# AN ANALYSIS OF EXPERIENTIAL SPACE AT THE CLOSE OF THE TWENTIETH CENTURY

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signed, 6-2-98,

Martin Walch.

# AN ANALYSIS OF EXPERIENTIAL SPACE

# AT THE CLOSE OF THE TWENTIETH CENTURY

## Aims of the Project

The aim of the project has been to:

(a) investigate the influence that systems of spatial representation exert upon the communication of aesthetic qualities arising specifically from direct experience of our physical environment;

(b) to study the qualitative differences in perception of landscape space experienced through systems of visual representation used in contemporary visual art; and

(c) to investigate the capacity of digitally augmented stereoscopy to visualise new models of landscape suitable to an art gallery setting.

# Introduction

> "If anything distinguishes this century from others it must be the ways in which technology has supplemented, illuminated and now almost replaced our sight."[1]

This research project examines the representation of space in stereoscopic imaging. It places the visual thesis in the context of the history and theory of the stereoscopic representation of space and the impact of changing notions of space on our perception of the landscape.

Images of Mt Lyell form the central subject matter of the visual thesis and provide the foundation for observations regarding the success of the anaglyphic and mirror stereoscopic methodologies employed. The project concludes that the veracity of stereoscopy as a medium of simulation still challenges current Virtual Reality technologies in terms of the degree and quality of immersion achieved and congruity of visual and kinaesthetic stimuli. It also demonstrates that the stereoscopic image conveys aesthetic information about the quality of the space it presents. It concludes that the application of digital processes to stereoscopic photography can result in new aesthetic modes for presenting and representing landscape as a comprehensive experience and that such presentations can be used to enquire into the manner in which the aura of a landscape space is established and maintained.

**What happens to the Mind in relation to Space.**

The visual thesis is primarily concerned with the way landscape is measured by sight, and the reality that space does not exist in isolation from time. Much of the contextual writing which follows this introduction investigates the role of vision as a selective and synthetic process (a complex adaptive system which evolves at individual and cultural levels) revealing, in its schema, the aspirations and blind spots of the individuals and cultures within which it is embedded. The evolution of my images has occurred in response to the systems of spatial representation in western culture that demonstrate the western obsession with what might be ironically termed "super-vision". In our culture vision means knowledge; that knowledge means power; and seeing, whilst remaining unseen, enables virtual omnipotence.

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1 Tana Wollen, *Future Visions: New Technologies of the Screen*, British Film Institute Publishing, 1993, p10.

Western landscapes, then, are mapped and defined according to imperatives which never existed for, say, aboriginal cultures. These 'maps' function by appearing to make direct connections between the terrain and what comes with it; they are primarily employed to define the utility, property and ownership of terrain within the landscape. However, until the equivalent of direct neural connection is achievable, there will inevitably be a slight rift between the smoothness of the real versus the 'graininess' of the simulated landscape (what I call the 'map').

The most sophisticated of flight simulators, such as the ones employed by QANTAS,[2] rely on the precise alignment of the different channels of information generated for their immersive experience, yet even so there still remains a perceivable gap between the real and its model. Indeed motion sickness quickly results from miss-alignment between visual and kinaesthetic stimulations, no matter how glossy their presentation.

Nevertheless, a convincing sense of immersion in a landscape can be experienced with a single monitor and a mouse when the feed-back between the two is synchronised. The human brain is incredibly adept at, and willing to, fill in any gaps in the perceptual field; at least, that is, until a significant contradiction is encountered. Alignment and synchronicity of information is more important than the resolution of each channel of information in terms of apparent veracity. My research demonstrates that human scale stereoscopic prints invoke for the viewer a heightened indexical relationship between the landscape and its representation that opens up a convincing space for contemplation.

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2 The author experienced first hand both the QANTAS flight simulator facility at Airport West, and the Inmartech driving simulator in South Melbourne.

**Between Wilderness and Wasteland: What is Natural Space ?**

> "Representation of the land has become an issue in itself, one attached to an agenda of social activity and historical reconsideration of land management. A variety of categories- "public," "political," "economic," "and "private" as well as "natural" -have become important markers for both picture-makers and land managers.[3]

> "For Photographers, the current challenge lies in making photographs that address the myths of landscape in ways that make sense out of contemporary experience".[4]

My research into the theory of landscape representation has led me to the conclusion that natural space is now a mythic dimension of the world. Space is landscaped by the mind even before it touches it, so it is impossible to actually experience space in a wilderness state. The wilderness is a concept that describes what is in existence before humans enter a landscape, and what is left when they leave. Wilderness therefore can also be the wasteland of cultivation gone feral, the nuclear testing ground, the shattered battle-field; the lair of the beast. This is an area of practical and philosophical importance which has grown out of my research project and which will provide fertile ground for future research.

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3 Merry A. Foresta catalogue essay for *Between Home and Heaven; Contemporary American Landscape Photography* an exhibition staged at The National Museum of American Art, Smithsonian Institution, 1991, p46.

4 Merry A. Foresta catalogue essay for *Between Home and Heaven; Contemporary American Landscape Photography* an exhibition staged at The National Museum of American Art, Smithsonian Institution 1991, p39.

## Scientific Space: The arbitrariness of units becomes the Rule.

The theoretical content of the exegesis consists of a series of ideas and relationships that have been developed into a framework which locates the visual thesis in terms of the histories of art, space and stereoscopy. This is intended to be an interpretation of the history, rather than a redefinition, and links the wide range of elements which have influenced my project.

Space is ubiquitous as a quality of our environment, and of human existence in general. Only at key moments of its redefinition do we become fully aware of its fundamental influence on the way we conceptualise our personal realities, and the importance of spatial schema in framing all our experiences of the world. The ambiguities encountered in any measuring of the space of landscape function to highlight the limits of description of all conventional language codes, and there is a pre-occupation with the relativity of measurement systems which can be found at the core of my project. In order to communicate our experience to others we rely on systems which serve to translate between the phenomena of the physical world and the phenomena of the intellect.

Historically, in a quest for quantitative accuracy, the measurement and discussion of physical space has shifted from an anthropocentric base to an abstract numerical one. The direct relationship between the human body and the space it inhabits (expressed in a measure like the foot for example), has become secondary to the increasingly abstract relationship between physical space and the human mind that over-sees it. Spatial Geometry is an example of a Logical language that attempts to enclose a set of objective perceptions of the external world within a rational system of relations. In contrast, Aesthetic languages invoke the subjective impressions reality makes upon the human spirit, and this is why I have chosen to use the poetics of visual art to interrogate the logic of the objective measurement of landscape.[5] Also, since I wish to expose the fundamental indeterminacy hidden at the heart of the western rational sciences, I will not attempt an explication of the many successful non-western models of space which already exist in parallel to our own.

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5 Pierre Guiraud, *Semiology*, London, Routledge and Kegan Paul, 1981, p 66.

Most western people are familiar with the convention of describing a space according to the number of dimensions it is said to contain. However this is a frame-work that serves to camouflage many aspects of space which are significant to human existence, but which are not considered to occupy any physical dimension. The convention of discussing things as either two or three dimensional ignores precedents set in the Arts and the Sciences, which have established models of space which do not define their quality or extent within such empirical axes as those of volume or location.[6] Hyper-dimensional and Zero-dimensional models of space exist, and have evolved along with other modes which use subjective and aesthetic parameters to describe their quality. Even the pure logic of mathematics predicts irrational spaces when pushed to the limits. Relativity Theory predicts the existence of Black Holes, within which "... enormous gravitational tidal forces .... draw matter towards [a] centre where it is destroyed in a region of infinite curvature, a space-time singularity, where the known laws of physics break down".[7] In modern theoretical science the zero-dimensional concept of "space" occupies one extremity of a range which currently extends to that of Super String Theory, which postulates that matter consists of standing waves formed in sub-atomic scale strings or loops (rather than discrete particles), and that these strings vibrate in a higher dimensional space, which appears to manifest a geometry of 26 dimensions.[8]

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6 "Ever since we created the concept, space has held whatever we put into it. We have imagined space to be many things, and that act of imagination has had implications for our image of light. Endow space with divinity and light is god-like; discover its shape and light is geometrical; fill it with matter and light is substantial. From Moses to Einstein, the history of light is also the history of space." Arthur Zajonc, *Catching the Light- The Entwined history of Light and Mind,* New York, Oxford University Press, 1995, p97.

7 *The Penguin Dictionary of Physics*, England, Penguin Books, 1991 p 424 .

8 "In summary, the rather obscure laws of the weather are easy to understand once we view the earth from space. Thus the solution to the problem is to go *up* into space, into the *third dimension.* Facts that were impossible to understand in a flat world suddenly become obvious when viewing a three dimensional earth."

Similarly, the laws of gravity and light seem totally dissimilar. They obey different physical assumptions and different mathematics. Attempts to splice these two forces have always failed. However, if we add one more dimension, a *fifth* dimension, to the previous four dimensions of space and time, then the equations governing light and

In addition to these unusual concepts of space, the modern discovery of Holographic Imaging dramatically demonstrates, (by recording an electromagnetic interference pattern characteristic of an object and its surfaces, rather than locating these points as perspectively projected onto a flat plane), that it is possible to encode three dimensions of spatial information into a two dimensional holographic film. If we then imagine the two-dimensional holographic plate being extruded into another dimension, that is, if it is extruded from flatness into a cube, it can now contain the extra dimension of time along this new axis. Thus within a three-dimensional cube, a four dimensional continuum can exist, a time-scape essentially like our own universe. In such a model the present can be thought of as any one 'slice'; as just an illuminated section with no thickness, which will appear animated if its neighbouring slices are lit up in sequence. This is a concept known as Blocktime,[9] where the "river of time" does not flow, and is instead spread out across time and space like a "glacier", a frozen eternity where the present is no more than a shifting crevasse. Many scientists and philosophers believe that the entire universe is in fact a Holographic field just like this.

Back in the every day world the practical advantages of defined systems for measurement are so numerous that they blind us to the philosophical significance of ideas and models like Blocktime. We forget about the absolute speed of light and the "Relativity" of all frames of reference to this benchmark.

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gravity appear to merge together like two pieces of a jigsaw puzzle. Light, in fact, can be explained as vibrations in the fifth dimension. In this way we see that the laws of light and gravity become simpler in five dimensions.

Consequently, many physicists are now convinced that a conventional four-dimensional theory is "too small" to describe adequately the forces that describe our universe. In a four dimensional theory , physicists have to squeeze together the forces of nature in a clumsy, unnatural fashion. Furthermore, this hybrid theory is incorrect. When expressed in dimensions beyond four, however, we have "enough room" to explain the fundamental forces in an elegant, self-contained fashion." Michio Kaku, *Hyperspace* , Oxford, Oxford University Press, 1995, p ix.

9 "Just as we can survey space as a landscape spread before us, so we can survey time (in our mind's eye, at least) as a timescape timelessly laid out. Philosophers refer to the timescape concept as 'blocktime', to distinguish it from psychological (and commonsense) ideas of 'the fleeting present." Paul Davies, *About Time*, England, Penguin Books, 1995, p72.

We forget that separate observers must inevitably experience different views or 'versions' of an event, and hence distance, space and "truth" are all relative and subjective. I can hold an object next to another and sense which is longer, but the 'true' length of something will always remain an abstract 'measure'. We forget this because the formal languages of measurement, (that is mathematics and geometry), demand that we do so. They require absolute agreement on the value of their fundamental units of length in order to "make sense". This is essential to the success of all language systems; for speech to occur, the utterer must subscribe to the rules of the particular language game and demonstrate proficiency, or else the gesture will be lost in confusion. The paradox is that any sign can have any significance, and yet in order for communication to occur the signifier must condense all possible meanings into just the appropriate one to signify the desired message. To solve this dilemma, a context must be established as a framework with in which communication may succeed. The initial form of the reference frame is essentially arbitrary; however, in Logical systems the value of the frame becomes absolute and concrete; whilst in Aesthetic systems it remains flexible.[10]

The following provides an example. The official 'metre' kept in Paris was the original context or framework for defining the centimetre in the modern S.I. system of units. The metre was a great deal more stable than the 'imperial foot', which was a unit that was initially derived from the average foot-length of the first ten men to leave church on Sunday morning. However, even though the new metre was unconnected to the random vagaries of human genetics, even this model varied in length with temperature, and it couldn't be manufactured beyond the accuracy of the very instruments which were supposed to guarantee its precision at the tolerances demanded of a standard reference. It was the failure of repeated attempts to use the Metre to measure the wave length of light, that led to light becoming the standard which defined the metre.[11] This about-face has served simply to camouflage what still remains as

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10 I am using the terms Aesthetic and Logic as they are used in Semiotics to describe language systems that are flexible and open-ended or rigid and closed.

11 "Since ... [1931] ever more precise methods have been devised to measure the speed of light. The last used highly stabilised lasers and special techniques for measuring ultra-high optical frequencies. Measurement became so exact that the main inaccuracy in them was due to uncertainties in the world's standard unit of length: the meter. In 1983 it was therefore decided to end the three-hundred-and-eight-year history of the measurement

a fundamental indeterminacy in all measurements of the space/time continuum.[12] The velocity of electro-magnetic radiation has become the new template for our fundamental unit of measuring, purely because it has proved to be the least variable benchmark.[13]

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of the speed of light forever. Instead of defining a unit of length, as had always been the case before, the speed of light would be defined! Its value was taken to be the then-current best-measured value of 299,792,458 meters per second. From 1983 on, the speed of light was no longer a quantity that could be measured; rather it was defined as a matter of pure convention to be the above value. Having given up the definition of the meter for that of the speed of light, physicists had to go back and adjust the unit of length so that it would be in agreement with the new standard. The meter, therefore, is now defined as the distance travelled by light in a vacuum during a time interval of 1/299 792 458 of a second. The carpenter's measuring tape is really so many light-seconds long." Arthur Zajonc, *Catching the Light- The Entwined history of Light and Mind*, New York, Oxford University Press, 1995, p265.

12 "The scene of action of reality is...a four-dimensional world in which space and time are linked together indissolubly. However deep the chasm that separates the intuitive nature of space from that of time in our experience, nothing of this qualitative difference enters into the objective world which physics endeavours to crystallise out of direct experience. It is a four dimensional continuum, which is neither 'time' nor 'space'." Hermann Weyl, quoted by Paul Davies in *About Time*, England, Penguin Books 1995 p73.

13 The higher the frequency of a wave, the shorter its wavelength, and thus the finer the resolution of detail achievable when tracing a target with it. Higher frequencies are also more energetic and therefore have a higher degree of penetration. Experimental research has so far revealed a seemingly infinite progression in the degree of resolution attainable by using increasingly powerful High Energy Particle Accelerators to probe matter. At this point in time there appears no end of possible detail and thus no basic 'grain' of which the reality of space/time might be composed. Results from the most powerful accelerators have shown no sign of diminution of this "nesting" of geometries, however Theoretical Physics predicts that there may actually be a fundamental unit, called the Planck Length, measuring $10^{-33}$ cm, within which six higher dimensions of space may be curled up. Unfortunately this length is so small that the energy and technology needed for experimental verification is still many years, quite possibly hundreds of years, beyond our present technical capability. Beyond our consensus reality of discreet objects and stable matter, the abstract geometrics of quantum and relativistic physics demonstrate that we are immersed in a multi-dimensional field, or holographic sea of

Yet when I stand and look at the landscape it is the distance between my pupils, not the metre, that forms the base-line against which my binocular stereoscopic assessments of space and depth are made. As an adult my cranium has finished growing and my inter-pupillary distance will not alter, (barring an accident that is). My inter-ocular span is a constant anatomic rule I unconsciously rely on when perceiving size and distance through the remote sensing provided by my vision. Since the average range of span between individuals is from 62-65 mm; this represents only a 1 in 20, or 5% variation for the majority of humanity. From this stand point it can be seen that stereo-scopic imagery is thus a reasonably universal language of spatial representation, and from the point of view of aesthetics, its origins in human physiology makes it an attractive alternative to some of the more abstract methods of measuring the landscape that I have discussed.[14] I think this fact is in no small part responsible for the popularity of stereoscopic imagery at various points in history.

We are at present witness to a significant re-calibration of the concept of space in our own culture. The advantages of Logical systems of measurement and definition, (e.g. property, commerce, statistics, navigation), are being questioned due to an accelerated expansion in the reach of our communication technologies, which has served to shrink our sense of the physical horizon, and effectively intensify our subjective sense of the density of humanity on the surface of the this planet. As I have already explored, scientific observations of the behaviour of matter have led to the development of many theories which predict and describe counter-intuitive spaces. Interpretation of these irrational areas is generally discussed in terms of a flexible and aesthetic dimensionality. The Internet and the World Wide Web are prime examples of logical information systems that have evolved into highly complex and aestheticised spaces, which often exhibit paradoxical and counter-intuitive connectivities,

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electro-magnetic matter/energy, where the coalescence of 'time/space/light' energies gives rise to the sensation of concrete form. In effect, objects can be understood as standing waves in the currents of electro-magnetism, they have the appearance of solidity because their energy across a defined space has a similar or greater density than our own.

14 I realise this has ironic overtones of Phrenology, however I do wonder if people with a greater interocular span are better suited for driving at high speed, and piloting planes.

despite the rational origins of their content and construction.[15]

In the arts it is not the intention to define space as a boundary or container without reference to that which is found within it, that is, without making reference to the experience of being within the space afforded by its mode of construction. Aesthetic concepts generally relate more effectively to what might be described as the emotional density or turbulence which occupies a region; the fragile ideas of objective measurement are even more difficult to sustain when they are filtered by human perceptual processes. Space exists around us and within us as a physical and sensual continuum upon which our perceptual processes constantly act; and we must not forget that our success in translating space into abstract forms, in order for us to navigate effectively through the real world, masks an extremely complex task that we accomplish almost effortlessly. Recognition of this fact is the impetus which has driven a great deal of physical and theoretical research throughout contemporary science and much of history, and has resulted in the belief that mathematics might enable a single ultimate framework within which it is possible to accurately describe and predict the behaviour of all matter/energy interactions across the vast range of scales encountered within all of nature.

The utilisation of formal geometry to represent space in artistic investigation has paralleled this tendency in main-stream science. Single point perspective can be seen as a Grand Unified Theory of Vision which has dominated western image making for over five centuries. However, art is not limited to presenting rational theories, and may move beyond the empirical order of perspective to incorporate the intuitive and the unique. Hence a flat field of paint may reference nothing external to itself, whilst still being capable of generating a profound spatial response in a viewer. The space that is represented, the "Representational Space", is therefore the space that an image artefact occupies in consciousness, and its extent can be considered unique for an individual, whilst generalised within a culture. It is a space of depiction, as well as reference, and is created according to rules chosen by a designer organising matter into image. The image is presented via a conglomeration of material that

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15 An example is Maya Quest 97 (http://mayaquest.mecc.com/maya97/) which is a multi-node quicktime panorama of a Mayan Temple complex. It consists of series of 360 degree panoramas which are inter-connected via short paths. It is initially difficult to move around within this space predictably, although it soon becomes quite intuitive.

is its physical form, and which occupies some physical space. However the space that the image re-presents does not exist at the physical level. Whether stone, paper or phosphorescent screen, the medium functions to "present a re-presentation", the meaning of which ultimately exists as an image viewed in the mind.

Art therefore can be understood as the visualisation of images from imagination, the concretisation of ideas into artefacts which can mean something. This creative process entails manifesting the space of consciousness in the realm of objective space; creating an art work which exists as an aesthetically coded, and potentially self-extracting translation, from the artist to the real world. Beginning with the earliest known artistic productions, the representation of space itself has principally occurred through sculpture. It was not until drawing was refined and coded through the development of geometry and rules for perspective organisation, that space was represented in flat images. A sculpture or object claims and occupies its own space, it presents space. Perspective based images re-present recessive space encoded onto a flat surface. From the right distance and the right angle the image will appear highly realistic and the view can be panoramic. Mastery of perspective allows the space of objects to be captured and organised so that it can literally reflect the point-of-view of the designer, not surprisingly the discovery of optics appeared to offer proof that such types of objective geometrical space might exist outside of human consciousness, as a fundamental structure of reality.

This idea gained a cultural momentum as photography proved it was able to transcend the narrow tunnel of unaided human vision and dramatically expand the scale of the 'see-able'. Photo-Optical systems were constructed which yielded images from the micro to the macro, from the very fleas upon fleas, up to the cosmic backdrop of our planets amongst the stars and galaxies. As well, the apparent scale of Time itself was also dramatically transformed by new images revealing processes which had been too brief, or too gradual to be witnessed by the unaided eye. Cinema then pushed this new a-temporality to the point of breakdown as it attempted to transcend its photographic flatness. Compensating for its lack of depth in space by valorising its depth in time, cinema has succeeded in orchestrating the way we perceive images by using montage and juxtaposition to control the way we receive them. Virtual Reality technologies have attempted to extend this by providing a stereoscopic and interactive experience of a cinematic type of space.

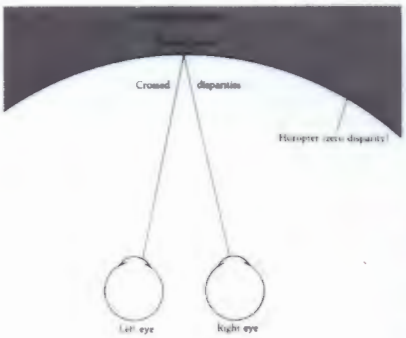
The result of all these technologies is that we no longer have to rely on memory as we did in the age of the oral histories. Since the invention of methods for the mechanical reproduction of text and images, the rising cults of Property and Individualism have invested greater value in the photographing and mapping of landscape than in its verbal or poetic description. No one knows this more than the traveller who must send home postcards, and return with snapshots, that testify to the unique and hard won benefits of actually being in paradise which no simple story could conjure. Until the advent of digital enhancement photographic prints were generally considered as traces of reality, and there-by laid a substantial claim to being more reliable than human memory as a records of the events that occur within a space, however with the advent of computer manipulation, the empirical strength of the photograph is no-longer beyond question. Photographic perspective has at last become an aesthetic, it is no-longer simply a dominant Logic.

## Stereoscopic Space

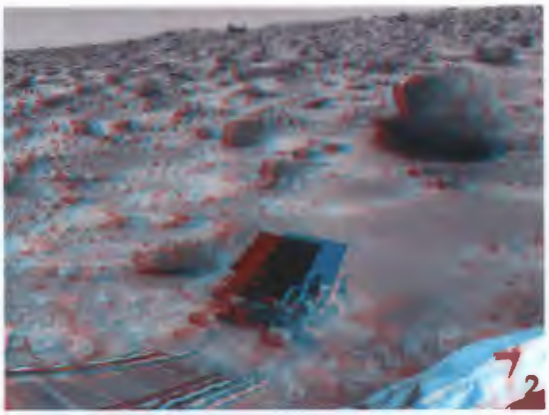
### Stereoscopic Depth Perception.

The biological basis of our vision has been intensively researched, and this study of the visual processes in humans has revealed much about our spacetime perception and memory abilities. A critical point in the understanding of vision was the realisation that it occurred in the brain rather than the eye. The optical process of collecting and focusing light is really 'sighting' rather than viewing. Vision occurs as the brain interprets the information provided by sight, resulting in the formulation of mental maps of spacetime. We respond very strongly to the visual clue provided by the displacement of objects in our two retinal images. The parallax between the sight-lines of our eyes renders two sets of relationships between corresponding points of light which the brain then views as spatial separation. This ability was demonstrated by Wheatstone's experiments in vision of 1838, which resulted in the first stereoscope. This device employed line drawings of objects drawn from different perspectives and was performed prior to the invention of photography which then popularised stereo-photography as a medium. Stereoscopes produce depth impressions through recreating the binocular disparity that naturally occurs between left and right eye images.

Illustration 1. Diagram showing horoptic boundary.


Crossed
disparities
Horopter: zero disparity
Left eye
Right eye

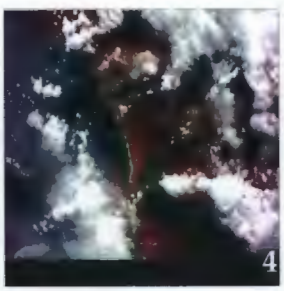
1



2

3

5



4

6

The 'horopter' is the region in space, about a point fixated upon by the eyes, in which the fusion of parallaxed images, known as binocular single vision, is readily achieved. Objects located outside the horopter may appear in double vision or as ghost images which are generally marginalised and suppressed. The horopter is then the line or 'surface' in which are situated all the points which are seen single while the point of sight, or the adjustment of the eyes, remains unchanged. As we scan an environment, the horoptic zone follows the point of attention, building in memory the impression of a finely resolved and unified space, even though it is only the central part of our vision that is sharp at any one time.

The human brain is extremely adept at achieving this twin channel synthesis. The visual cortex carries out many millions of comparative "operations" per second in order to produce the effortless, seamless and immersive sensorium we refer to as "seeing", and the ease of achieving this as an adult tends to make us forget how many years it takes for us to achieve the integration of our hands and eyes, and to predict the motion of the external world in relation to our own locomotion.

Stereoscopic photography has enjoyed a wide appeal since it first appeared in the early 1840's. During the 1850's and 60's it reached the proportions of a public craze, and a rekindled enthusiasm existed during the 1880's and 90's, the 1950's and 60's, and again in the 1990's with the advent of Virtual Reality systems. It presents a magical space of illusion which has charmed nineteenth and twentieth century tastes. It eclipsed the Panorama as the most popular form of immersive representation, as it furnishes an experience of illusory space that leaves the viewer with the distinct impression of having been transported.[16] The external world is also excluded by the device, with the result

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16 "Verisimilitude was the keynote, and early panoramas served to make a record, to document and register events and occasions. Most panoramic photographs were taken by commercial photographers whose output ranged from taking school or military 'class' pictures, to recording oil fields (labelling each derrick), logging activities, factories, mining and indeed any type of industry, frontier towns, the construction of railways and the opening up of new lands in general.

The landscape too was 'recorded', the panorama being the ideal format to make the most complete topological record. The nineteenth century was addicted to 'scientific accuracy', and Aime Civiale's aims, for instance, were avowedly 'scientific' when, for ten years

that the veracity of the correspondences in detail, which are both finely resolved and perfectly reproduced, are able to overwhelm the viewer with the authenticity, with the 'present-ness', of the space depicted. A stationary viewer looking at a pair of orthographic stereo colour transparencies of a stationary scene, is viewing an artefact that presents an extremely close match to our natural perceptual experience. In fact if the exact distances between the taking cameras is known, plan views of a site can be drawn from stereo photos alone. This facility has seen photogrammetry used to record and map fatal crime and accident scenes, as well as the surface of the earth and other bodies in space, most notably Mars at the present time.

Illustration 2. Anaglyph stereo image of mars rover, 1997.

Stereoscopic imaging systems have their roots in the science of how we see, but contemporary virtual reality systems are still unable to model at truly photographic resolutions in real time. The most convincing immersive spaces are currently provided by flight simulators,[17] which incorporate sound and motion feedback systems in real time. Multiple video screens beyond the 'cockpit' allow highly resolved scenery to appear at a distance, however they are not stereoscopic representations as there is no binocular effect; the elements are limited to appearing on the plane of the screen, and they require huge

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from 1859 to 1869, he made a detailed record of the entire Alps. This was published in 1882 with 41 panoramic views, an early forerunner of the NASA photographs mapping the surface of the moon." Jonathan Bayer, from The Panoramic Image in Photography published in *The Panoramic Image* , England, John Hansard Gallery, The University, Southampton, 1981, p28.

17 "The value of these simulations is that they are effective enough to induce symptoms of anxiety in pilots similar to those experienced in real aircraft flying. Brenda Laurel of Teleprescence Research observes that 'Even at very low frame rates and very low resolution, something quite extraordinary happens when your visual sense and your auditory sense and your kinaesthetic senses are all working in tight linkage with one another. And that's the essential trick of the medium'. The Australian airline Qantas, with one of the best safety records of any airline, has been using flight simulators since the 60's. A measure of the sophistication and efficiency of current systems is evident in their considerable reduction in real aircraft flying for training and skills advancement". Rebecca Coyle, from The Genesis of Virtual Reality published in *Future Visions: New Technologies of the Screen*, British Film Institute Publishing, 1993 p152.

dedicated computers to run them; a good flight simulator costs half what a real plane costs, whilst objects only appear natural at a distance.

The stereoscopic image has a recognised ability to render a strong sense of proximity to an object, and a keen sense of the weight and feel to a space. Questions immediately arise as to how these sensations occur. They may be entirely projected by the viewer, but this does not explain cases where a single image pair repeatedly produces similar responses in different individuals. It seems the aesthetic information carried by a stereoscopic representation includes content which also attributes a sense of the character to the space depicted. Significant is the fact that space is presented by a stereoscopic image; it is not re-presented. The space of stereoscopic "illusion" is actually identical to "authentic" space at the level of neurological function.

The question of where a virtual viewer is located whilst existing bodily in one space and conceptually in another, becomes an impossible one. How the viewer navigates within such a space; how that space is inhabited, this is the key issue. New Media commentator Geoffrey Batchen makes the point clear in his review of 'Techniques of the Observer' by Jonathan Crary;

> So it would seem that..... the key to the experience of the stereograph is that the eye is both disembodied and re-embodied. Or, to put it another way, in a single act of looking, the observer is moved back and forth between two separate but conjoined embodiments. Cut off from all distractions by the masked instrument held to the face, the eye of the viewer is dismembered from his or her immobilised body and induced to wander freely through the receding picture planes that unfold ahead. That same wandering eye simultaneously becomes a miniature prosthesis for another body; the viewer enjoys, as Holmes points out, the palpable sensation of turning into a flying phantom limb and thereby becoming an integral part of the representation being seen.[18]

The viewer is at once the magician and the deceived, knowing that a device intervenes between the viewer and the image, but not between the viewer and the space. This helps to explain why many people remark that they recall images from the stereoscope in a similar manner to real places, and that they

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18 Geoffrey Batchen, 'Enslaved sovereign, observed spectator: on Jonathan Crary, techniques of the observer' in *Continuum: The Australian Journal of Media & Culture* (Ed John Richardson), vol. 6 no 2, 1991.

are remembered in an entirely different manner to the illusory spaces encoded in two-dimensional images. In his book Jonathan Crary quotes Hermann von Helmholtz's writings of the 1850's;

> "...these stereoscopic photographs are so true to nature and so lifelike in their portrayal of material things, that after viewing such a picture and recognising in it some object like a house, for instance, we get the impression, when we actually do see the object, that we have already seen it before and are more or less familiar with it. In cases of this kind, the actual view of the thing itself does not add anything new or more accurate to the previous apperception we got from the picture, so far at least as mere form relations are concerned".[19]

The stereoscopic image enables the mind to inhabit the illusory space as if it were concrete. Through the agency of the eyes, consciousness can explore distant terrain without risk of becoming lost or cut-off from retreat. This facility is exemplified by the NASA Mars Lander and Rover project of 1997, which functioned as phantom limbs on the martian surface, and sent back stereoscopic images so that man could remotely landscape it.

## Digital Mappings of Stereoscopic Space

Stereo photography has been utilised as a technique for mapping remote landscapes since its invention. The remarkable ability of the stereo image to capture and deliver its subject recommended itself for the documentation and exploration of the American West. The photographer Timothy O'Sullivan accompanied Clarence Kings' Geological Survey across the United States and during this he made many stereo views of the landscape that was destined to be tamed by the transcontinental railway. Stereoscopic systems were soon found in the service of aerial mapping and military intelligence, and with the development of satellites and Space exploration they have come of age in the digital era.

> "The early development of [digital] technology co-incided with the era of space exploration, so digital imaging systems quickly began to play much the same role in twentieth-century voyages of discovery as topographic and botanical artists had played in eighteenth-century ones: they reported previously unseen marvels and

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19 Jonathan Crary, *Techniques of the Observer*, Massachusetts, MIT Press, 1993, p 124.

inventoried potentially colonisable territory.[20]

Illustration 3. Apollo 17 lunar landscape, 1973.

Illustration 4. Landsat image of Tasmania, 1997.

Digital imaging processes have been used by NASA since 1964, initially to clean up the analogue images acquired by the Ranger series of spacecraft which mapped the moon. The Apollo series of landings on the moon also made extensive use of analog stereo photography; astronauts were taught how to make stereo images using a single Hasselblad camera. This involved standing with feet at shoulder width, and making an exposure with the camera above one foot, and then repeating the exposure above the other foot while the camera remained pointed at the same object. There are more than superficial similarities between the digital re-assemblage of information from remote surveys, and the reconstruction of vision in the mind from external sense data. The Mars Pathfinder Lander sits on the surface of a dusty planet, making digital stereoscopic scans of the landscape which it encodes as radio signals and relays to earth, where they are decoded, reconstructed and analysed and interpreted. It is a structure which supports the eyes of our culture, communicating via a satellitic nervous system to the literal "head"- quarters at NASA.

The application of the computer to the task of representing space is a highly significant advance. The computer is essentially a tool with the ability to manipulate data, and to store and represent information in physical form. Initial input is generally through scanners which are used to analyse artefacts, and make digital measurements of analog originals. The computer can then perform work on this information according to the directions of the user. This straight forward arrangement hides the fact that the user moves into a very new type of space/time when directing such a system. The desk-top box is a complex labyrinth of nested information in electronic form which creates the illusion of containing vast tracts of space with peculiar connectivities embedded in it. In this sense it is much like the human head, finite from the outside and infinite on the inside. This spatial paradox transforms the way in which other spaces are seen and represented from inside the computer system,

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20 William J. Mitchell, *The Reconfigured Eye- Visual Truth in the Post-Photographic Era*, Massachusetts, MIT Press, 1992, p 11-12 .

particularly when individual computers can also inter-connect to create hyperspaces across networks.

Using the computer brings additional capacities to the mapping of stereoscopic space. Whether a digital stereoscopic reconstruction is viewed with a VR helmet or simple stereoscope is secondary to the way in which the image is formed by using the computer. Digitisation of stereoscopic image pairs enables the binocular disparity between all elements to be selectively altered. The limitations of the horopter can be transcended, since digital mapping allows the binocular disparity of any corresponding points to be tuned to remain within horoptic boundaries if that is desirable. This goes beyond the limitations of conventional photography because the elements of an image are represented internally as data, and they may be chosen and translated in plastic ways. In the computer, texture and colour may be lifted from the matter they describe, and their signification may be altered. The qualities of an object or space can be freed from its immediate substance, thus liberating the aesthetic element to operate at the level of an avatar or attribute.

## How the West was One: An Archaeology of Space

"Before it can ever be a repose for the senses, landscape is the work of the mind. Its scenery is built up as much from the strata of memory as from layers of rock".[21]

Historically the word Landscape has emerged from the middle-ages usage as reference to the 'district owned by a particular lord or inhabited by a particular group of people. The modern forms of the word (landskip, landscape) date from the late sixteenth or early seventeenth century, when the influence of Dutch landschap painters encouraged a revival and redefinition of landscape to refer to representations of scenery, especially rural scenery, and then to scenery in general or a particular scene'.[22] The Collins Dictionary defines landscape as '1. an extensive area of scenery as viewed from a single aspect. 2. a painting, drawing, photograph etc., depicting natural scenery. 3. the genre including such pictures. ~vb. 4. to improve the natural features of (a garden, park, etc.), as

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21 Simon Schama, *Landscape and Memory*, London, Fontana Press, Harper and Collins, 1995, p7.

22 Marvin W. Mikesell, *Man, Space, and Environment*, Oxford, Oxford University Press, 1972, p10.

by creating contoured features and planting trees. 5. to work as a landscape gardener'. This leaves us with a contemporary definition of landscape as a type, or class of physical space, which results from a technique for seeing space founded on the existence of privileged and unifying viewpoints. Landscape is not what is out there in the physical sense. It is a conceptual product of our attempts to order the chaos of the material world, a schema used for describing and representing our environment in order to render it sensible and meaningful to ourselves and others. Landscape is essentially a construct of value systems, a category of space subject to cultural construction and design.

The formation of landscape as idea is a defining moment in the separation of western culture from nature. The framing of the physical world in terms of technology, (and I propose verbal language as the first technology of representation), began at a point that signifies the individuation of human consciousness from its environment. Being conscious of one's environment means recognising oneself as different and separate from it. Once this occurs the space of separation becomes the space of difference, a physical space where position can be used to represent symbolic relationships between other objects. Christopher Tilley's work with the Neolithic tombs of Sweden clearly suggests that megalithic architecture functioned 'as a lens for perceiving the landscape around the monuments',[23] and that the 'architectural form [of the monuments] and topographic features of the landscape play off each other to create a distinctive sense of space'.[24] Through an analysis of three different topographical areas he develops the thesis that 'The domesticated mind ... imposes order and form onto the natural world and part of this imposition in the Neolithic is monument construction. A new space-time becomes constructed and part of this process is a separation of culture from nature, humans from the natural world. Thought no longer attempts to reflect the world but actively constructs new spaces in it.[25]

Illustration 5. Neolithic tomb, Ireland, 1988.

Space has long been at the core of the landscape experience. Our impressions depend not simply on what is present before us; more significant are the spatial

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23 Barbara Bender, *Landscape: Politics and Perspectives*, Oxford, Berg Publishers, 1993, p10.

24 Barbara Bender, *Landscape: Politics and Perspectives*, Oxford, Berg Publishers, 1993, p10.

25 Christopher Tilley, Art, Architecture, Landscape [Neolithic Sweden], *Landscape: Politics and Perspectives*, Oxford, Berg Publishers, 1993, p80.

relationships between ourselves and what we see. For example the distance between ourselves, and a threat or a friend, has a major implication for our well being. So too does the height or depth of any barrier we encounter. It seems our culture has as an imperative the desire to escape the tyranny of empty and/or restrictive space; we are driven to manipulate it, to de-construct it, to "Landscape" it. We cut down the trees to make a clearing in the wilderness in order to hold wild nature at bay, and it is in this manner that Wilderness defines what landscape is not. 'A landscape happens not by chance but by contrivance, by premeditation, by design; a forest or swamp or prairie no more constitutes a landscape than does a chain of mountains. Such landforms are only wilderness, the chaos from which landscapes are created by men intent on ordering and shaping space for their own ends'.[26] Even the remote surface of a once wild Mars is rapidly being landscaped by robotic probing.

It is by understanding and manipulating the relationships among things in space that we also create Place. We transform the unknown world of random objects in undifferentiated topography into familiar 'Placements' through the processes of exploration and discovery. Over time, a landscape may reveal itself as Place, (not simply location), as it undergoes an evolution based on association; a process where the events occurring within the space become inseparable from where they are occurring. The most extreme example of this is the idea of Home, which can be a small pocket in the landscape which enables intimate action, or even an entire landscape which enables a way of life.

Control of space is of primary importance to the Western consciousness. From the time of Ptolemy and the early map makers, the flat space of the ground seen from a high vantage point became the dominant mode of representing and controlling the landscape.[27] Lines of Longitude and Latitude were inscribed on

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26 John Stilgoe, *Common Landscape of America,* Yale University Press, 1982, p5.

27 "Only by the slimmest margins does the map fail to be a window on the world, margins which, because we can control and understand them, no more interfere with our vision than does a sheet of window glass. All you have to do is ignore the frame. All you have to do is ignore the way the window isolates this view at the expense of another, is open only at this or that time of day, takes in only so much terrain, obliges us to see it under this light . . . or that. This is the slight of hand: if your paying attention to the glass, you're not paying attention to what your seeing through the window." Denis Woods, *The Power of Maps*, London, Routledge, 1993, p 21.

these charts in the hope that a single system of co-ordinates might suffice to describe the exact location of anything on the ground. In this sense Cartesian space has become a Grand Unifying Theory of Space that has established and maintained the control of property by recording it and locating it according to the axes of x,y and z. It is not widely recognised that the push to develop an accurate method of determining Longitude, (which was necessary to avoid massive loss of shipping and men whilst crossing the oceans), was the motivation that led to the development of accurate chronometers, as well as the production of detailed astronomical charts of the entire heavens. This is because in order to know exactly where one is, it is necessary to be able to relate to some referent, (for example the positions of the stars in the sky, or the reading of a chronometer which keeps the time of a known location), thus one can locate oneself within a global system of positioning by calculating how far around the globe one is.[28]

When Charles Darwin arrived in the Derwent River in 1835 aboard the Beagle, the ship was carrying no fewer than twenty two chronometers which were being used to accurately fix the longitudes of foreign lands.[29] Twenty years later in the same locality, the triumph of colonial man over the turbulent space of weather and topography was being re-presented by photography. Frederick Frith and John Mathieson Sharp were making Australia's oldest photographic panorama in Hobart during 1855-1856. They produced a silver albumen print measuring 14 by 95.5 cm, depicting a view of Hobart Town taken from a small knoll behind the suburb of Wapping. Using what was undoubtedly the latest technology to image a frontier settlement was a significant exploratory act. They were conducting remote sensing for Britain, whilst providing a defining self-portrait for the colonists which could eclipse the earlier hand drawings of

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28 "Airline pilots, too, know exactly where they are with three numbers -their altitude and two coordinates that locate their position on a grid or map. In fact, specifying these three numbers can pin-point any location in our world, from the tip of our nose to the ends of the visible universe. Even babies understand this: Tests with infants have shown that they will crawl to the edge of a cliff, peer over the edge, and crawl back. In addition to understanding 'left' and 'right' and 'forward' and 'backward' instinctively, babies instinctively understand 'up' and 'down.' Thus the intuitive concept of three dimensions is firmly embedded in our brains from an early age." Michio Kaku, *Hyperspace* , Oxford, Oxford University Press, 1995, p 10.

29 Dava Sobel, *Longitude*, London, Fourth Estate, 1995, p 164 .

Augustus Earle, and which incidentally Darwin had encountered in their re-incarnation in the Panorama in London's Strand in 1831.[30] The panoramic format spread out before the eye, illustrating the principle behind Jeremy Bentham's concept of the Panopticon,[31] the best example in the world at that time being the Model Prison just down the road at Port Arthur. The Panoptic principle proposed the establishment of a view with no blind spots; a wheel of sight with the overseer at the hub, seeing yet unseen within a landscape of surveillance.[32]

Illustration 6. Panoramic drawing of Hobart, 1831.

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30 'In London I saw a Panorama of a Hobart Town: the scenery was very magnificent, but unfortunately there is no resemblance to it in nature.' excerpt from Darwins diary of 5th of February , 1835, quoted in *Charles Darwin in Australia*, p85.

31 Reality Television promotes its self as a transparent net which simply collects visual events without harming them, yet run along-side the articles on human rescue and canine endeavour, there are inserts which attempt to establish that video surveillance is no-longer an option for us, it must be accepted as an essential element of our culture that will make us safer. It trades on fear in order to realise control. We are living in a Panopticon that is being constructed from the inside, where amateur and professional video record every spectacle that occurs, and along with the attitude of, "if it wasn't video-ed, it didn't happen", we find ourselves believing that we are always under surveillance. The following quote is from a book by Janet Semple which describes Jeremy Benthams' design for the Panopticon; it is a disturbing portrayal with dark parallels to contemporary culture.

"Bentham's system of inspection had five different aspects; first, the prisoner was watched by authority to ensure discipline and good behaviour; secondly, the governor would watch the actions of his subordinates; thirdly, these subordinates would watch the governor; fourthly, the inmates would spy on each other; and fifthly, the whole structure would be thrown open to the public. The only darkness in this dome of light was that the eyes of the prisoners were veiled, they could not see their inspectors, their visitors or the inmates of other cells. And they could never know when the eye of inspection was upon them. .... The building was at every point a device to ensure the reality of inspection". Janet Semple, *Bentham's Prison*, Clarendon Press Oxford, 1993, p 140.

32 Bentham called the panopticon, 'a mill for grinding rogues honest'. Janet Semple, *Bentham's Prison*, Clarendon Press Oxford, 1993, p. 152.

Such a system did have its blind spots. The construction of vision around a disk-like structure makes sense to those pre-occupied with details in the surface and on the horizon, (as was the maritime culture of colonisation) however such a system was blind to concepts of depth. The tower in the Panopticon obscures what is directly above or below the central over-seer; vertical depth can only be achieved by stacking successive disks of this flattened space on top of one another. This leads to what I would characterise as a sedimentary accretion of Space, wherein time was understood as a shallow process which allowed history to build-up layer by layer without inter-mixing. This paradigm was quite suitable to the nineteenth century pre-occupation with Newtonian mechanics and linear narratives, however the newly emerging ideas of "Deep"[33] Geological Time being advanced by James Hutton and Charles Lyell were beginning to over-turn this conventional view. Charles Darwin was crucial to this change in understanding, as he was the first to provide a conceptual frame-work and factual evidence that suggested that the world had evolved over a vast period of time. He showed that massive upheavals could be accomplished gradually and without the intervention of God. Even more importantly, he precipitated a fundamental re-assessment of the relation of man to nature, by establishing the development of man as a valid natural phenomenon, and one worthy of scientific study.

**Sedimentary: Oceanographic: Holographic**

Darwin, Huxley and Lyell expanded the science of landscape space/time to include concepts of density: no-longer could landscape be seen as just one surface stacked on another, it had acquired the turbulent depth of the Oceanic. It was now rich with the unseen currents of an incomprehensibly ancient history, and the evidence for this was constantly being found in the twisted and folded fossil record. Spurred on by the Industrial Revolution, Empirical science had begun its transition from a clock-work, volumetric Newtonian view of space, toward a dynamic and energetic view of space/time, dense with the concepts of fields and currents discovered by Faraday and refined by Einstein as Relativity Theory. Contemporary physics shows us that space is flowing and turbulent; it is punctuated by singularities; it is finite yet unbounded, and it is warped by matter/energy. It tells us that the Ocean of space is a Holographic one, where in all waves ripple out to infinite bounds, and through reflection

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33 Stephen Jay Gould, *Time's Arrow, Time's Cycle*, Harvard University Press, 1987, p2.

and refraction influence all other waves. The transition to this understanding has been paralleled by a corresponding shift in the self-image of the observer; a progress characterised by a move from the observer seeming to be objective and detached from the experiment, results and equipment; to one of being inseparable from them and even an active influence in the nature of the results. There are no clear lines between observer and observed, subject and object, self and other, virtual and actual, representation and real.

## Mt Lyell- Contested Landscape

In 1862 the Government Surveyor Charles Gould was sent to find gold on the West Coast of Tasmania. It was only three years after Charles Darwin had finally published his Origin of Species manifesto, and Gould doesn't seem to have approved of the concepts expounded within it. Darwin was advancing a theory of time and space so vast that animals could morph themselves from one species into another through subtle variations over millions of years. With the support of Charles Lyell and T.H. Huxley, Darwin was extending the age of the Earths' landscapes well beyond the limits of Gould's creationist imagination, and it seems Gould felt compelled to concretised his disapproval through his strategies of naming; attempting to permanently inscribe his preferred version of events within the landscape itself. Gould named the three highest peaks of the West Coast range in honour of Sedgwick,[34] Jukes and Owen, all bitter opponents of Darwin's theories; in contrast the three smaller peaks were named after Darwin, Huxley and Lyell. Ironically Gould found no payable deposits of minerals during his investigation of what was later to become Australia's richest copper field, and further, the great bulk of mineral wealth eventually found in this region has come from Mt Lyell.

Mining of the landscape at Mt Lyell began on the surface in 1883 and continues today 900 metres underground. The Oceanographic experience of the landscape I have previously described, became fully present to me as I travelled under this mountain for the first time. I was struck by the sheer volume of rock above my head as our vehicle travelled into the face of the cliff, the landscape vanished as I entered it, sinking down seven kilometres of decline in a four wheel drive, lights flashing, the air a sea of unlocatable echoes; I felt trapped like a deep sea diver in a diving bell. The mine extends the concept of the simple cave beyond human scale, there is no simple exit into the light from down there, the bathymetric pressure of the ocean of rock above demands decompression, there is no instant escape, no bursting to the surface. It seems so strange to stand on a tunnel floor, at once above ground and underground. There was an intense sublimity in the experience of these spaces for me. They conjured vivid images of The Deluge before my eyes, the fear of a sudden and overwhelming flood of rock, the landscape become asphyxiating

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34 Adam Sedgwick, Woodwardian Professor of Geology at Cambridge University, under whom Darwin studied as a postgraduate student.

fluid, choking and blinding; drowning me.

The old Mt Lyell open-cut is a wilderness. In 'Common Landscape of America', John Stilgoe traces the roots of the word wilderness to the anglo-saxon *'wylder ness'*, which identified the nest or lair of the wild beast. He says;

> "Bewilderment meant encountering the dragons and great worms of age old tale, and it meant fighting off wolf packs, boars, and bears. It meant confronting the fragmented former oneness of man and nature, and it meant knowing the true fragility of civilised order. Wilderness identified those spaces beyond human control, the spaces of bewilderment, the spaces of heathen".[35]

In this age when all topographies are under the gaze of the satellite, there can be no wilderness in the sense we generally use. Even South-West Tasmania is no-longer a wilderness, it is a landscape. We have projected onto that space ideas about virgin nature and untrammelled beauty, and these are false. Aboriginal history has occupied this region for perhaps 40 000 years, and every day of the year there is a bush walker in it some where. We no-longer fear these so-called wild places, they are domesticated and fully mapped, they are wild landscapes perhaps, but not true wilderness. The spaces we fear now are different, the lair of the beast is the den of man, the dark hole filled with our own excreta; the nuclear dump, the toxic waste storage tank, the abandoned mine-field, the nuclear test site, the battle field.

Illustration 7. J.W. Beattie panorama of Iron Blow Mine, Mt Lyell, 1893.

Mining might seem to be one of the primary un-natural expressions of western mans' objectification of the landscape and the individual's separation from it, yet this is far from true. For early miners their's was a journey into the womb of the life-force itself. Rupert Sheldrake observes in his book The Re-birth of Nature that;

> "Mother Earth was seen to be very active. She was thought to exhale the breath of life, which nourished living organisms on her surface. If pressure built up within, she would break wind, causing earthquakes. Fluids flowed with in her and the water came out of her springs like blood. Within her body there were veins, some of which contained liquids, and others solidified fluids like bitumens, metals and minerals. Her bowels were full of channels, fire chambers and fissures, through

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35 John Stilgoe, *Common Landscape of America*, Yale University Press, 1982, p10.


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> which fire and heat were emitted in volcanic exhalations and hot springs. She bore stones and metals within her womb, and nurtured them as they grew, like embryos within her, ripening at their own slow pace.
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> All over the world miners traditionally practised purification rites before entering the womb of the cave or the mine; they were entering a sacred region, a domain that did not rightfully belong to man. The mythologies of mines are replete with fairies, genii, and gnomes, the diminutive guardians of the treasures of the Earth. The ores were then taken to the furnace, which speeded up their ripening by heat; the furnaces were like artificial wombs, and the smelter and smith took over the gestatory and formative powers of the Mother. In ancient societies metal-workers and smiths were at once feared and held in high esteem; their powers were regarded as both sacred and demonic."[36]

My project has focused on Mt Lyell because of the paradoxical beauty I find there, and because of the strange similarities between mining and my image making processes. A mine is a mythic landscape being re-created at the very instant of its annihilation, and the geologic violence of this reality literally under-mines any neat conceptual divisions between concepts like wilderness and culture. Mt Lyell is contested ground, a no-mans land that exhibits aspects of the tragic wasteland and the majestic Eden. It reminds me as much of the trenches of the first world war and an abandoned Nuclear Test Site as it does Monument Valley, The Grand Canyon, or the Dakota Badlands. Mining pits the chemistry of explosives against geology at a scale that is sublime.

Illustration 8. Photograph of Mt Lyell Opencut, 1996.

In many ways the methods of my digital image construction parallel those of the miner. The black spaces inside my two cameras, sunk into the field of electro-magnetism that I quarry, echo the working galleries of a coal pit. The gelatinous lode I work consists of silver traces which I digitally screen from the flux of spacetimes past. This is assayed and analysed down stream using the computer, and then the refined image pairs are filtered and layered; and finally metamorphosed into a mass producible alloy of chromatics and density.

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36 Rupert Sheldrake, *The Rebirth of Nature- The Greening of Science and God*, Century Publishing Great Britain, 1990, p 7-8.

## Influences

Paintings of historical events, news photographs and snapshots have transformed the personal and cultural construction of memory, and through this they have modified History itself. There are images I cannot forget, like those of The Holocaust, even though I was not born when they were taken; and these images, (in conjunction with those which emerge from the more fluid and ambiguous spacetimes of art), transform and externalise our memories, and have resulted in a strange contemporary image culture which often seems to serve as a 'collective memory' at the cost of personal amnesis.

Out of the many images and experiences that have influenced me, a handful float toward prominence when I consider my life in relation to this project. Exploring and photographing stone-age burial chambers and forts in Ireland, Wales and Scotland in 1988 had a major impact on me. I was instructed by the way the stone work was sculpturally integrated with the landscape, and delighted at the realisation that these structures where both a 'technology' and a paradoxical testimony to the very natural history of my species.

Illustration 9. Neolithic stone fort, 1988.

Thus it was that I began a long process of seriously questioning my pre-conceptions about divisions between culture and nature as reflected by images of the landscape. As a young photographer I had been greatly impressed by the work of Ansell Adams and local photographer Peter Dombrovskis; the transcendental grandeur of the romantic Eden they conjured was hard to resist, and yet as my idealism faded, so my taste for these images was soon dulled. I remember feeling sad that I had sucked the marrow from these icons, and was now immune to the charms that had held me in rapture.

I found my imagination engaged more fully by images of nature as a sublime force;[37] an awesome and impersonal generator and recycler of phenomena. The

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37 "To the romantic artist the sublime was a way to span the abyss between inner and outer, and outer and 'the Beyond'. It was in part an attempt to resolve the most pressing epistemological dilemma of the time- the disjunction between subject and object. In fact the sublime experience itself is an attempt at the farthest perceptual extreme to reconcile subject and object, self and nature.... The moment subject and object are interfused, the comparing faculties cease, and unity at last may result. And the objects most capable of

more apocalyptic paintings of J.M.W. Turner, John Martin, Thomas Cole and Frederick Edwin Church satisfied this interest. For me the most powerful of these images deal with the theme of The Deluge. Although this is initially an overtly biblical reference, the concept re-appears in many of the works of these romantic painters as an expression of a general fear of being swept from the solid ground of reason by the irrational and un-civilised forces of a sublimely 'feral' nature. The post-industrial-revolution degradation of this planets resources has even spawned a post-modern refinement of this apocalyptic sublime; that is the "Green House", a slower, hotter deluge, with mother nature as the avenging parent.

Illustration. 10 'The Deluge', Francis Danby, 1838.

The concept of the deluge in painting has also been mirrored in literature since this time, and there are a number of important books which have helped formed my preoccupation. Thomas Jeffries' After London; Wild England, written in 1887, George R Stewart's Earth Abides of 1940, and Russell Hoban's Riddley Walker of 1980 are all exquisite depictions of life after the fall of the techno-capitalist world, where wild nature re-claims the globe, and man is again small and responsible.

The image of the open ocean is closely related to that of the deluge. Thus the exploits of the mariner are the subject of many sublime tales. Both Edgar Allan Poe, in The Narrative of Arthur Gordon Pym of Nantucket, and Joseph Conrad, in Heart of Darkness, create miasmic descriptions of the tumultuous space of the sweeping ocean as metaphor for man navigating the space of life.

By the time the photographer Timothy O'Sullivan began making his images of the American west in the late 1860's, wilderness was being regarded as a resource rather than a threat. The austere and pristine quality of his images gives an uncanny impression of the serious emptiness that Eastern America saw in the west. There is a sense of intense gravity to his vision that holds everything fixed in a petrified atmosphere, as if the gelatine had oozed out of the print, setting into the scene itself.

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initiating this conjunction are those most beyond the constraining power of the intellect: the vastness of the skies, the expanse of the sea, huge mountains. The sublime thus came to imply the surreal, and what started as an aesthetic became a metaphysic." James Twitchell. *Romantic Horizons.* 1983. p11.

John Watt Beattie made similarly dramatic views of the Iron Blow mine at Mt Lyell in 1893. These images poignantly pre-figure the battle fields of the 1914-18 conflict in Europe; they show how chemical and explosive warfare have wrought havoc on the industrialised landscape, leaving the ground cold and alien. As historic documents they are both realistic and romantic, and exhibit a stark panoramic quality I find characteristic of 'remote sensing', it is un-self conscious, and reminds me also of the moonscapes taken by the astronauts of the Apollo missions.

Illustration. 11 J.W. Beattie panorama of North Mt Lyell, 1893.

Between 1977 and 1979 *The Re-photographic Survey Project* located and re-photographed over 120 sites in the USA which had originally been documented by Timothy O'Sullivan, William Henry Jackson, and other pioneering photographers whilst surveying in the 1860s and 1870s. The RSP painstakingly matched original vantage points and even duplicated the seasonal light and time of day, and in doing so produced a remarkable series of documents which challenged the way landscape and photography were read.

Illustration 12. Pyramid Lake, Nevada by Timothy O'Sullivan, 1867, and Mark Klett, 1979.

Just as the New Topographic photographers had done, the RSP photographers concentrated on the vernacular landscape. As Thomas Southall observes in his paper 'Second View: a search for the west that only exists in photographs';

> While the New Topographic photographers rediscovered undervalued, common landscapes, the RSP explored similar territory by showing what had become of landscapes that might once have been considered wilderness, but now had experienced at least a century of human activity. Many changes and losses documented by the RSP are obviously to be lamented, but their photographs also suggest that human occupation does not necessarily have to be destructive, radical, or uncontrolled. In fact the RSP's refusal to draw predictable negative conclusions about the evidence of people in their photographs makes the project all the more useful to critics and contemporary commentators re-evaluating our relationship with the land.[38]

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38 Thomas W Southall, 'Second View: a search for the west that only exists in photographs' in *Perpetual Mirage- Photographic Narratives of the Desert West*, New York, Whitney Museum

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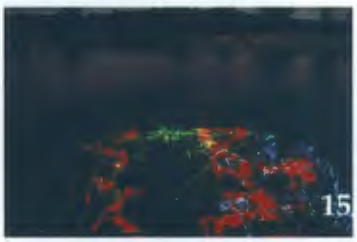
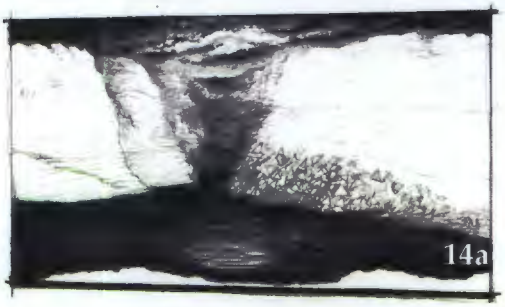


15



14a

14b

Peter Goin and Richard Misrach are two photographers who have extended this technique of re-evaluating the vernacular by applying it to domestic american wastelands created by the military in peace-time. Goins' Nuclear Landscapes series examines the left overs of nuclear testing grounds and storage areas. The images testify at once to the resilience and strength of nature, which we see reclaiming the ground, at the same time as hinting at the invisibility of the extreme radioactivity which still makes these sites unsafe for humans.

Richard Misrach's series 'Bravo 20' is a work of art in the tradition of the apocalyptic sublime. Misrach took these images at a naval bombing range in Nevada. They show a landscape convulsed by ballistic testing, a world of bomb craters and burnt out vehicles splendid in the clear desert light. The subtle colourations and exquisite surfaces somehow begin to naturalise the extreme emptiness, and as a viewer I find the images make me feel simultaneously strangely proud and quietly guilty that I can aestheticise their form through abstracting their content.

> I found myself at the epicentre, the heart of the apocalypse. Alone, no sounds, no movement. No buildings, no roads. No indication of life, no promise of civilisation. Only the smell of rusted metal. Bombs and lifeless holes. Side by side were great beauty and great horror.[39]

Illustration 13. 'Bomb, destroyed vehicle and Lone Rock', Richard Misrach, 1987.

In closing it is interesting to note that during the past one hundred and fifty years very few artists have attempted to make stereoscopic works of art. Since its emergence the technique has been almost entirely limited to use within documentary and scientific traditions of image making. In the nineteenth century a great deal of pornography was imaged using stereoscopy, and some critics have linked this to the popular decline of the medium after this point. Marcel Duchamp[40] made at least one experiment with stereo images about the

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of American Art, 1996, p 196.

39 Richard Misrach, quoted by Terry Williams in 'Richard Misrach's Bravo 20: The bombing of the American West', in *Perpetual Mirage- Photographic Narratives of the Desert West*, New York, Whitney Museum of American Art, 1996, p 187.

40 See his 'Handmade Stereopticon Slide, 1918-1919', referenced in *The Optical Unconscious*,

time that he made his 'Roto-reliefs', and Salvador Dali produced some rather curious and little known stereo paintings, which are basically revisions of his 'flat' works.

In terms of contemporary investigations of the medium, *Geo-derma* 'is a collaborative project, involving artists Brian McClave, David Carson and George Millward, 'investigating the relationship between the perception and understanding of a three-dimensional environment, the manipulation of materials within this space - both historically and contemporary - and the resultant alteration to the inhabited terrain,'[41] .This will be shown at Perth Institute of Contemporary Arts, in Western Australia, from 11th of February to 15th of March 1998. I have communicated via e-mail with David Carson and exchanged sample images, however at this stage I am unable to comment on the content or form of the project.

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p 131.

41 Quote from Introduction of website for Geoderma at http://www.imago.com.au/geoderma/.

## Methodology

### The exploratory drive.

"There is always a wild longing - a thing I cannot describe - which makes men want to go out again to wild, unknown places."

This is a quote attributed to Ernest Shackleton, which I found inscribed in the diary of my great grand father John Ernest Philp. It appears as a pre-fix to his daily track notes, made whilst surveying a new route into Frenchman's Cap for the Surveyor General in early 1910. The quote appears on its own page prior to the first entries, and serves as a comforting reminder to me (as I imagine it did for him), that I am not alone in my strange compulsion to explore, and perhaps I have never really had a choice. My practical research has always been based in the landscape, and my prime motivation in making art has been to create artefacts which can communicate aspects of my awed response to the physical surroundings I experience when exploring.

From my earliest experiences growing up in a bush setting atop a sea-cliff, I have found myself profoundly moved by the character and arrangement of the space that enfolds me as I live. I have walked, climbed, swum, cycled and flown through as many of them as possible in an attempt to live some significant part of my existence in such places and thereby gain direct knowledge and insight into their attributes. Such topographic inspiration is not simply limited to the realm of concrete external space either. It is clearly mirrored in our internal imaginary dimensions, within the archetypal landscapes of thought in which we all dwell, and it is the intent of my theoretical research and studio practise to construct images which make the inter-relation of external and internal landscapes visible to others.

### First Encounter

Three approaches to my subject have developed over time, and the approaches taken are heavily influenced by the extent of my familiarity with a site before I attempt to record it in stereoscopic form. The considerable weight of my equipment in the field means that most initial explorations into an area are performed with only a single camera and sketchbook, and frequently without camera or map. The emphasis is on approaching places in an intuitive mode, such that imaginary responses to the landscape can project themselves into the

still unknown areas of a site, and in so doing the mind and body are engulfed in fantasies about what might be 'there'. I often make drawings on site, and pre-drawings of photographs may also be made between the time of the encounter and the time when the film is processed, so that first impressions represented by the drawings can be later compared with the more 'objective' photographic impressions.

Once I have decided to make a stereoscopic record of a place, a primarily non-interventionist approach is adopted. I tend to focus on the spaces, locations and views which elicit the strongest emotional responses from me, and then attempt to crystallise within the stereo image some prompting traces of the affect the space has on me at that time. I work to find out more about the relationship between my subjective knowledge and vision, and the enfolded dynamics of the terrain I photograph. I carefully choose my points of view, but do not manicure the sites. The emphasis at this stage is on a direct response without intellectualisation.

Illustration 14. 'Pre-drawing' and photograph of 'The Iron Blow', Mt Lyell, 1996.

**Return - intervention/ tracing lines of natural force.**

Returning to a site marks a literal "re-vision" of it. The temporal aspect of my working method now begins to operate beyond the bounds of an individual visit, and this means a relationship has begun. Memory affected by time interacts with my senses to create new spaces, as layers of past and present experience begin to alter in significance. By photographing at night, long exposures can be employed to compress chunks of space and time into stereo image pairs, thus creating a chemical memory trace which extends the subliminal instant of high-speed photography, into the spacetime continuum of the stereo representation. Here time is the 4th dimensional axis, encoded within the movement of elements across the space during the long exposure. Light sources, for example a flame or laser, the moon and the stars, articulate the space as they traverse it, leaving chords, beams and pockets of illumination in/of the space. Some are used to stabilise the images in a manner similar to lines of longitude and latitude on a map, whilst others act as beacons and spotlights which broadcast the specifics of their locality. Others function as the traced gestures of my direct physical actions, or as traces of natural energies within the space; for example the movement of lights generated by the action of

wind and water. Objects are employed to define the space and make reference the markers of industry and science.

Illustration 15. Timelapse photograph of dam outflow, Bronte, Tas, 1997.

**Synthesis/Reconstruction- implicating the viewer**

Finally, re-working these images in digital form allows me to work with stereoscopic representational space as a plastic medium. By using digitised stereoscopic pairs it is possible to construct, combine and refigure spaces in new ways. Exchange between once separate spaces and their attendant qualities can be as simple as the multiplication and transferral of points and objects, or as complex as the fusion of textural and spatial information from a group of sites into an altogether new space. The method of viewing greatly affects the sense of space and immersion that is be achieved, whilst also making the viewer aware in varying degrees that they are an accomplice in the creation of the work. There is no doubt that the final images are formed in the mind of the beholder, rather than existing on the wall.

The digital Anaglyphic stereo images are constructed from contrasting colours, (generally red and cyan or magenta and green are used), and viewed through a pair of lenses with one colour over each eye. This enables each eye to see only one channel of the stereo information in the original two colour print, and the brain then synthesises the two colour streams to achieve binocular stereoscopic vision. The degree of offset between the two sets of information therefore determines the spatial plane of the object depicted. By varying this separation, an object can be made to rest on, in front of, or behind, the apparent surface of the image plane. Matching of the colour of the lenses in the glasses with the printing inks is critical.

Mirror stereoscopes have been chosen for the viewing of the large stereo pairs because they dramatically illustrate the existence of the privileged points of view, or 'stations', which conventional linear perspective rules establish. The eyes must be placed in a specific location in order to see the complete view.

Both the use mirror stereoscopes and anaglyph printing allow the image to be seen flat as well as in three dimensions, thus making explicit the rift between the wall and the spatial synthesis achieved by the mind. The intrusion of peripheral details does serve to partially disrupt the sense of being contained

within the representation, and for some individuals this will collapse the three-dimensional continuity of the image altogether at times.

In this project I have restricted my use of lens stereoscopes to viewing my raw 35mm slides. Lens stereoscopes (which I have employed in the past), use lenses to enlarge the stereo pair so that it fills the field of vision. These smaller devices are looked into, and generally provide a more complete feeling of immersion due to the fact that they mask out the external environment. They give a sense of being transported into a private sensorium, one that is no longer firmly anchored to the every day world.

**Technical Issues.**

The technical issues which have arisen during my research primarily revolve around topics related to;

(a) acquiring the left and right image channels for a stereoscopic pair,

(b) manipulating each image individually whilst viewing the pair in stereo,

(c) re-combining left and right channels for printing,

(d) the scale of the final image when rendered as a large plotter print,

(e) and, viewing the print in stereo.

A Macintosh computer with twin 180 mhz processors and 250 Megabytes of RAM is used to run Photoshop 4, which is used to write post script files to a Raster Image Processor which drives a 50 inch Nova Jet Digital Inkjet Plotter.

I work initially with a 35mm slide film scanner, and a flat-bed scanner. With 35mm images the original file sizes generally run to 30 Mb RGB and 7Mb B&W TIFFs at maximum. Working sizes can drop as low a few hundred Kilobytes per side and still retain significant spatial information.

Raw scans are then optimised for tonal range and brightness, and cropped. This first crop should be limited to the largest width and height that is common to both the images. With file sizes identical it is now necessary to add spare pixels all around the image, (a 10% margin is good). This free canvas space enables the two images to be combined as layers and then floated above each other and rotated without losing any of the image. By using the Difference setting with the layer combinations it is possible to check the precise alignment of features in each image.

To align the images, a point or object must first be chosen which will be used to define the level of the picture plane. Usually this is taken to be the closest object to the camera. If so, the image then appears to exist behind the plane of the wall upon with which the frame sits, if not, some part of the picture will appear to project out into the room in front of the picture plane.

Once this point has been chosen, the images are aligned vertically and

horizontally around it. Next it is necessary to choose a major horizontal line (or series of points), to act as an artificial horizon. This line is then checked for rotational alignment between the two. The pair is then checked for composition and cropped for final height and width to create the standardised pair. Lens distortion may also become apparent at this stage, but is very difficult to correct for.

In order to manipulate the images whilst working with them in stereoscopic space, it is necessary to master the technique of cross-eyed viewing from the computer monitor. The higher the screen resolution of the monitor the better. First the left and right files are opened and placed on the desk top at the same magnification. The left image is placed on the right side and vice versa. The eyes are then crossed until the left eye is looking at the left frame, which is on the right side of the screen, and the right eye looks at the right frame which is on the left side of the screen. The successful combination results in stereo fusion.

While maintaining this fusion, it is then possible to introduce layers, images and objects into the 'cross-eyed' stereo space of the 'master' images. By adjusting the amount of horizontal offset between any part of the left and right images and its background, (positive or negative relative to the point which locates the level of the picture plane), it is easy to move that object backwards behind the picture plane, and forwards in front of the picture plane.

The two main methods that I use for recombining the left and right images prior to printing are dependant on the intended mode of viewing. Mirror and lens stereoscopes require prints with the left and right images on their correctly named sides. Wall mounted prints for cross-eye viewing are also extremely effective, and vary only in that the images are reversed, and on the incorrect sides of the print as it where, however they require that people viewing them have mastered the cross-eyed technique outlined above.

Anaglyph images work due the fact that the two channels of stereo information are carried by discrete colours. Colours which oppose one another on a colour wheel are naturally the most effective. Red and cyan are the most frequently used colours, since relatively stable dyes can be manufactured which pass or reflect only these parts of the spectrum. When a pair of red/cyan glasses are worn in front of the anaglyph print, the red lens passes only the red portion of the print, thus making red areas appear light, and cyan areas appear dark. Thus

each lens passes only one channel of the stereo image, and stereo fusion results.

Critical to the Anaglyph method of printing is the exact control of the colour range and contrast in the final print. This is because the print cannot contain any black channel information. When printing in CMYK it is necessary to finalise the image in RGB screen mode and save this master before beginning a series of tests designed to establish a transfer function which has no black generation, and which produces a printed grey from a carefully balanced mix of cyan, magenta, and yellow. Thus an image can be made on screen, and then have a precise series of contrast and colour corrections made to ready it for printing. The image will look very different on screen at this final stage compared to what comes out of the printer, so a very clear methodology must be established and maintained.

## Conclusions

This project has demonstrated the ability of digitally augmented stereoscopy to provide an immersive environment which is capable of communicating new visual models of landscape experience.

The visual thesis demonstrates that aesthetic qualities arising specifically from direct experience of our physical environment are able to be reconfigured and represented in a concrete form that is unique to the digital stereoscopic medium. It also provides evidence that this system of visual representation is able to challenge current Virtual Reality technologies in terms of the credibility of stimuli and the presence of the space depicted. The thesis also demonstrates that human scale stereoscopic prints invoke for the viewer a heightened indexical relationship between the landscape and its representation, and that this in turn induces a space of contemplation.

The exegesis examines the history of systems of representing landscape space and the influence that such systems of spatial representation exert upon the manner in which landscape is viewed, understood and utilised. It also examines the physiological basis of digital stereoscopy and concludes that the application of digital processes to stereoscopic photography can produce new models of experiencing, representing, and comprehending space, and that this spatial experience is largely independant of detail and hence is only loosely related to image resolution. Observations regarding the anaglyphic and mirror stereoscopic methodologies employed conclude that the application of digital processes to stereoscopic photography can result in new aesthetic modes for presenting and representing landscape as a comprehensive experience and that such presentations can be used to enquire into the manner in which the aura of a landscape space is established and maintained.

Research conducted into the theory of landscape representation leads to the conclusion that 'wilderness' is now a mythic dimension of the world, and that theoretical debate over the definition wilderness is an activity that highlights the contemporary shifts in modern distinctions between nature and culture. This area of philosophical enquiry will form the foundation of further research by the artist.

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