-jñāna. But those who are not very advanced, they conclude the Absolute Truth is nirākāra, impersonal Brahman. Or a little advanced than them, the yogis, they see Paramātmā within heart. They, they are also the same truth, advaya-jñāna. But if you want real bliss, if you want to talk with this Absolute Truth face to face, and treat with Him as friend, as son, as lover, that is Bhagavān. Not impersonal Brahman, neither Paramātmā. That will not get. Therefore it is said here, “The Absolute Truth is one.” Either you call Him nirākāra Brahman or call you Him localized Paramātmā, He’s in my heart, everyone’s heart, éçvaraù sarva-bhūtānām hād-deçe arjuna tiñöhati [Bg. 18.61]. But if you want to take advantage, full association of the Supreme Personality of Godhead, that is Kṛṣṇa. That is Kṛṣṇa. Brahmeti paramātmēti bhagavān iti çabdyate. Vadanti tattva-vidas tattvaà yaj jñānam advayam. This is very important verse. So tattva-darçés are that, nondual; there is no difference. The same example, that there is the sun planet; there is sun-god, whose bodily effulgence is the sunshine; and the sun globe, localized; and the sunshine. All these three taken together is one light, but the sun-god is different from the sunshine; the sun globe is different from the sun-god. Similarly, this brahmajyoti is nothing but Kṛṣṇa’s personal effulgence. Yasya prabhā. Yasya prabhā [Bs. 5.40], you can, you can say, “Oh, Kṛṣṇa is so powerful that He is providing brahmajyoti.” Well, why not? If some creation of Kṛṣṇa, the sunlight and moonlight, is so powerful that it expands all over the universe, so how much powerful is Kṛṣṇa? Brahmano ’ham pratiñöhā. Therefore Kṛṣṇa says, “I am the source of this brahmajyoti.” Brahmeti paramātmēti bhagavān iti çabdyate.

Now, how to understand the Absolute Truth? The next verse says,

tac chraddadhāna munayo  
jñāna-vairāgya-yuktayā  
paçyanty ātmani cātmānā  
bhaktyā çruta-gāhētayā  
[SB 1.2.12]

These are very important words. The Absolute Truth can be understood, can be known, by whom? Chraddadhāna munayo. Chraddadhāna. Tac chradda dhāna: those

who are faithful. That is the beginning. If one is not faithful, if he does not believe in God, for him it is, it is to be forgotten. He cannot not understand what is Absolute Truth. Atheist who does not believe in God, who has no faith, he cannot receive; he is not possible. Na mää duñkâtino müòhäu prapadyante narādhamäu [Bg. 7.15]. They are narādhamäu, or always constantly engaged in sinful activities. They cannot (indistinct). Chraddadhāna, ādau çraddhā, those who have got faith, that is the beginning. Then chradda dhāna, simply having faith, will not do. Then one must associate with sādhu, chraddadhāna munayo, must be thoughtful philosopher, munayo. Chraddadhāna munayo. Tac chraddadhāna munayo jñāna-vairāgya-yuktayā [SB 1.2.12]. Simply mental speculator or philosopher will not do. He must have complete knowledge, and the effect of knowledge must be, he must be renounced, without any attachment for material world, jñāna-vairāgya-yuktayā. Just like in the beginning we discussed this,

vāsudeve bhagavati  
bhakti-yogaù prayojitaù  
janayaty āçu vairāgyaà  
jñānam...  
[SB 1.2.7]

Vairāgyam and jñānam. We must have complete knowledge of the Absolute Truth. At the same time, we must be detached from material sense gratification. These two: jñāna-vairāgya-yuktayā.

We have got history in our country. Great sages, muni, āñi, they used to live in the forest to culture knowledge and become detached from these material activities, jñāna-vairāgya. But that is not possible in this age. From the very beginning of our life we are brought up in big cities like Bombay, Calcutta, London, New York. Then, where is the question of going to the forest? Does it mean that if one cannot go to the forest for acquiring knowledge and detachment then he has no chance? No. Kali-yuga, there is special concession that is given by Lord Caitanya Mahāprabhu. You haven't got to go to the forest of Himalaya for attaining jñāna and vairāgya. You can stay in your place. You can remain in Bombay, you can remain in London, you can remain in New York, big, big cities, and you can perform your prescribed duties. You can be very businessman. You can remain in (indistinct), or anything. Caitanya Mahāprabhu says. He said also from the Vedic, sthāne sthitaù çruti-gatāà tanu-vāi manobhir, jñāne prāyasam udapāsya namanta eva, san-mukharitāà bhavadéya-vārtām. This was spoken by Rāmānanda Rāya, and Caitanya Mahāprabhu accepted. Originally this verse was spoken by Lord Brahmā. Rāmānanda Rāya quoted from the words of Lord Bralmā, and Caitanya Mahāprabhu accepted: "Yes, this is the process." What is that process? Jñāne prāyasam udapāsya. If we don't be independent, unnecessarily mental exercise to understand what is God, what is Absolute Truth. Don't bother about these things. Then, what to do? Namanta eva: just become submissive, then san-mukharitāà bhavadéya, just try to hear from a realized soul. This process. Don't try to speculate yourselves as great philosophers and waste your time and become puffed-up, that "I am now realized, I am God." These puffed-up positions must be given up. You must be submissive.

Kṛṣṇa therefore wants this submissiveness. Sarva-dharmān parityajya mām ekaà çaraëam [Bg. 18.66]. Just like we speak sometime to our disobedient son, "First of all

you submit. Then I shall do whatever you are require.” The same. We have to... Our, this material position is we are all puffed-up, unnecessarily. Although we are on the grip of material nature, we are very much puffed-up. Daivé hy eñā guëamäyē [Bg. 7.14]. We are beaten every step, we are so beaten by the material nature, still I am thinking, “I am God.” Every step. This position should be given up, and we have to become namanta eva, submissive. Then, becoming submissive, san-mukharitāā bhavadéya-värtām, we have to hear about Kṛṣṇa from the Kṛṣṇa devotee, not from others, not from professional men, not from the impersonalists, even not from the yogi, but from the devotee, san-mukharitāā bhavadéya. Because they will misrepresent it. A devotee will not, never misrepresent. A devotee will say exactly what Kṛṣṇa says. He’ll not adulterate. That is not his business. Therefore it is recommended that you should hear about the Supreme from the realized devotee. San-mukharitāā bhavadéya-värtāā sthāne sthitāū çruti-gatāā tanu-vāi manobhir. You remain in your position. Remain in Calcutta, Bombay or any big city. Because nowadays, in this age is city life. No gentleman, no intelligent man lives in the village. So you remain there, but try to hear from the devotee about Kṛṣṇa.

Then it is said that prāyēēa ajito ’pi. Kṛṣṇa is ajita. Nobody can conquer Him. But such devotee who submits himself to hear from the realized soul, Kṛṣṇa becomes conquered by him. Vedeñu durlābhaā adurlābhaā ātmā-bhaktāu [Bs. 5.33]. Therefore it is said, tac chraddadhānā munayo jñāna-vairāgya-yuktayā paçanty ātmani cātmānam [SB 1.2.12]. Ātmani, within his heart, he can see the Supreme Soul, Kṛṣṇa, ātmanaā bhaktyā. There is the real process, bhaktyā: by means of devotional service, not by speculation or mystic power. That is not possible. Therefore a special word is used there: bhaktyā. And in the Bhagavad-gētā Kṛṣṇa also says, “Not by yoga system or by jñāna system or by karma system, but bhaktyā mām abhijñāti yāvān yaç cāsmi tattvataū [Bg. 18.55].” This tattvataū means the tattva-jñāna. Bhaktyā. And what kind of bhakti? Not that simply I sit I sit down and cry a little, I practice how to cry, sentiment. No. Çruta-gāhētayā: understanding about the Absolute Truth from Vedic knowledge. That is bhakti. That is real bhakti. Sentiment is not bhakti—I stand and I practice how to cry: “Oh, this man cries always.” No. Of course, crying is there, just like Caitanya Mahāprabhu used to cry. But that stage is very, very high. It is not possible. You are crying, but next moment you are engaged in ordinary thing, that crying is artificial. One who can cry for Kṛṣṇa, he becomes mad, just like Caitanya Mahāprabhu. Govinda-viraheēa me. Çūnyāyitā jagat-sarvaā govinda-viraheēa me. He says, crying, “Everything is now over. There is I cannot see Kṛṣṇa.” So that crying is different crying. Not that in the meeting I cry, and, next moment, I am now dry, “I want this, I want that...” But that not crying. Cakñuñā prāvāñāyitam çunyāyitā jagat-sarvaā govinda-viraheēa. Caitanya cakñuñā prāvāñāyitam, just like torrents of rain falls from the sky, so govinda-viraheēa, on account of separation from Govinda, cakñuñā prāvāñāyitam, çunyāyitā jagat sarvaā govinda-viraheēa.

So therefore here it is particularly said, bhaktyā. Bhaktyā means you have to execute the devotional service under the direction of a proper spiritual master, bhaktyā çruta-gāhitaya, and you have to hear about Kṛṣṇa. Two things must go on. If... Just like here you’ll find the arcā-vigraha, worshiping the Deity, is going on. But if simply these thing go on, it will be happening... Because none of us are expert. There must be çruta-gāhitaya. We must here about Kṛṣṇa also. Two things must go on parallel lines. If simply speculation goes on, that will not help us, and if simply ringing the bell goes on, and then that will not... Thet is not. There are temples, many hundreds and

thousands, but nobody goes, because there is no çruti, çruta-gâhitaya. People say, “What is there? They’re simply ringing the bell, that’s all.” So two things must go on: bhaktyä, çruta-gâhitaya. There must be devotional service, discharge of devotional service as they are prescribed in the çästra, as they are guided or ordered by the spiritual master—that will go on—at the same time we have to hear, namanta eva, çruti vak-manobhiù. In this way, if we live our life, athäto brahma jijñäsä, jévasya tattva-jijñäsä, if you try to understand the Absolute Truth, this is the process. If we follow, then our life is a success.

Thank you very much. (end)

ITEM T5: Bhaktivedanta, Abhay C. 1972b. “Srimad Bhagavatam Lectures 1:2:8, Vrindavana, October 19, 1972.” In *The Bhaktivedanta VedaBase*. Database, version 4.11 (1998). Los Angeles: Bhaktivedanta Book Trust.

Pradyumna: (leads chanting, etc.)

dharmaù svanuñöhitaù puàsää  
viñvaksena-kathäsu yaù  
notpādayed yadi ratia  
çrama eva hi kevalam  
[SB 1.2.8]

Translation: “Duties or dharma executed by men are only so much useless labor if they do not provoke attraction for the message of the Supreme Lord.”

Prabhupāda: So dharmaù svanuñöhitaù puàsäm [SB 1.2.8]. Dharma generally means occupational duty. We have several times explained. (In) the English dictionary, dharma is explained as faith. So faith may be changed. But actually, what is meant by dharma, that is constitutional position, activities in one’s constitutional position. This has been explained by Lord Caitanya Mahāprabhu. Jévera svarüpa haya nitya-kṛṣṇa-dāsa [Cc. Madhya 20.108-109]. Real dharma, constitutional position of the living entity, is to serve Kṛṣṇa. That is real dharma. Kṛṣṇa also confirms in the Bhagavad-gētā, sarva-dharmān parityajya mām ekaà çaraëää vraja [Bg. 18.66]. So mām ekaà çaraëää vraja, simply unto Kṛṣṇa, surrender, that is real dharma. Otherwise it is pseudo-religious principles, pretension, dharmaù projhita-kaitavaù.

There are two kinds of dharma: kaitava, cheating religious system, and real religious system. That is the subject matter of Çrémad-Bhāgavatam, to teach people the real religious system. In this chapter also, Sūta Gosvāmé has explained, sa vai puàsää paro dharmo yato bhaktir adhokñaje [SB 1.2.6]. You can execute your occupational duties or religious system very nicely, but if you do not develop your love for God, Kṛṣṇa, then it is simply useless labor. It has no meaning. The test is how much you have developed your dormant consciousness for loving Kṛṣṇa. That is the test. Bhaktiù pareçānubhavo viraktir anyatra syāt [SB 11.2.42]. If actually one is making progress in devotional service, he must be detestful to any other system. They are not interested. Actual interest is Kṛṣṇa, Viñëu. That is our actual interest. Especially when one comes to the form of a human being, his special interest should be how to

approach Viñëu. Na te viduù svārtha-gatià hi viñëum [SB 7.5.31]. Svārtha-gatim, self-interest. Everyone is inclined for his self-interest, but they do not know what is real self-interest. Somebody is thinking, “To satisfy the senses, body, that is self-interest.” Somebody is thinking, “To satisfy the mind, whims of the mind, that is self-interest.” Somebody is thinking, “Liberation of the self, mokña, mokña-väichä...” That is also not self-interest. But when one thinks in terms of serving the Supreme Personality of Godhead, that is real self-interest.

So na te viduù svārtha-gatià hi viñëum [SB 7.5.31]. People do not know. [break]... svārtha-gatià hi viñëum. Real self-interest is to become Vaiñëava, servitor of Viñëu. Viñëur asya devatā iti vaiñëava. That is real self-interest. Why people do not become Vaiñëava? Generally they worship various demigods—devotee of Lord Çiva, devotee of Goddess Kali, Durgā, so many. But they have been condemned by Bhagavad-gétā, spoken by Kāñëa Himself: kāmāis tais tair hāta-jñānā yajante anya-devatāù. Hāta-jñānāù. Çréla Viçvanātha Cakravarté Öhākura gives his comment: hāta-jñānāù nañöa-buddhayaù, “One who has lost his intelligence, they are inclined to worship other demigods.” Kāmāis tais tair hāta-jñānāù [Bg. 7.20]. Because they do not know what is his self-interest. He thinks that his self-interest is to give comfort to this body, the senses, sense-gratification. That is his misguided self-interest. Durāçayā ye bahir-ārtha-māninaù. Bahir-ārtha-māninaù. Bahir-ārtha means external energy. This body, gross body and the subtle body, they are made of the external energy. Bhümir āpo ’nalo väyuù khaà mano buddhir eva ca.

So people, having no information of the spirit soul, they are interested in body and mind, and they have created some concocted religious system for benefit of the body and mind. So the varëäçrama-dharma, beginning... Dharma begins from the varëäçrama-dharma, which is now going on in the name of Hindu religion. Actually there is no such word “Hindu” in the Vedic literature. It is a concocted word given by the Muhammadans. Real Vedic system of religion is varëa and äçrama. Four varëas: brähmaëa, kñatriya, vaiçya, çüdra; and four äçramas: brahmacäre, gāhastha, vānaprastha, and sannyāsa. So one has to execute... The brähmaëa must execute his system of life, satyā çamo damas titikñā ārjava, jñānā vijñānam ästikyā brahma-karma svabhāva-jam. A brähmaëa must execute all these principles of life. Similarly, kñatriya, he should be very brave, not to go away from fighting. He must have a ruling capacity. He must be charitable. In this way, kñatriya must execute his system of life. Similarly vaiçya, he must also execute his system of life: kñāni-gorakñya-väëijyā vaiçya-karma svabhāva-jam [Bg 18.44]. Agriculture, cow protection. Nowadays, either brähmaëa or kñatriya or vaiçya, practically everything is lost. Nobody is executing his occupational duties. Simply çüdra, without any knowledge, without any enlightenment. Try to get some money and fill up your belly and go on sleeping, that’s all. This is çüdra-karma-svabhāva-jam. Paricaryätmakaà karma. Therefore çästra says kalau çüdra-sambhavaù. In this age practically 99.9% population are çüdras, because they have given up, they have forgotten everything, what is the duty of brähmaëa, what is the duty of a kñatriya, what is the duty of a vaiçya. Maybe some vaiçyas are there and çüdras are there.

So even one executes his sva-dharma very nicely, but if he does not develop his Krsna consciousness, then çrama eva hi kevalam. This is also simply spoiling the life. On the other hand, Närada Muni gives his opinion, tyaktvä sva-dharmaà caraëämbujā hareù, “If one gives up his occupational duty and takes shelter of the lotus feet of

Krsna,” caraëmbujaà hareù, “so even he is not mature and falls down from the devotional service on account of so many reasons, still, he is not loser, whereas a person who is executing his occupational duties very nicely, but he has no Krsna consciousness, no idea of Krsna consciousness, he doesn’t get anything. He’s loser.” Ko vārtha āpto ’bhajatāà sva-dharmataù. Sva-dharmataù, keeping in his own position as a brāhmaëa, kñatriya, vaiçya and çüdra, if he is executing his duties very nicely, but has not developed Krsna consciousness, then it is to be understood that he has lost everything. This is the verdict of çāstra.

So dharmatù svanuñöhitaù puàsāà viñvaksena-kathäsu yaù, notpādayed yadi ratim [SB 1.2.8]. This hearing process is very, very important. But people are not interested in hearing. They are simply busy in some other duties. My Guru Mahārāja used to say... One who was not interested in hearing, he used to call him a daëðavat-class. Daëðavat-class of men. That means simply he knows how to make daëðavats, that’s all. (laughter) Anyone who will come to him, he would see whether he is a daëðavat-class of man or hearing class of man. So daëðavat is nice, but by offering daëðavat, if one does not develop the intent of hearing, çravaëam, then he is not making very much progress. As you know, because I was little interested in hearing, my Guru Mahārāja, he accepted me as his disciple. He marked this. “This boy is interested in hearing. He does not go away.” Actually, I do not know. I could not understand what he was speaking in the beginning, but still I was very much interested to hear him, out of curiosity or something like that.

So hearing is very important thing. Notpādayed yadi ratim, viñvaksena-kathäsu yaù. Kathä. Hari-kathä. This is accepted by Çré Caitanya Mahāprabhu. When He was talking with Çré Rāmānanda Rāya on various subject matters, Çré Rāmānanda Rāya began from the varëäçrama-dharma, sādhyā-sādhana. “What is the aim of human life? How a human being executes his religious principles?” Sādhyā-sādhana. So Rāmānanda Rāya began from the varëäçrama-dharma. Actually, unless the human society comes to the category of varëäçrama-dharma, he is not a human being; he is animal. Still, in India, because they are still inclined to the system of varëa and āçrama, there are so many benefit for the Indians. I have traveled all over the world so many times. Because there is no varëäçrama-dharma, how loose they are. That has been experimented. I have seen. So actually, unless one comes to the standard of varëäçrama-dharma, he is not considered to be a human being. Therefore the Vedic civilization begins from the varëäçrama-dharma. And in the Viñëu Purāëa it is said, varëäçramācāravatā puruñëä paraù pumän, viñëur ārādhyate. Because the ultimate goal is to approach Lord Viñëu, viñëur ārādhyate panthä nänyat tat-toña-kāraëam. So this varëäçrama-dharma was proposed by Rāmānanda Rāya, but Caitanya Mahāprabhu said, eho bāhya äge kaha ära: “This is not feasible. Better if you know something better than this, you propose.” Because Caitanya Mahāprabhu knew that in the Kali-yuga, practically the varëäçrama-dharma will never be observed, or it will be very difficult to observe. So people by simply observing the varëäçrama-dharma will not be able to make very much progress in devotional service. Stereotype. In this way, gradually, Çré Rāmānanda Rāya presented so many proposals. Varëäçrama-tyāga, jīāna, jīāna-miçra-bhakti, so many ways, and Krsna Caitanya Mahāprabhu rejected all of them. Eho bāhya äge kaha ära. But when Rāmānanda Rāya read one version which was spoken by Lord Brahmä,

jīāne prayāsam udapāsya namanta eva

jévantī san-mukharitāā bhavadéya-vārtām  
sthāne sthitāū ṣṛuti-gatāā tanu-vāi-manobhir  
ye prāyaṣo 'jita jito 'py asi tais tri-lokyām

This verse, when Rāmānanda quoted from Ṣrémad-Bhāgavatam, immediately Caitanya Mahāprabhu accepted, and He said, eho haya, “This is nice. This is nice.” What is that? That sthāne sthitāū ṣṛuti-gatāā tanu-vāi-manobhiū. “You remain in your position.” It doesn’t matter what you are. You may be Indian, you may be American, you may be European, you may be a brāhmaëa, you may be çüdra, you may be engineer, you may be doctor, you may be fool, you may be rascal. Whatever it may be, it doesn’t matter. Sthāne sthitāū. Don’t be disturbed. Don’t try to change your position. But jīāne prayāsam udapāsyā namanta eva. Don’t try to speculate, “God is like this, God is like that.” Speculator, mental speculator. Give up this habit. Just become humble, namra. Jīāne prayāsaā namanta. Namanta means namra. Namra, offering obeisances. Just like we offer daëðavats. So similarly, namanta, to surrender. In a surrendering spirit, in a humble spirit, try to hear about the Supreme from the realized souls. This is the process. San-mukharitām. Not professional. One who has actually realized, from him, if you hear, meek and humble, without speculating mentally, then by this process only, one can realize the Supreme Lord very easily. Supreme Lord is called Ajita; nobody can conquer Him. But if one adopts this process, hearing from the realized soul in an attitude of humbleness, then he can conquer the ajita. He can understand. And Caitanya Mahāprabhu immediately accepted this process, eho haya, äge kaha ära. Eho haya “This is nice.”

Therefore our Kṛṣṇa consciousness movement is to give chance to the people in general hearing about Kṛṣṇa, that’s all. Either hearing Hare Kṛṣṇa mantra or hearing Bhagavad-gétā or hearing Ṣrémad-Bhāgavatam, anything you like, hear about Kṛṣṇa. Try to hear about Kāñëa in meek and humble attitude. Then gradually, everything will be revealed. Ataū çré-kṛṣṇa-nāmādi na bhaved grāhyam indriyaiū [BRS. 1.2.234]. By simply speculation you cannot understand what is Kṛṣṇa, what is His name, what is His form, what is His quality, what is His pastimes. We cannot. Ataū çré-kṛṣṇa-nāmādi na bhaved grāhyam indriyaiū [BRS. 1.2.234]. By these blunt senses we cannot understand what is Kṛṣṇa. Sevomukhe hi jihvādaḥ svayam eva sphuraty adaū. But if you engage yourself in His transcendental loving service, beginning with the tongue, sevomukhe hi jihvādaḥ... So hearing by the ear and chanting by the tongue is the supreme method recommended by all authorities. This is çravaëaā kértanam.

çravaëaā kértanaā viñëoū  
smaraëaā pāda-sevanam  
arcanaā vandanaā dāsyāā  
sakhyam ātma-nivedanam  
[SB 7.5.23]

So we must be inquisitive. We must be very eager. That eagerness should be aroused: “Where kṛṣṇa-kathā is being taught, let me go there, let me hear.” In this Vāndāvana you will find, there are many places they are hearing about Kṛṣṇa. So either Vāndāvana or anywhere else, wherever Kṛṣṇa is heard, that is Vāndāvana. Not that Vāndāvana is limited with a certain space. Vāndāvana is transcendental. Tatra tiñöhāmi nārada yatra gāyanti mad-bhaktāū. Kṛṣṇa says, “I stay there where My pure devotees chant about Me.” Yatra gāyanti mad-bhaktāū. So if you become pure

devotee and if you chant this Hare Kṛṣṇa mantra, you can create Vāṇḍāvana anywhere, any part of the world. Not that you have got to come here. You come here. That's all right because it is established, Vāṇḍāvana. When Kṛṣṇa comes here, whenever He comes on this planet, He comes here. There are so many devotees. Certainly there is meaning, there is importance of this dhāma. But still, if it is not possible to come here, you can create Vāṇḍāvana anywhere, provided you are a pure devotee and you are chanting Hare Kṛṣṇa mantra without any offense. Just like we have got our New Vrindaban. This year we have seen practically how these American boys and girls, hundreds and thousands, always who are remaining, not less than five to seven hundred... And for one week continually, in Janmāñḍamé, we observed Janmāñḍamé festival. Actually it was as good as this Vāṇḍāvana, because the chanting of the holy name was going on and hearing about Bhagavad-gétā, Çrémad-Bhāgavatam was going on. There was tulasé plants, devotees, çré-vigraha. Everything was there. So actually, it was replica of Çré Vāṇḍāvana.

So therefore the most important thing is, to make advance in devotional service, to increase the appetite for hearing. Viñvaksena-kathāsu yaù, notpādayed ratim, kathāsu ratim. Kathāsu means, rati means attraction to kathāsu, that means hearing. Çravaëam. So this is the test, that anyone who is supposed to be advancing in devotional service, bhakti-yoga, the test will be how much he has awakened his intense desire for hearing about Kṛṣṇa. That is the test. That is the test. So the perfectional platform is stated here, that “You may execute your different occupational duties, dharma, but the test will be whether you have developed your consciousness, you have developed your Kṛṣṇa consciousness.” That is the test. So you can read the purport. Pradyumna: “There are different occupational activities in terms of man's different conceptions of life. To the gross materialist who cannot see anything beyond the gross material body, there is nothing beyond the senses. Therefore his occupational activities are limited to concentrated and extended selfishness. Concentrated selfishness centers around the personal body. This is generally seen amongst the lower animals. Extended selfishness is manifested in human society and centers around the family, society, community, nation, and world with a view to gross bodily comforts.”

Prabhupāda: This is very important point. People are very much interested in welfare activities for the human society. So they think that by feeding poor men or giving cloth or opening hospitals, schools, colleges—“These things are required. What is the use of hearing about Kṛṣṇa?” That is their opinion. But these welfare activities are extended selfishness. This word we learned from our Guru Mahārāja: “extended selfishness.” Just like I love myself for my sense gratification, and then I extend it to my son. I am gratifying my senses. I have got my wife. And to get my son another wife... The principle is the same. Then my grandchildren, then my great-grandchildren. Or, not only limited with the family, then society, then community, then nationally, then internationally. But they are all extended selfishness. Yes. Without knowing what is the real self-interest. Therefore we find so many faults in such welfare activities. In... They are opening hospitals for the human beings, daridra-nārāyaëa-sevā, but the poor goats and cows, daridra-nārāyaëa—they are also daridra-nārāyaëa according to the definition—but they are being killed. For one daridra-nārāyaëa, another daridra-nārāyaëa is being killed.

So that kind of philanthropy is not accepted in the Çrémad-Bhāgavatam as very advancement of civilization. The advancement of civilization will be tested, how the nation, individually or collectively, has advanced in Kṛṣṇa consciousness. It is very difficult to understand this, but the fact is this. Bhāgavata says that you cannot rectify the destiny of another man. That is not possible. Bālasya neha çaraëaà pitarau nāsiàha. It is not that because one has got good parents, therefore he will be happy. No. Not necessarily. Bālasya neha çaraëaà pitarau nāsiàha. So similarly, it is not that a diseased person, because he is being treated by a first-class physician and he is being supplied first-class medicine, therefore he will be cured. No, there is no such guarantee. Because if the supreme authority does not sanction... Suppose a man is diseased; he is going to die or suffering. So his relatives and friends are trying to save him. The çāstra says that “You cannot save him simply by giving him first-class medicine or first-class medical treatment.” They, they can also, cannot guarantee. Ask any qualified doctor, that “This man is being treated by you. Can you guarantee that he will be cured?” They will say, “No, that is not possible. We are trying our best.” Therefore we should know the ultimate sanction depends on Kṛṣṇa. I have got practical experience, because I was dealing in medicine. So the attending physician of my pharmacy, he came back from a call and told me that “I saw one patient lying in a very precarious condition, suffering from pneumonia. So according to our science, he could not live. I do not know how he is living.” There are so many cases. I had dealings with medical men. One big medical man in Gayā, he told me that “Mr. De,” that “we give very first class medicine to a patient, to my best knowledge. He dies. And I try one small medicine, and he is saved. That is my practical experience.” He was Muhammadan doctor. He told me.

So actually unless one is saved by the supreme authority, there is no question of saving him by so many philanthropic work. Actual saving is this Kṛṣṇa consciousness movement. Because if one is raised to his Kṛṣṇa consciousness, the whole problems of his life will be solved. That is real welfare activity. Other things you cannot change. If one is destined to suffer by some agency, you cannot stop. Therefore Bhāgavata says, tasyaiva hetoū prayateta kovido na labhyate yad bhramatām upary adhaū. You simply try to awaken your Kṛṣṇa consciousness, which was impossible in other living conditions. Either going to the heaven planet or going to the hell planet or becoming Brahmā or ant... Do not try for all these elevations. Simply try for awakening your Kṛṣṇa consciousness.

Then why so many people are trying for happiness? The answer is: tal labhyate duùkhavad anyataū sukhaà kälëna sarvatra gabhëra-raàhasä. Nobody tries for distress, but distress comes; similarly, even if you do not try for your happiness, if you are destined, happiness will come. But if you take to Kṛṣṇa consciousness, it is simply happiness. There is no more distress. If we become steadily situated in Kṛṣṇa consciousness, then it is simply happiness. As Prabodhānanda Sarasvaté has explained, viçvaà pürëaà sukhäyate. There is no problem for a devotee. Viçvaà pürëam... Everyone is perplexed with the problems of this universe, but for a devotee, viçvaà pürëaà sukhäyate.

(aside:) I think time is up. Thank you very much. [break]

Bhaktivinoda Öhäkura says,

mānasa deho geha jo kichu mor

arpilui tuwä pade nanda-kiçor

He was family man. So he surrendered everything: his body, his mind, his family, his children, everything under Krsna.

mānasa deho geha jo kichu mor  
arpilui tuwä pade nanda-kiçor

Mārobi rākhobi jo icchā tohārā... In this way, there is a nice song. So you cannot take charge of your family, society or community or country. No. Prakāteu kriyamāēāni guēaiu karmāei sarvaçaū [Bg. 3.27]. Everything is going on under the influence of different modes of material nature. Just like in our country, when Gandhi was living, he got sva-rājya, but still, he was thinking he had to do something, he had to do something. And he did not separate from politics. He was old man. He should have retired, but he did not, unless he was killed by somebody. This is the attachment for material things. All these leaders, they think, "Without me, the country will go to hell." But so many leaders came and gone. The country is going on. Therefore, in the Bengali it is said, rāja mare, rājya acara. "Because the king has died, therefore kingdom will stop." That is not the... It, it will go on. Why do you bother? That is knowledge. Krsna is taking care. You just engage yourself in the service of Krsna.

That is your duty. (end)

ITEM T6: Bhaktivedanta, Abhay C. 1973. "Letter to Sir Alistair Hardy, Bhaktivedanta Manor, 28<sup>th</sup> July, 1973." In *The Bhaktivedanta VedaBase*. Database, version 4.11 (1998). Los Angeles: Bhaktivedanta Book Trust.

Sir Alister Hardy, F.R.S.  
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Dear Sir Alister Hardy,

I beg to thank you for your coming here yesterday evening, we had very nice talks on religious experience, and I have studied your replies to my questions very carefully. My first question was "what is the problem of the human life?" So I have already explained, the problem is that at the present moment there is no proper understanding of God. Human life is especially meant for this purpose, to understand God. That is quite natural, cats and dogs or lower animals or man almost like animal cannot understand God, neither they think such things are necessary, that one should understand God, and his relationship with him.

According to Vedic understanding, a human being without understanding of God is no better than an animal, and that is a practical proposition, that is the only difference between an animal and a man. For man there is a religious system--scriptures, it may be Bible, Koran, Bhagavad-gita, or Srimad-Bhagavatam, it doesn't matter everywhere there is a system, religious system, philosophical system to try to understand the

supreme power. In your research institute you are also trying to explain that supreme power. Your research institution is the latest institution to study that supreme power. Therefore the right conclusion is, the problem of the human society at the present moment is to understand God, or as you say, the supreme power.

When we speak of power, it means there must be a source of the powerful, for example we may speak of the electric power, so immediately it suggests that there must be a source of power, the power house, and the power house is being conducted by some engineer. So ultimately there is a living force, a living entity. He is generating the power by mechanical arrangement, and we can experience his power in so many ways. You have tried to explain in your book "The findings of such research might spark off a new phase in religious history, people might be induced to try the experiment of approaching this power in their own way, not by prayer or the alteration of physical events or for national safety or material aims, but for spiritual strength and guidance for a better way of life, or perhaps how best to deal with some difficulty." This is indeed very good.

When you say "People might be induced to try this experiment" of approaching this power. Power is energy, so when you speak of approaching the power it means the powerful, power is not independent unless being the power there is a supreme powerful, this is reasonable, to search out the powerful. Without the powerful no power can exist. A politician or a big general exhibits his power as the powerful by his commandment or by his order. Therefore your understanding of the power is not complete, you must induce people to approach that supreme power. We can understand power in wealth, if a man is very wealthy he is powerful and can exhibit his power by spending money. Similarly if a man is very strong he can exhibit his power in so many ways. Similarly if a man is highly educated he is also powerful, he can influence so many men with his knowledge. Therefore we have to accept that behind the power, there must be the powerful, otherwise our knowledge is imperfect. When we understand the powerful then immediately we can know his different powers perfectly. The powerful has multi powers. If a person can understand what is that powerful God, then he can easily understand what are his powers. So this whole world is being conducted by the power of the supreme person, or the powerful. The only problem that we face is that we are neglecting to understand the supreme powerful. The subsidiary problems as you have stated, just like over population have been created by man. If we accept that the ultimate truth is the powerful, then the powerful can maintain any number of population, otherwise there is no meaning to powerful if he is subjected to any limitation. The supreme powerful is unlimitedly powerful, and practically we can see that the problem of overpopulation amongst the animals is not extant. Just like the elephants, they are not thinking where to get food. Or just like the cats and dogs and hogs, they are producing at a time half a dozen children or more, so in comparison to them man is producing one child, or two children. Formerly man used to have hundreds of sons, at the present moment a man has got two three at most ten sons. So where is the question of over population? We understand from the history of Mahabharata that Dhritarashtra had one hundred sons, but there are many other examples also. Maharaja Rsabha dev had one hundred sons, so they were big prominent men in the history the names of the most prominent men are mentioned. It is therefore safe to conclude that if the King can produce one hundred sons the subjects also can produce one hundred sons, if not all of them at least

some of them. So at that time there was no question of overpopulation, we do not find it in the history of Mahabharata.

Actually it is not a question of over population but of equal distribution of food. Just like America, they are producing enough food, and there is potency of producing more. But the Government prohibits the farmer to produce more. It is not a problem that the population has increase, but the distribution is mismanaged. Or by industrialization we have reduced the energy for producing food in favor of producing thing other than food. So on the whole it is not a question of overpopulation but of equal distribution of food, or producing food. For want of God consciousness this mistake is there.

If God is all powerful, he may not agree, or at least his agency, the material nature, may not agree to give sufficient food to the demons. Demons means Godless persons. We get this historical event from the Srimad-Bhagavatam, that during the time of Maharaja Prthu there was scarcity of food, so the King wanted to punish the earthly deity, because she was not supplying food. He wanted to kill her. But the earthly deity replied, that she has reduced the supply of food because she did not like to supply the demons. So there is no question of overpopulation, it is a question of demons. The number of demons has increased and therefore by nature that supply is minimized. As we were discussing that verse from Bhagavad-gita that "The production of food depends on sufficient pouring of water from the sky" that is not in our hands. Because we have become Godless, because we have stopped sacrifice or Yajna, which means to worship the Supreme Personality of Godhead, the supply of rain may be stopped. God may not be angry, but his agents like the material nature, she does not like to give sufficient food stuffs to the demons. That is the version of the Vedic literature. At the present moment the people are all demonic, they do not care for sinful life, unrestrictedly they are killing animals which is the most sinful activity, unnecessary. They are indulging in all kinds of intoxicating habits, and unnecessarily they are indulging in prostitution. The demonic people take advantage of women who do not get husband and take advantage of their body for sense gratification. These things are happening because people have no knowledge of the powerful. So the real problem is want of God consciousness. People should know that power, then other problems will be automatically solved.

Similarly the problem of malnutrition, it comes to the same proposition. Because nature is taking revenge on the demonic population malnutrition is also one of the branches of such revenge.

Pollution of environment is a problem which people in America are viewing with great concern. This problem is also due to Godlessness. People instead of producing food they are producing in huge quantities some artificial necessities of life, for which so much industry is working at top speed. Industrialization means to bring the people more and more away from God consciousness. The laborer, the worker in the factory, all of them are sudras, and the capitalist of the industry they are vaisyas, so the whole population is now composed of vaisyas and Sudras, which means the quality of passion and ignorance is now prominent. A passionate person or ignorant person cannot understand the Powerful, only those who are in Goodness or mixed Goodness and passion they can understand the powerful. so there is a necessity of changing the ignorant persons into persons with real knowledge. Therefore these people should be

turned to become God conscious, that is our programme. Anyone from any group, either sudra, vaisya, or any group lower than the sudra, we are taking them and making them intelligent and giving them a chance to understand the supreme power. So all around the real problem is to understand the supreme power and all other problems are subsidiary. There is no question of over population of people become God conscious. The all powerful can supply any amount of necessities of the people, and they can eat very nicely and so there is no question of malnutrition. For want of knowledge of the supreme powerful all these problems have come into being.

Then as you mentioned the problems of clashes between racial and national interests which often lead to war. This problem is also due to lack of God Consciousness because God consciousness means to understand that we are all sons of the same family. That is stated in the Bhagavad-gita, that the supreme lord must be the supreme father. I have got my father, he has got his father and he has got his father on and on he has got his father, in this way there must be one ultimate father, nobody can deny it. So that ultimate father he is God. Therefore in every scripture the supreme powerful is addressed as father, and in the Bhagavad-gita also the supreme powerful is mentioned as the supreme seed Giving father. Because we are forgetting the father, because we are forgetting that we are all the servants of one supreme father we are missing our real relationship between one living entity and another. If we actually understand that we are born of the same father and everything that is there on the surface of the globe, in the sky in the water everything is the property of the supreme Father, then we must understand that everyone has got the right to use the property of the supreme father. Just like in a big family the father is there, the mother is there and the sons are there. The father gives food to the sons as much as they require. One son may be a very voracious eater so he may eat more than the other son, but the father supplies him, he does not stop him, the father is competent to supply all the sons as much as they require. But if one son is hoarding food stuffs, that is sinful. You cannot take more than what you need. We see practically if we throw one bag of grain in the street many birds will come, they may eat two three four or ten grains, but they do not stock away for the future. But if we put a bag of rice into the street and allow people to take there will be regular fight, because every human being will want to take more than his immediate need. So this is also due to lack of God consciousness. If one can understand that the father is there, and he is supplying daily bread then why shall I stock more than I need. the present scarcity of food stuffs is due to hoarding by the capitalist. There is enough food stuff in the world, but at the same time there is a scarcity. If you pay more money on the black market then you will get enough. So from God's side there is enough food, but from our side we are mismanaging everything simply to make more money. Unless there is God Consciousness, understanding that everything is the property of the supreme father, there are so many children so he will supply, why should I hoard food, the problems will not be solved.

Now so far as ideology of religion is concerned: Religion means to abide by the orders of God, that's all. God is great, we are his sons, he is supplying all our necessities these are the right understandings. Why should there be any difference in religious practices. If you come to God consciousness then we can understand the birds the beasts the plants everyone is son of God, we have no right to kill. But the so called man made religious systems say the animals are our food and another religion says, "No, no, there should be no animal killing," this difference in practice of religious systems is due to want of God consciousness. If we actually come to the

point of God consciousness then all these differences will be perfectly resolved, but unless there is actual God consciousness you will not be able to change the Ideologies. I have asked many Christian Gentle men ``Why are you killing when in the Bible it is clearly said, Thou shalt not kill?" they cannot give me any satisfactory reply. In a round about way they try to avoid this question. So all these are due to a lack of God consciousness.

So all these problems are due only to a lack of God consciousness. Therefore is you can actually help people to know about the supreme powerful that will be a great help. But I see that your method is not very satisfactory. You are making research by accepting the statements of common peoples expression of religious sentiment. There is no need of research, the result of research in this matter is already there perfectly presented in Bhagavad-gita, all we have to do is accept it and the whole problem of research is solved. You want to establish your conclusion of religious experience by taking the opinions of laymen. A layman's sentimental expression about religious problems is not a practical understanding of religious problems. Religion as we have explained means the orders of God, therefore it must be scientifically studied, what are his orders, how to abide by them. Simply by taking statistics of the sentiments of common men we cannot come to the right conclusion.

Therefore for right understanding we are advocating that people take advantage of this institution, International society for Krishna consciousness by hearing about God from authorized books like Bhagavad-gita and Srimad-Bhagavatam which were directly spoken by God himself, therefore making the whole thing most scientific and practical. I hope that we can again meet and discuss this important matter further.

I hope this letter meets you in good health.

your ever well wisher

A. C. Bhaktivedanta Swami  
ACBS/had

ITEM T7: Bhaktivedanta, Abhay C. 1974. "Srimad Bhagavatam Lectures 1:16:21, Los Angeles, July 11, 1974." In *The Bhaktivedanta VedaBase*. Database, version 4.11 (1998). Los Angeles: Bhaktivedanta Book Trust.

Nitāi: (leads chanting, etc.)

arakñyamäëù striya urvi bälän  
çocasy atho puruñädair ivärtän  
väcä devéà brahma-kule kukarmaëy  
abrahmaëye räja-kule kulägryän

“Are you feeling compunction for the unhappy women and children who are left forlorn by unscrupulous persons? Or are you unhappy because the goddess of learning is being handled by brähmaëas addicted to acts against the principles of religion? Or

are you sorry to see that the brāhmaēas have taken shelter of administrative families that do not respect brahminical culture?”

Prabhupāda: Arakñyamäëà striya urvi bālān. According to Vedic culture, first protection—to the cows, to the women, to the brāhmaēas, to the children, and to the old man. This is the first business of the government, to give protection. Practically, there is no criminal charge against them—against a brāhmaēa, against a woman, a child. Suppose a child steals something. Who is going to prosecute him? It is not taken very seriously. So they require protection. They should not be given freedom. Like a child, he is not given freedom, similarly freedom... Of course, there is. Protection means to some extent no freedom. If I want to protect the child, then I sometimes say, “Don’t do this.” That is one of the items of the protection.

So here description of cow-killing is already done. Now in this age, Kali, these things will be lacking. First thing is that no protection for woman. Woman requires protection by the father, by the husband and by the elderly children. But that is now finished. Practically no protection. They are, under the name of so-called freedom, loitering in the street. It is a very abominable condition of life. Now these things are very prominent in the Western countries especially. In India they are still dragging the Vedic culture. So woman are given protection. The father gives protection to the woman, child, and up to sixteen years, utmost. Then she must be married. The father’s duty will be finished when the daughter is given to a suitable boy to take charge. That is marriage system. Marriage system is that it is necessary, necessary for social equilibrium. And it is the duty of the father to get the daughter married to a suitable boy. And when she is married, then the father’s duty is finished. Unless she is married, the father’s duty is not finished. This is Vedic culture. It is called kanyā-dāya. Kanyā means daughter, and dāya means obligation. Kanyā-dāya. There are so many debts. Putra-āēa, pitā-āēa, deva-āēa, bhūtāpta.

devarñi-bhūtāpta-nāēā pitēēā  
na kīkaro nāyam āē ca rājan  
sarvātmanā yaù çaraēā çaraēyā  
gato mukundaà parihātya kartam  
[SB 11.5.41]

We have got debts to so many people. First debt is to the demigods. Just like the sun-god, moon-god. They are supplying heat, light. The Varuēa. In this material world. We have got so many debts. But people do not care for it. Just like we are receiving light from sun, but what we are paying to the sun? Therefore we remain debtor. This is the Vedic idea. You are getting this electricity. If you don’t pay the bill, how long you will be able to use it? After some days the connection will be cut off. But although we do not pay any bill to the sunlight, because it is the order of Kṛṣṇa, it is giving us light. But how long it will go on? This is sinful. If you take something from a person and if you do not repay, that is sinful. Āēa, it is called āēa.

So there are so many debts. First to the demigods, then to the āñis, saintly persons. Because we get knowledge, Vedic knowledge from the āñi, we must be debtor. Guru-āēa. Debtor to the spiritual master, to the sages, to the saintly persons, because we are getting knowledge from them. Therefore the Vyāsa-pūjā is there. Once in a year the disciples are worshiping the spiritual master and trying to repay what he has received

from the spiritual master. Devarñi-bhūta. Similarly, in our ordinary dealings also, you are my friend, I am your friend, you are getting some help from me, I am getting some from you. So we are debtors, obligation. Devarñi-bhūta, āpta. Āpta means relatives or family. We are indebted to the father, mother, elderly family members. In this way we are implicated with so many debts. Devarñi-bhūtāpta-nāēā pitēēām [SB 11.5.41]. So you can liquidate the debts simply... It is practically impossible. Therefore, if you take shelter of Mukunda, çaraēā çaraēyam, the worthy of taking shelter... If you take shelter of anyone else, he cannot give you protection. Kṛṣṇa says, ahaā tvāā sarva-pāpebhyo mokṣayiṇyāmi. If you cannot liquidate your debts, you become sinful. But if you surrender to Kṛṣṇa, Kṛṣṇa says,

sarva-dharmān parityajya  
mām ekaā çaraēā vraja  
ahaā tvāā sarva-pāpebhyo  
mokṣayiṇyāmi mā çucau  
[Bg. 18.66]

“I shall get you released.” This is one side. And... From spiritual angle of vision. But from material angle of vision āēā, debts, you can become insolvent. “I cannot pay.” If you apply to the court... I do not know whether this act is there in your country. In India there is insolvency act. If one is debtor, then his assets, then he submits to the court that “I have got so much asset and I have got so much debt. So people may not harass me, the court may divide amongst my creditors whatever I have got.” This is called insolvency. So court decides that he has got thousand dollars’ debt, but he has got only hundred dollars, so that hundred dollars is divided: “You take this and be satisfied.” He is not... That is called insolvency. That is in terms of debts.

But so far the debts of the daughter, it is not debt, it is called dāya, kanyā-dāya. Debt you can take insolvency, but dāya means it is so obligatory, there is no such question that you can get relief from it. It must be... Therefore the word is used, kanyā-dāya. Still in India, the process is as soon as the girl is grown up the father is very anxious to find out a suitable boy and hand her over. Then... So that protection will be finished. It is already finished, at least in the western countries. There is no obligation of the father how to get the daughter married. Therefore the question is, “Whether you are lamenting that in this age of Kali these things will happen: cow slaughter, no obligation for the daughter...” And bālān, children. They are also not taken care of. Not only that, they are taken care of, but now child or baby is being killed. This is Kali-yuga. This is conclusion(?)

And how one can be happy? So many sinful activities are going on. How they expect to become happy? It is not possible. Therefore it is being asked that “Whether you are thinking of all these things and therefore you are unhappy?” Sober man becomes unhappy. Para-duḥkha... Especially Vaiṇēava. A Vaiṇēava has no problem for himself, but he has many problems for others. Because a Vaiṇēava... That is Vaiṇēava, unhappy by seeing others unhappy. That is Vaiṇēava. That is a first-class Vaiṇēava, para-duḥkha-duḥkhé. Just like Caitanya Mahāprabhu. By His practical example... He was a very learned scholar, many students, very respectable. He was so respectable in Navadvépa that in one night He collected a hundred thousand of people to challenge against the Kazi’s judgment, civil disobedience. Kazi acted against saikértana, so Caitanya Mahāprabhu challenged, “Now, tonight, we shall perform

saikértana with 100,000 of people.” And 100,000 of people gathered together and chanting and went to the house of Kazi.

So the example is... He was at that time hardly twenty years old, but how much influence He had that simply by His order 100,000 people collected and chanted Hare Krsna mantra and challenged the Kazi, that “You are forbidding. We shall continue. Do whatever you like.” So this is His popularity. And Lakṣmī-devé, the, directly the goddess of fortune, wife, most beautiful young wife. And seventy-years-old mother. So He has got obligation. But still, Caitanya Mahāprabhu, Vaiṣṇava, para-duḥkha-duḥkhé... That is stated in the Çrémad-Bhāgavatam. Tyaktvā su-dustyaja-surepsitarājya-lakṣmī-dharminōha ārya-vacasā yad agād araṇyam [SB 11.5.34]. He had no business to take sannyāsa at very young age, only twenty-four years old, such nice family, good wife, mother. In a family where there is good mother and good wife, that is happy family. And one who has no good mother and good wife, then it is hell. This is Vedic culture. So Cāṇakya Pañcāṅga said, mātā yasya gāhe nāsti. If somebody has no mother at home, bhāryā cāpriya-vādiné, and the wife is very harsh, dealing with the husband not very properly, araṇyā tena gantavyam, he immediately give up that house and go to the forest. This is Cāṇakya Pañcāṅga. That what is the use of such nonsense house?

mātā yasya gāhe nāsti  
bhāryā cāpriya-vādiné  
araṇyā tena gantavyam  
yathāraṇyā tathā gāham

For him the home is as good as forest. Therefore there is no family system. Everything finished.

So it is only Krsna consciousness movement trying to bring back Vedic culture so that people may be very happy. It is not a business; it is not a religious sentiment. It is a program to make everyone happy. Sarve sukhino bhavantu. This is Vedic culture. Not that “I exploit you, you exploit me, I cut your throat, you cut my throat.” This is not human society. And this has begun already. Because you cut throat of the animals—you are very expert, cutting throat—now you will cut throat each other. This is the... So a sober man, thinking all this downfall of the human civilization, he becomes very unhappy. He becomes, very unhappy. Oh. This human civilization, human being, human form of life, was given by God or the nature for cultivating Krsna consciousness, spiritual. That is not possible in the lower form of life, animals, the cats and dogs. And this is an opportunity given by nature’s law. Now we get this body. Now you understand your position, what you are, to understand that you are not this body. So long in the lower grade of life you were under the impression that you are a body, the cats and dogs. They do not know that the body and soul is different. But it is the human form of life to understand that “I am not this body.”

That education begins in the Bhagavad-gītā in the beginning: dehino ’smin yathā dehe [Bg. 2.13]. Dehē means the possessor of the deha is within the body, not the body is the person. But no education. Throughout the whole scientific world, university education, there is no concern that “I am not this body; I am soul.” Such a foolish, rascal civilization is going on in the name of advancement. No protection for woman, no protection of children, no respect for brahminical culture. So it is the

animal civilization. Polished animal, that's all. Otherwise it is not civili... That is Vedic culture. Therefore...

And another: brahma-kule kukarmaëi, kukarmaëi. Ku means bad, and karma means work. So they are very much proud. Here, you have no such thing here because there is no question of brähmaëa, kñatriya, vaiçya, çüdra. Everyone is the same. So, but India still, there are four classes of men—brähmaëa, kñatriya, vaiçya, çüdra. Here it is in Kali-yuga. Therefore kukarmaëy abrahmaëye räja-kule kulägryän. Brähmaëa and kñatriya... Brähmaëa means the persons learned, very intelligent, the Vedic culture, knowledge in Vedas. Çamo damas titikñä ärjavam. These are the brahminical qualification. Control the senses, control the mind, very clean. Çamo damas titikñä, tolerant, ärjava, simplicity. These are the brahminical qual... Then jñanam, full knowledge. Not that I am talking of becoming a brähmaëa, but I have no knowledge. That is not brähmaëa, allowed. A brähmaëa must be very much learned. Brähmaëa's another title is paëòita. Paëòita means very learned, paëòitajé. Where is our paëòita? He is not here?

Devotee: He's not here.

Prabhupäda: He is not well? (hears response) Hm. So this is civilization, this is culture. So at the present moment there is no respect for brahminical culture. Just like we are trying to make our disciples perfectly men of character. No illicit sex, no intoxication, no gambling, no meat-eating. And people will take it very lightly. They laugh. Because they do not know what is brahminical culture, what is the perfection of human life. So all these are happening and will continue to happen till the end of this age, very, very dangerous. We must always consider. Don't be allured by big, big highways and skyscraper building with full advertisement of wine and cigarette. This is not life. This is not life. Life, here is life. Let anyone come and compare this life in this temple and outside. This is life.

So be careful that this material world is itself dangerous. Especially in this age of Kali, it is dangerous. It is stated in the çästra, padaà padaà yad vipadäm, every step there is danger. This is the position. Mäyä is so strong that you should always expect simply danger. But if you become Krsna conscious, you can overcome these dangers... Padaà padaà yad vipadää na teñäm. It is not... This dangerous position is not for them. Who? Samäçritä ye pada-pallava-plavam, one who has taken shelter of the lotus feet. It is a great ocean, just like the Pacific Ocean. It is just like a great ocean, big ocean of ignorance. As in the ocean, if you go, even on a boat, it is always dangerous, similarly, we are in the ocean of material civilization. There is always danger. But if you take shelter of the lotus feet of Krsna, paraà padam, then you overcome the danger and you go back to home, back to Godhead.

Thank you very much. (end)

ITEM T8: Bhaktivedanta, Abhay C. 1976. "Srimad Bhagavatam Lectures 3:22:22 and Initiations, Tehran, August 12, 1976." In *The Bhaktivedanta VedaBase*. Database, version 4.11 (1998). Los Angeles: Bhaktivedanta Book Trust.

Prabhupäda: He knows the rules and regulations?

Atreya Äñi: Yes, Çréla Prabhupäda.

Prabhupāda: Let him say. Let him say.  
 Atreya Āñi: You can say it in English?  
 Mustafa: I can't say it completely correctly.  
 Prabhupāda: Say it in English. No illicit sex, no gambling, no intoxication, no meat-eating.  
 Mustafa: ...and eggs and fish.  
 Atreya Āñi: His name in Parsi, his name is Mustafa.  
 Prabhupāda: So his spiritual name Vallabha dāsa.  
 Atreya Āñi: Balab?  
 Prabhupāda: Vallabha dāsa. Not like that, here.  
 Atreya Āñi: Vallabha dāsa. His name is, in Parsi, Hussain. It means "all-compassionate."  
 Prabhupāda: So far the ten offenses, you will teach them. Your name, Çrédhara dāsa.  
 Atreya Āñi: Çrédhara dāsa.  
 Prabhupāda: Hare Kṛṣṇa. So read one passage from the books.  
 Pradyumna: (leads chanting, etc.)

so 'nu jīātvā vyavasitā  
 mahiñyā duhituḥ sphuṇam  
 tasmai guḇa-gaḇāḇhyāya  
 dadau tulyā praharñitau

Translation: "After having unmistakably known the decision of the Queen, as well as that of Devahūti, the Emperor most gladly gave his daughter to the sage, whose host of virtues was equalled to hers."

Prabhupāda: (repeats verse in Sanskrit) So here is the Emperor Manu, so he decided to give his daughter to Kardama Muni. And the sanction of the Queen, that was also expected. That means the father's sanction, the mother's sanction, and the girl who is going to be married, her sanction. These things are required before marriage takes place. Nowadays, dāmpatyē ratim eva hi svékāram eva udvāhe: marriage takes place simply by agreement between the parties, the boy and the girl. They can go to any magistrate and get it registered. But according to Vedic system, that is not the system. The system is the father, mother also must agree. The agreement must be, the parents' sanction must be there.

So guḇa-gaḇāḇhyāya, Kardama Muni, great yogi, what to speak about his qualities. Dadau tulyām, and Devahūti also equally qualified. So this kind of marriage is very happy marriage, and the result of such marriage is Kapiladeva. Because the marriage was very appealing, therefore Lord Kapiladeva, incarnation of Kṛṣṇa, He appeared in the womb of Devahūti. There are two Kapilas, original Kapila is the son of Devahūti and Kardama Muni. Therefore He is particularly known as Devahūti-putra Kapila. Sāikhya philosophy was enunciated by Him. He taught His mother also. You'll find all those instructions of Kapila Muni to His mother. So the system was very nice. Everything was there. There was no question of simply brahmacārés. No. There are married couples. This Kardama Muni was a great yogi. Still, he married. There was no disturbance. Although he promised one son only to Devahūti, but I think he got another nine daughters. So very nice system, everything was there—but for the purpose of realization of the highest truth. That is the civilization. Nothing has to be stopped; everything can go on. For bodily comforts we are very much busy, that's

nice. But if you increase the bodily comforts, there is no limit. That should not be the purpose of life.

In a Bengali proverb it is said, *çarére na mahaseya ye sahaye taya saba*. This body is so nice that if you practice something, it will be accustomed. Just like we are sitting on the floor. If we practice to sit on the floor, there is no necessity of this couch. We are not refusing couch if available, but not that without couch I cannot sit. This kind of civilization is condemned. Besides that, we have got our own business. The real business is *athāto brahma jijñāsā*. *Jévasya tattva-jijñāsā*. In the *Çrémad Bhāgavatam* you will find, *kāmasya nendriya-prétir* [SB 1.2.10]. So there are some necessities for sense gratification, but not for the senses, but for spiritual upliftment. *Jévasya tattva-jijñāsā*. The life is meant for inquiring about the Absolute Truth.

So we cannot spare our valuable time for bodily comforts, sacrificing our real aim of life, self-realization. That is not civilization. That is animal civilization. First consideration is self-realization. Therefore you'll find Vedic civilization very simple because they took it main business, self-realization. The bodily comforts... Big, big kings, because they had to rule over the country, some gorgeous type, style of living. They were... Ordinary persons, they were satisfied in a cottage. Still you'll find in India in the villages—I think here also the same—they don't mind. I see from the street the original walls.(?) They are not very much interested how to live comfortably. The real purpose of life should be done. At the present moment the civilization is simply for bodily comforts. *Divasa-çaréra-sāje*. Whole day is spoiled for trying how to make the, keep the body in comfortable situation. That is not the purpose of life. The purpose of life is, we should supply the necessities of the body as you can keep fit for executing spiritual purpose. But at the present moment there is no spiritual purpose, simply bodily comforts. This is the civilization of animals. As animals they do not know anything except bodily comforts. If human society becomes like that, then it is animal society. And because it is animal society, there is no peace in spite of advancement of material comforts.

So we can take instruction from the vivid, living examples of this Kardama Muni and Devahūti. Kardama Muni is an ascetic, very simple living, and Devahūti is the daughter of emperor. And she agreed to marry Kardama Muni, so, engage in the service of her husband. So just imagine a person, ascetic. What assets he has got? No home, no good food, nothing. Still she agreed gladly. Here it is said, *dadau tulyāā praharñitaū*. So 'nu *jñātvā vyavasitaā mahiñyā duhituū sphuōam*. *Duhituū*, consent of the daughter. It was, the daughter's consent was taken, "Whether you like," but she selected her husband. She told that "There is Kardama Muni. I want to marry him, that Kardama Muni." She expressed her desire to her father, and the father and mother came to offer the daughter to Kardama Muni. The first consent was the daughter's. Now just see, she was emperor's daughter, how comfortably she was living, but she voluntarily accepted all the difficulties for becoming the wife of an ascetic. You cannot expect royal comforts when one becomes the wife of an ascetic. Of course, later on everything was given to her by the mystic power of Kardama Muni, but in the beginning she accepted in a very humble cottage to live with her husband and serve him.

Thank you very much. (end)