Drawing and Visualisation Research

Published in *TRACEY* | journal
Drawing Across Boundaries
Sep 1998

www.lboro.ac.uk/departments/sota/tracey/
tracey@lboro.ac.uk

Proceedings of a symposium held at Loughborough University in September 1998

FROM DRAWING TO COMPUTING AND BACK AGAIN

Angela Eames [a]

[a] Department of Visual Arts (Drawing), Camberwell College of Arts

Being is not unlike drawing - drawing ***exists***.

Drawing is not unlike painting - painting involves ***uncertainty***.

Painting is not unlike running - running can be ***transcendent***.

Running is not unlike working - working allows for ***strategy***.

Working is not unlike programming - programming favours ***reason***.

Programming is not unlike thinking - thinking is not ***static***.

Thinking is not unlike drawing - drawing is ***being***.

INTRODUCTION

In the late 1980s, I was working on a series of drawings which involved multi-layers of stencilled graphite elliptical shapes on paper. The drawings were all four feet square and worked on a horizontal surface. Two drawings in particular, *Opus* and *Upstream* were carried out in 1987. These took many hours to carry through and on completion of six such drawings I was beginning to feel like a machine. I had never felt the urge to go near a keyboard before (with the exception of my venerable, portable typewriter), but I had this inkling that a computer might be able to carry further what I was trying to do. I, as a human computer, could only go so far, but maybe the genuine article could take my strategies as far as they could go. As luck would have it, some two years later I gained access to an *Amiga*. It was difficult, to say the least, without manuals or instruction, but I did have an aim; to see if the computer could produce layered ellipses. Six weeks later I found that it could. Not only that, but in terms of breaking down my mark-making skills, it was a gift.

A pair of drawings were carried out whilst I was lecturing in Rio de Janeiro in 1988, at a school called Parque Lages. They are titled *Inside/outside* and *Outside/inside*. The dimensions are five feet square in each case and the media, graphite on paper. Other drawings titled *Life-class* and *Amalgam #6* were carried out in 1989. *Life-class* was carried out using manual compositing and *Amalgam #6* was carried out using a drawing board constructed as a convex curved surface; both are five feet square, graphite on paper. I refer to these works to point out that it was the drawing practice itself which designated the use of computers although it was several years before I realised that these drawings incorporated equivalents of transformations, for example, cut and paste, wrapping and stretch. In addressing the subject of drawing in relation to digital technology, my views are governed by my drawing practice, an acknowledgement or perhaps acceptance of the indefinability of drawing and not least my experience of teaching drawing for many years.

To come to the point, I propose that the resurgence in drawing during the past few years, evidenced in country-wide exhibitions, an increase in educational emphasis and as the chosen topic of this conference and others, is largely due to the advances in technology itself. I propose that were we not faced with a somewhat myopic attitude toward the visual arts and computing there would not be the intuitive and renewed interest in the practice of drawing. Wherever there is a tendency for visual decisions and evidence to be predicated by the medium itself, there is a need to develop visual language appropriate to the moment and to persist in engagement in terms of *purpose* rather than *style*. Were we able to think and move around the computing environment in a more intuitive manner (of course this may only be a question of time and familiarity), we might be able to question, provoke and more fruitfully engage in social, cultural, political and economic issues so dramatically affected by technological development. I deliberate rather than criticise.

In the making and placing of marks, two and three dimensionally, drawing has ultimately led us to the electronic realm which in turn continues to discharge responsibility and incite engagement. Drawing as visual thinking, unconstrained by means or method, is both rudimentary and vital in developing human awareness of 'reality' in a synthesis of natural and artificial. I refer to visual work, not necessarily drawings, since I am concerned with visual thought as opposed to finalised examples of drawing. My views are governed by my drawing practice, an acknowledgement or perhaps acceptance of the indefinability of drawing, and by my experience of teaching drawing. Despite my objective stance in working, I cannot deny the subjectivity of my approach as moulded by influence, conditioning and not least interests. These will be evident in the selection of visual work and the inevitable overlap of ideas and concerns. The chosen work is appropriate to the subdivision of content in the following sections:

1. Exists - drawing as actual, as a reality
2. Uncertainty - drawing as the pursuit of an untrodden path
3. Transcendent - drawing as spiritual document, as revelation
4. Strategy - drawing as endeavour encompassing intuition and rationality
5. Reason - drawing as cognitive thought
6. Not static - drawing as continual probing
7. Being - drawing as forming.

In consideration of these issues I make no apology for the free and frequent use of texts written by artists, critics and historians. Their texts demonstrate in many cases a concurrence with my own deliberations but they also allow the intervention of different voices within the writing. Neither do I exclude or dismiss parallel insights and understanding gleaned from scientific and technological research or philosophical thought. I make reference to visual thought as drawing, implicit within a range of visual practice and in spite of art historical positioning.

EXISTS - DRAWING AS ACTUAL OR VIRTUAL BUT NEVERTHELESS A REALITY

A survey of two and three dimensional visual work reveals both an interconnectedness and a separateness of these two realms. Drawing a two dimensional reality on a two dimensional surface from a three dimensional reality demands an experiential acknowledgement of both. One is not making a copy or an illusion of three dimensions in two dimensions. Similarly, the activity of drawing within the computer does not have to be seen as making an illusion of three dimensions. The computer offers a peculiarly non-physical association of mark in the equality of presence and the quality of mark through pixels, whether monochromatic or chromatic. Traditional drawing is a physical act whereas drawing on, or perhaps into, a computer screen could be described as physical but different. Both activities are nonetheless real.

In a work by Robert Morris dated 1985 entitled *Blind Time III*, Morris worked blindfold with graphite on paper for fourteen minutes. The result is an actual and physical embodiment of human intention and emotion, the intimacy of drawing and touch, between art and the body. No amount of previous knowledge could predict the outcome. The drawing was carried out within strictly defined parameters but contingent upon his particular emotional and physiological state - straightforward recording - recording *III* in this case - never to be repeated - an actuality. A work by Robert Rauschenberg, the infamous *Erased De Kooning* drawing involved the erasure of a De Kooning drawing. Here there is also actuality. Though the surface of this drawing appears not to have definitive marks, it has the evidence of those once-made marks. They are made present in the evidence of their absence. In acknowledging the biographic mark, Rauschenberg was rethinking the possibilities within drawing. In some ways the erased De Kooning might be considered a virtual drawing - it entered a new realm of drawing.

A drawing by Frank Auerbach, *Portrait of J.Y.M.* can be paralleled by a work made by Michael Kidner entitled *Column No 1 in front of its own image*. Both Auerbach and Kidner are drawing actualities. Auerbach has no set parameters other than that there will be a search and that the search will take time and commitment on the part of himself and his sitter. The image, Tony Godfrey writes, 'only comes about after endless activity before the model or subject, rejecting time and time again ideas which are possible to preconceive.'[i] Auerbach's approach verges uncomfortably on aesthetic decision-making, whereas Kidner totally accepts the outcomes of his strategies. The black and white marks on the flat canvas plot a three dimensional column from different viewpoints. The column is mapped and a new version of the column in two dimensions is revealed as an entity. The transference from three dimensions to two dimensions could not be anticipated or preconceived. As an artist working with systems, Kidner is one of those artists engaging in spatial mergers whose systematic approach to work prompts a greater understanding of nature, science, art and computing space.

We use the word *virtual* when talking about aspects of the computer-generated world and involvement with computers gives some experience of this. Woolley describes virtuality as 'abstract entities, in being independent of any particular physical embodiment, but real nonetheless. 'Virtual', then, is a mode of simulated existence resulting from computation.'[ii] As human beings, we assimilate our sensory, or even hallucinatory, experiences, acting out a form of simulated existence as part of a complex survival strategy - we intuitively learn how to cope in the *world*. Exposure to new and different ways of seeing requires looking, absorbing, incorporating and learning. We would probably have had some difficulty in assimilating perspective had we been around at its inception. What is new work which is inherently out of sight? When watching television, are we able to distinguish between two and three dimensional digital imagery, given the fact that the imagery is viewed through a two dimensional medium - the screen? Can we even distinguish between film and video? Can we or do we distinguish between television and the physical world? And does this all

contribute to the blurring of boundaries between natural and artificial? We have to work at it to find out.

I consider drawing activity as being tripartite involving the observer or the investigator, the observed or the subject matter, the observation or the outcome. The observer, investigator or *drawer* examines and scrutinises throughout the working process and the process culminates in actual results or *drawing*. When questioning, searching within, or commenting upon the nature of the environment via whatever means, one is engaging in the actual and the real and the outcomes are in fact actual and real. The making of a drawing which consists of physical material whether that be the interaction of graphite and paper or motorcycle tyres and dirt, results in an actuality - a drawing. When working within the electronic realm of computing the absence of the physical does not necessarily denote that the results are abstractions or not real. The outcomes of visual thought, strategy and implementation within the computing arena are in an equivalent sense real but they are pertinent to the virtual. Whilst some work may culminate in outcomes which can only be engaged with by means of electronic interaction, other work may be presented in material form - digital imaging as printout, video, projection, installation etc. Visual thought remains a critical factor in the implementation of work.

UNCERTAINTY - DRAWING AS THE PURSUIT OF AN UNTRODDEN PATH

By 'untrodden path' I mean the path which each individual or group of individuals tread within their lifetime, historically, geographically, culturally and physiologically. Human beings deploy eye/hand/foot/brain in response to what I would call object-interference (life forms, buildings, objects, still and moving). Constraints in perception are necessary to operate within our physical environment, since there are aspects of the environment of which we are not fully conscious. This is not to say that one remains unconscious of these aspects. They may well reveal themselves at moments when one is less conscious and more receptive. They might not be invisible but they can be hidden or unperceived in normal daily endeavour. The acceptance of this condition or state of being only serves to exacerbate the situation with regard to what we might actually be able to perceive; the invisible or unknown.

If one were to tie a brick to the wrist of one's natural drawing hand or to blindfold oneself, the ability to operate in a habitual or mechanical manner is modified. The brain and the body are subjected to unfamiliar circumstances, unfamiliar that is, until one adapts to the new conditions and habit takes over again. This is not mentioned as an illustration of futile attempts to break habit. In an exercise of this nature the restraints are additional to the selected subject matter. They take the subject matter beyond simple drawing gesture and brain activity and force the drawer to recognise habitual tendencies and hopefully superficiality of response. Drawing remains difficult but one has an opportunity to recognise this fact.

At the risk of promoting controversy, I would describe Richard Long's work as a drawing. Rudi Fuchs describes Long's word-pieces in particular as 'visual art using words; they are, like the map pieces, rather dry in their formulation. That is, they do not syntactically construct an atmosphere, as poetry does.'[iii] These drawings utilise verbal language as an equivalent of mark or evidence. In an equivalent sense an earthwork carried out by Michael Heizer in 1971 where he inscribed curved lines on the surface of the desert with a motorcycle, could be called a drawing, one which consisted of physical material and involved the making of marks in the interaction of motorcycle tyres and dirt. The drawings of both Long and Heizer result in actualities. Both works involve the linear, duration/time, distance and an element of control, and neither work emanates from a previous conception as to the outcome. In Long's case years of previous experience offer a surety in procedural terms but the individual pieces of work carried out in differing geographical and climatic locations embrace immediacy and uncertainty. In the words of Frank Popper, 'Long makes images which resonate in the imagination, that mark the earth and the mind and make a plea for a considered, sensitive intervention by man in nature.'[iv]

Uncertainty can be seen in the work of Jan Dibbets and Eva Hesse. Dibbets is an artist who uses photography as a means to draw that which is not usually, if ever, seen. He records moments in time. In the case of *Corrected Perspective (studio)*, he records a moment in time and space where the camera corrects the perspective of a drawn trapezoid shape on a wall of his studio. The eye sees a photograph of his studio where a linear square hovers on the surface of the photograph - somewhere between two and three dimensional space. It is a photographic moment - a record of what the eye would see, should it be in that particular position. When Eva Hesse physically hangs ropes and twine in three dimensional space, these strands are literally drawn through space, they are suspended and dangle, interconnected and amorphous, denying geometric conventions but alluding to a natural and organic order. They reference the realms between two and three dimensional space. They focus on what is at the edges of conventions and delineate our attempts to straddle these boundaries. Rosalind Krauss maintains that 'she locates her reading in the sublimated, fronto-parallel plane of modernist opticality, the skeins dancing weightless before our eyes. But though she locates this plane by means of her own insistence on uprightness, and of the wall as a kind of backdrop or support for the image, she also defies the meaning of the plane, its existence as a precondition of form.'[v]

A phenomenon of the current use of computing might well be a lack of discernment and originality. The assurance with which one might work in a computing environment (power failures aside), wherein information can be recorded and salvaged, can be a seductive and easy route at times. We are all aware of the inability of bringing fresh words to the page when adapting texts on a word processor and the question must be, how can one work with uncertainty in the computing environment? The evolution of the computing environment owes much to artists who have insistently probed space.

Concerning the above a phrase comes to mind; deception is possible because seeing is believing. If one perceives the world by virtue of corporeal dependency, then perhaps one is incapable of perceiving the totality. Deception might be the norm. Breaking through the barrier of deception which human beings intuitively construct for themselves is at the heart of visual drawing practice; seeing that which might be obscured in everyday, conditioned perception and understanding. Uncertainty is a paramount condition of drawing

TRANSCENDENT - DRAWING AS SPIRITUAL DOCUMENT, AS REVELATION

Joseph Beuys once stated: 'our true capital is our creativity. I would allow the artistic principle and the economic principle to completely flow over into each other, then the economic principle would become an artistic concept. Our basic production then is the quality of human consciousness and human thought.' [vi] Were it were not for the questionable interference of the marketplace one might think that we have arrived. The increasingly integrated nature of visual practice and the obsolescence of the four divides, Fine Art, 2D Design, 3D Design and Textiles/Fashion bears testimony to a culture of crossover. Marina Abramovic, Stelarc and Robert Smithson amongst many others would subscribe to the desire to move from a *competitive society to a more compassionate society*. Unfortunately, the world of economics operates under different criteria, and as Dennis Potter said, 'but then everything was given a price tag, and the price tag became the only gospel. And that gospel was very thin gruel indeed.'[vii] Economics uses both science and art but to what end? In addition, an overriding faith in something called *progress* makes it difficult to determine the real situation. Is there a culture of crossover or are there aspects of scientific and artistic discovery which are recognised in the marketplace and then subsumed for their monetary worth? Traditionally, drawing has been a solitary, private, quiet and concentrated activity - attributes which might also be aligned to the practice of meditation - no less so now. The individual has the opportunity to engage self with other, undistracted. As Richard Serra wrote, 'what I continually find to be true is that the concentration that I apply to drawing is a way of tuning or honing my eye. The more I draw, the better I see and the more I understand.'[viii]

One might think that stills from Marina Abramovic's performance work, *Rest Energy* (duration four minutes) and from Stelarc's performance of *Third Hand* present a curious juxtaposition. Both artists have similar personal visions of the artist's role or for that matter their visions of our future. For Abramovic the art object or artifact will give way to a 'world without art in the sense that we have it now.' Abramovic says 'it will be a world without objects, where the human being can be on such a high level of consciousness and in such a strong mental state that he or she can transmit thoughts and energy to other people, without needing objects in between.' Sitting or standing like the Samurai in old Japan, 'so there will be no sculptures or paintings or installations ... a non-objective world.'[ix] Stelarc's belief in the profound obsolescence of the human body echoes this vision although his

involvement with high-tech equipment might lead one to believe otherwise. They both maintain that humankind has to come to terms with its humanness. Abramovic's performance with her partner Ulay, with bow fully stretched, arrow pointed at her own heart and Stelarc's computer-choreographed performance with a robot attest to this. Whether their personal visions of the future come about or not, visual thought will still prevail, drawing as an activity will continue to exist; it will simply change its form once again. The technological developments of Western culture would appear to have shrunk the globe to such an extent that the beliefs and understandings of myriad older cultures are able to touch upon peoples of a later and different time and space.

A well-known piece, disintegrating now, as Robert Smithson would have fully expected, is *Spiral Jetty*. Smithson's philosophy embraced the essential universal force of entropy, and this often misunderstood earthwork symbolises the obsolescence of the machine age. The spiralled jetty is steeped in symbolism; the orbit of the moon, the symbol for growth, cosmic forms in motion; the Golden Number, the snake as symbol of wisdom and eternity, nebulas, whirlpools, or the snail's shell - the spiral as one of the essential motifs of ornamental art all over the world and an image of contracted time. Whilst I was in Rio de Janeiro I took a photographic slide when standing on the roof of the art school, looking up the mountain at the statue of Christ with arms outstretched. In taking the slide, I aimed my camera up toward the summit of the mountain where I could clearly see the Christ figure. I took the shot. Weeks later when the image was developed and damaged in the process it took me some time to realise that it was the same shot. A cloud of mist had obscured the statue and two missiles of light had penetrated the landscape. A totally unexpected, if not suggestive image. The connection between the Smithson image and my own is simply, time and duration.

STRATEGY - DRAWING AS ENDEAVOUR ENCOMPASSING INTUITION AND RATIONALITY

Strategy might suggest a working approach devoid of emotional attachments, passion, fear, anger, indifference etc., but however much we try to eliminate human sensibility, it remains. The implementation of strategic procedure can allow for aspects of reality previously concealed to be made visible. By working strategically human fallibility or reference can still be acknowledged whilst the risks of contamination and obfuscation are reduced. Strategies imposed by artists are continually scrutinised as to their effectiveness during the doing of work. They engage both rationality and intuition. Beuys described intuition as 'nothing other than that which we understand as thought, but it is a superior form of thinking, an enlarged consciousness in which one realises that man is free.'[x] Unlike a craft tradition where strategy controls the start and also the finish of work, my own strategies inevitably break down as they are challenged and changed by a continuous

probing into the *what* - the subject matter and the *how* - the investigatory means. Failure plays a significant role.

When viewing work by Mel Bochner, in particular, a piece titled *Mental Exercise - Estimating a Circle* and by Ellsworth Kelly, a piece titled *Curve, Radius of Ten Feet*, one might ask what the need for such works is when the computer can produce images of geometric perfection. But perhaps one should be asking where is an equivalent questioning taking place with regard to this realm of perfect geometry - now. Bochner's hand-drawn circle comments upon the perfect and the imperfect and the need for us to be aware not only of this distinction but also that this distinction will remain, despite notions of progress. Kelly's work suggests that there are different ways of seeing. What is it like to see an arc relating to a circle twenty feet in diameter in a completely different context? This form of enquiry can be extended in computing. In its capacity to make the invisible visible, and for three dimensional simulation, the computer allows for the re-spatialisation of the visual world and cultural relations. This can occur on an individual level, i.e. the relationship between artist or spectator and artwork (whatever form that takes, static, moving, multi-perspectival, or even simulated) or on the collective level, i.e. multi-media or media transmission of information or image. The computing environment can augment our ability to perceive the visual world and our response to this revolution in time and space is significant.

A drawing carried out c.1460, believed to have been by Paolo Uccello but now attributed to Piero Della Francesca, could be considered the first wireframe drawing! Similarly a work by Vija Celmins carried out between 1977 and 1982 where eleven pairs of stones, each pair a real stone and an identical bronze cast painted to look exactly like the real stone, could be looked at in the light of solid modelling - one stone being the replication of the other! These works are just further evidence that within the realm of human endeavour all is unchanging. They remind us that the developments within the computing environment reflect continuous and ongoing scientific, artistic and philosophical endeavour rather as well as discovery. I am not suggesting that we have reached the apogee of human cognizance, rather that we as human beings are unchanging and that the same drives, aspirations and problems are recurrent and that we need to reflect upon that human consciousness in the pursuit of knowledge. With reference to computing, we need to allow for intuition as well rational thought within strategic procedures.

An excerpt of an interview between Jean Silverthorne and Vija Celmin went as follows:

> *VJ:That's because I like to think that time stops in art. When you work on a piece for a long period it seems to capture time. The paintings that I like to see (like Piero Della Francesca) have a stillness, a compacted time that opens your eyes. When you pack a lot of time into a work, something happens that slows the image down,*

makes it more physical, makes you stay with it.... Don't you think that this is kind of corny?

JS: I think that everything is corny.

VJ: Well the impulse to make art is sort of romantic. I don't think that there has been any real progress, do you? I think that there is discovery in work and moments that seem to come together whether by purpose or intuition.

JS: What interests me is the narrow space of this archaic pursuit.

VJ: I don't think it's an archaic pursuit. I think I have great faith in people painting forever. Using machines to make art, I mean, it's expressive, but I have never felt it to be as expressive as something that has to be totally constructed from scratch with unnameable nuances, where everything counts because everything has to be actually made.[xi]

Computer programs are usually produced in response to particular requirements. The programmer needs to know what is required so that algorithms can be structured to provide results which intentionally correspond to those requirements. The programmer could be seen to be working within the craft tradition but craftspeople are well aware of the *happy accident* or the *mistake* or *where things didn't quite go according to plan*. It is the coupling of intuitive and accidental behaviour with a rational and planned approach which is intrinsic to innovation. How else might we recognise potentials beyond our individual and necessarily limited experience.

REASON - DRAWING AS COGNITIVE THOUGHT

Words such as creativity, innovation, invention are often used in the defence of drawing as being critical to an explorative approach but underlying these attributes is the ability to absorb and understand through perception, intuition and reason. The writing of David Gelernter in relation to the 'spectrum' mechanism and in particular his notions regarding the idea of mental focus is significant in this respect. In his book, *The Muse in the Machine*, he states that 'human thought is laid out in a continuous spectrum. Every human mind is a spectrum; every human mind possesses a broad continuous range of different ways in which to think. The way in which a person happens to be thinking at any given moment depends on a characteristic I'll call 'mental focus'. Focus can be high or low or medium; it changes throughout the day, not because the thinker continually changes it, as he might consciously raise his arm, but in subliminal response to his physiological state as

a whole ... from the intense violet of logical analysis all the way downward into the soft slow red of sleep.'[xii]

A piece of work by David Mach and a drawing by Victor Newsome demonstrate the analytical approach of artists in referencing the nature of matter and a rational approach to investigation and interpretation. They are two very different works which utilise similar subject matter - the head. The Mach piece has presence in its scale - an enormous three dimensional head constructed through line as contour (using coat-hanger wire) and the Newsome drawing - a devastatingly clinical analysis of the head - an archetypal head. Both are idealisations wrought from the imagination but rigorous in their manifestation.

Gravity, mechanics, balance, weight; issues explored traditionally in the realm of drawing but in the case of particular works by Michael Craig-Martin and Stelarc are transferred to the realm of three dimensions. A work by Craig-Martin titled *On the table* and a suspension piece carried out by Stelarc. Of the Craig-Martin piece, Lewis Biggs stated that it is 'like a scientific demonstration of gravity and mechanics. It adds nothing whatever to our knowledge. It aims instead to return us to the astonishment at the ordinary which direct perception can provide when our knowledge of images and languages is momentarily - like the table - suspended.'[xiii] The equivalence is obvious. In the Craig-Martin, four buckets are placed at the corners of a tabletop. Cords which pass through pulleys, on the ceiling, are attached to the bucket handles and the tabletop. The buckets contain the precise volume of water required to balance the tabletop in space. This piece stems from our world of objects and challenges our somewhat localised preconceptions and expectations. Stelarc in turn, in the performance piece subjected his body to hanging by flesh-hooks, cords passing through pulleys and attached to a number of rocks. His own weight is counterbalanced by the rocks. The piece allows us to reflect upon who, or more exactly perhaps, *what* we are. Neither of these works would I call drawing but they do enable a focussing upon and an acknowledgement of visual thought. The simple parallel between them, devoid of issues of content, is a notion of counterbalance - a counterbalance in the Stelarc piece which might suggest neutralisation or equity of matter.

High focus thinking relates to the logical and analytical whilst low focus thinking presents the opposite end of the spectrum, loss of control, creative fancy and an ability to be receptive to the unexpected or fantastic. Although in his thesis Gelernter pursues an alternative and perhaps controversial view with reference to computing technology and artificial intelligence in particular, it is relevant to drawing and to visual practice in general. The state of mind required when engaging with drawing involves high and/or low focus thinking. The practice of drawing requires an approach which is alert, organised and rational in the preparatory sense, an ability to survey the immediate time, space and interruptions and continual open-mindedness to the particular situation.

NOT STATIC - DRAWING AS CONTINUAL PROBING

When drawing, one can experience something entirely new, find something out, see something one has never seen before and change the way in which one views the surrounding world, be it physical or virtual. Within my own visual practice, drawing involves exploring what is out there - via the layering and paring down of marks or visual information/data. In sifting through and searching out possibilities specific to selected subject matter and in the forming of work there is a necessity for continual and constant critical reflection. Godfrey in his book *Drawing Today*, states that 'drawing is to be defined more by the activity that initiates it rather than the material it leaves its traces on.'[xiv]

I make reference here to the work of Al Held, specifically his black and white paintings made in the mid 1970s. In the *Volta* series, incised white lines on a black ground visually cut through pictorial space. Similarly but inversely in the *Inversion* paintings, black lines on a white ground cut through pictorial space. The resultant two dimensional shapes, bounded by white or black line, allude to images of virtual forms which displace and interpenetrate each other. The paintings are physical layerings of paint. Previous layers are revealed by the application of varying widths of tape which define the linear shapes during the layering process and are then removed. The shapes are not determined by logic and the composition not dictated by reason - 'this pictorial investigation, astonishing in its consistency, is marked by an inner freedom of approach.'[xv] Despite the medium of paint these works align directly with drawing. For both artist and observer, the combinations and interpretations are precisely in the impossibility of these juxtapositions, at least within pictorial space - visual conundrums. Not so, now that we have computers. (It is worth noting that it was in the early 1970s that computers first appeared in some Fine Art departments of art schools.) Held is just another example of an artist pre-empting future space and the potential within computing space and it should be no surprise to be told that Piero Della Francesca was the artist that he most admired. Another Craig-Martin work, a drawing titled *Reading (With Globe)* is carried out by applying tape directly to a wall. These drawn works are always described as being variable in dimension because they can literally be adjusted to any wall size by means of projecting the master image and tracing with the tape on the wall surface. The drawings are immediately accessible to the viewer in terms of an association with clear and precise representations of everyday objects but they are simultaneously impossible spatial readings. Lynne Cooke states that 'Craig-Martin's wall drawings constitute an attack on the still orthodox conventions of this modern scopic regime.'[xvi] What we see is representative of what we cannot not see.

The work of Madeleine Gins and Arakawa is an example of what is happening now in drawing. In an extensive body of work referred to as *Landing Sites,* they delve into computing space by exploring the potential of three dimensional drawing. The outcomes of the work demonstrate that a coalescence of the *how*, the *what* and the *why* is intrinsic to visual investigation. The range of visual reference, in architectural building, siting, interior

and exterior space, and just where exactly we as human beings place ourselves, explores the relationship of physical and virtual. At times this results in imaging which although uncomfortable by association can nevertheless be interpreted and read.

A sequence of stills taken from a catalogue image illustrating a video piece by Mona Hartoum shows an aspect of drawing which is revealed perhaps inadvertently. A grid of circular images shows stills from a video of a camera passing through body passages. They allow the viewer to grasp via still images some of the complexity of the moving image but they are also individual scans. They are not unique within the realm of medical imaging but the presentation of these individual images suggests a different way of viewing and observing the body - internal in relation to external. Conventions of contour and containment in the making of two dimensional images from a three dimensional reality are here augmented by a process, electronic scanning, where one can literally draw through an object - a form of drawing which makes traditional medical illustration literally obsolete. *The Visible Human Project*, a deconstructed and reconstructed human form accessible through the Internet, is another demonstration of this mode of drawing.

Drawing allows visual thinking, an engagement with the other and the opportunity to reflect upon that otherness. Visual engagement based on an exploration of possibility is preferable to replication. Any engagement with computing can be on the basis of the exploration of opportunities and possibilities particular and peculiar to that realm as opposed to the imitation of manual technologies. A popular misconception of the use of computers is that they provide a tool for working faster or at least more precisely. Though the latter is possibly true, the former, as those working with computers will be aware, is not always, if ever the case. Visual facilitating within programs originates conceptually and manifests itself via programming, from manual technologies. This presents the artist using the computer with a somewhat contradictory working arena and given these circumstances, suggests that the aim should be to search out drawing potentiality within the application or program and to introject the irrational into a predetermined situation; particularly those sets of instructions endemic to the computing environment. Reference to the probing approaches of Held, Craig-Martin and Gins and Arakawa might prove beneficial.

It is evident that at the sharp end of visually oriented technological development, in computer graphics, special effects for the film world and advertising, money paves the way for creative possibility. It would seem at times that the sky is the limit but at the blunt end of the market, creative and innovative possibilities are no less present. There is a human tendency to be in complete awe of that which we cannot comprehend. Much computer imaging has employed existing conventions of representational modes rather than inquiring into new and revelatory visual modes which explore the latent and particular properties of computing space. A word which appears infrequently in the text is *experiential* but it is, I believe, a word which succinctly describes the working approach of

the artists and designers whose work I have shown. It is also a word which aptly describes an engagement with drawing. Drawing reveals itself as an activity which is enmeshed within the diversity of visual practice.

BEING - DRAWING AS FORMING

So as not to limit myself to the rarefied area of fine art practice I mention drawing which occurs in the workplace, not intended as drawings for the gallery wall but as drawings which enable work. For example, drawings which were used as a means of distributing sewing patterns and which continued to be used until the 1970s and drawings which were used to draught out patterns for the making of lace during the nineteenth century. Cocheris wrote, 'one cause that has exercised a most deplorable influence on industrial arts, is the profound contempt that artists profess for commercial enterprise; it might be said they fear to profane their talent by conferring a character of public utility on it. Their predecessors were less proud, not believing to demean themselves by designing lesser objects.'[xvii] To set the record straight and with regard to drawings of this nature the strategic approach is implicit in the acknowledgement of drawing as an integral and indispensable factor of the making process - the thought process which pre-empts the fabrication.

Most computer-assisted or computer-generated images display the regular, recognisable and ultimately *replicative* attributes seen in glossy advertisements and on screen. Examples of these are the virtualisations by Buf/Duran - virtual interior spaces emulating physical and recognisable substance and environment - and the commonly seen computer manipulation of photographic imagery of the *PhotoShop* variety. If we are bound to the gadgetry of computer applications reliant only upon *realistic* representation or the soporific collage of *photo-bites* and which essentially provides merely an efficient mechanism for duplication, we shall surely be proceeding along a *one way road* of progress or superficial improvement.

When Keir Smith left a perforated steel stencil out in the open in order to allow the natural process of rusting to mark the paper underneath, he was drawing. One drawing in particular is titled *The freedom of the open sea*. The perforations are linear interpolations of feather, oar and estuary. And when Steve Cripps constructed machines which smashed into the gallery wall, he was drawing. Fusions of conjecture, material and action. Whether it is unpredictable variables determining the intensity of a chemical reaction, or the mechanical carrying out of a set of instructions, both drawings result from a process which is one stage removed from the autographic mark - one stage removed from the erased De Kooning drawing.

Similarly, Antoni Gaudi experimented with three dimensional, structural possibilities when designing Guell Colony Church. 'He devised a model out of strings, from which he

suspended small sacks of sand, corresponding to the weight which the supporting arches and pillars would have to carry. This served as an upside down model of sorts. A picture of it had only to be turned upside down to get a clear idea of what the final structure would look like.'[xviii] Gaudi effectively transferred his drawing activity from the drawing board into three dimensional space. Drawing and forming were integrated. Another architect, Frei Otto, allows the very substance of the building to be the drawing - the tensile structure of the Munich Stadium. I am considering here, drawing not as think tank but drawing embedded within process. The process is not contrived as a means to produce a drawing - rather the drawing is intrinsically part of the forming and if drawing is forming then this is drawing.

CONCLUSION

In conclusion, I return to my own research within drawing. The computing environment centres on the mathematics of coordinate space, the emphasis in the visualisation of visual and virtual realities within this space being considered solely from the point of view of the object in space, i.e. that the object is positive and the space is negative. Construction of virtual realities is based on the assemblage and placement of an object or number of objects within this mathematical space. How unlike our real world - no air, pressure, density, resistance, vacuum, fog, cloud or even rain. Every student when engaged in the activity of drawing becomes aware of factors such as light, refraction, reflection, shadow, heat, cold, vapour, even emotional stasis of the drawer. All are considered in the activity of drawing.

In a piece of work by Nigel Rolfe titled *The Rope that Binds us makes them Free*, Rolfe bound his head in thick sisal twine, turning himself into his own sculpture. I have recently made a video work titled *Second Skin - Version III*. A circular image - a point of light, a pencil point, live dog, moving fur, projected around a physical room, moving through time, drawing a moving image into a real three dimensional space. This piece stems from work carried out over the last five years, generically titled *balls of wool*. I am interested in rethinking the position of the viewer and the viewed. What would it be like to see differently? Rolfe's work engages the viewer - s/he is on the outside looking in - s/he can only imagine what Rolfe is unable or able to see. Within the virtual environment one can see from the inside out - to see the winding of a ball of wool or even the unwinding of that ball of wool. I am using the computer to do something which it can do and I cannot. I can move around, by means of a virtual camera, within a virtual space, a room, which I can anticipate and build. I can track the camera as though I was winding a ball of wool. I can record this visual information onto video and project it into a real space. Ultimately it is the reaction and interaction as a physical human being to a different environment which interests me. I want to find out how I and others who enter such an installation might react spatially. Would I feel disoriented? Would I be able to register what is going on visually?

Would I feel sick? This video work derives directly from my practice of thinking, surmising and testing out through drawing.

Drawing has a history which can be traced back through time but my thoughts have centred on the issue of 'where is drawing now', particularly as I find myself party to a so-called *resurgence* in the activity. If the word resurgence is defined as *a raising from the dead* - a reappearance, this suggests the readoption of previous concerns. My emphasis in this paper has been on visual thought and visual thought as drawing and how that might be manifested through reflection, deliberation and speculation in a variety of visual outcomes. My intention has been to demonstrate how the work of many visual practitioners has, in parallel with scientists and philosophers (stretching further back through time than I have written of here), contributed to where we are now. The electronic realm has come about as a consequence of the musings and conjectures of these many thinkers and doers. I hope to have given some indication of the necessity for and the relevance of work produced by artists exploring potential through or inherent as drawing and the implications for us and technology.

Acknowledgement of the computer simply as a tool has exacerbated the problem for artists and designers, encouraging the notion that one makes work facilitated by technique alone. Artists have never had any problems using, inventing sometimes, or adapting to tools - so why an impasse? Drawing can combat this situation. It decries the superficial adoption of technique and promotes an attitude to work which centres on the transgression of previous methods, uses of material and reasoning. It can enable a greater understanding of the computing environment wherein the potentiality of the electronic realm can be genuinely explored. This electronic realm is not seen as the apex of human achievement, simply another rung on the ladder of human curiosity and invention. A rung which might allow us to engage with other aspects of space and time. Our physiological state is such that we are able to view the world as being on the outside looking at the other - hardly surprising then, that we have had an obsession with the *object*. We accept, through the exploits of physicists, chemists, biologists and others, that this is not the complete picture. The computer allows new and different views of this same world and perhaps there are whole new experiences out there instead of sensational replication. It is my belief that it is the continuance of an experiential and experimental approach to work, one which acknowledges risk and failure in an attempt to become conscious of our potential as human beings and maybe beyond, which is signified by the current resurgence of drawing.

REFERENCES/BIBLIOGRAPHY

i Tony Godfrey - Drawing Today - Draughtsmen in the Eighties, Phaidon, 1990.

ii Benjamin Woolley - Virtual Worlds - A Journey in Hype and Hyperreality, Blackwell, 1992.

iii Rudi H. Fuchs - Richard Long, Solomon R. Guggenheim Museum, New York, Thames and Hudson, 1986.

iv Frank Popper - Art of the Electronic Age, Thames and Hudson, 1993.

v Rosalind Krauss - The Optical Unconscious, Massachusetts Institute of Technology Press, 1993.

vi Louwren Wijers - Quote from Joseph Beuys in his article 'From a competitive to a Compassionate Society' in Art meets Science and Spirituality, Art and Design, Academy Editions, 1990.

vii Dennis Potter - Television Interview with Melvyn Bragg, Channel 4 Television, 1994.

viii Richard Serra - source unknown.

ix Johan Pijnappel - Quote from Marina Abramovic - in his article 'Marina Abramovic' in Art meets Science and Spirituality, Art and Design, Academy Editions, 1990.

x Louwren Wijers - Quote from Joseph Beuys in his article 'From a competitive to a Compassionate Society', in Art meets Science and Spirituality, Art and Design, Academy Editions, 1990.

xi Vija Celmins in interview with Jean Silverthorne - Vija Celmins Exhibition Catalogue, Fondation Cartier pour l'art contemporain, 1995.

xii David Gelernter - The Muse in the Machine - Computers and Creative Thought, Fourth Estate, London, 1994.

xiii Lewis Biggs - Between Object and Language, Palazio de Velazquez, Madrid, 1986.

xiv Tony Godfrey - Drawing Today - Draughtsmen in the Eighties, Phaidon, 1990.

xv Willy Rotzler - Al Held - Exhibition Catalogue, Gimpel Hanover and Andre Emmerich Galerien, 1980.

xvi Lynne Cooke - Michael Craig-Martin - A Retrospective, Whitechapel, 1989.

xvii Hippolyte Cocheris - Lace - from applied arts to industry, Booking International, 1995.

xviii Rainer Zerbst - Gaudi - A Life Devoted to Architecture, Taschen, 1993.