Title: An Exploration of Systematic Strategies for Representing Three-Dimensional Space on a Two-Dimensional Surface.

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This is an exegesis/dissertation submitted to Auckland University of Technology in partial fulfilment of the degree of Master of Art and Design

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Attestation of Authorship

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person or material which to a substantial extent has been accepted for the qualification of any other degree or diploma of a university or other institution of higher learning except where due acknowledgement is made in the acknowledgements.

Abstract

This project explores systematic strategies for establishing a definitive mode of representation in drawing. These strategies are considered in the context of the subjectivities and contingencies of perceptual experience, the mediation of that experience and inherent limitations in representational language. The aim is to explore the possibilities of constructing two-dimensional artworks which serve to define or investigate perceptual processes, perspective devices and spatial relationships.

Introduction

This exegesis accompanies an exhibition of drawings in a number of media which have been developed during the latter stages of this masterate research project. These have evolved in a systematic process in which I have explored particular ways of representing three-dimensional space on a two-dimensional surface.

In the first chapter I discuss the nature of the project. I describe the different methodologies used in the research, and my research methods are discussed. A number of the concepts which directly relate to the research question are described and their relevance to the research topic established; visual reception, the nature of the visual field, visual perception and the interpretation of visual information, and systems of visual perspective are the key concepts dealt with. Lastly I discuss the systematic aspects of the approach taken to the development of the research project.

In the second chapter I give a detailed description of the historical development of the project. I discuss how ideas developed over a number of years have provided a framework for this research and how my art work has evolved as I have attempted to answer the research question. Specific insights into decision making processes, derived from contextual research into historical and contemporary art, are described.

The bibliography which follows contains references specifically referred to in the main text and the appendix. It also lists texts which I have studied which have provided a general context for my theoretical and practical research.

I have continued to develop and refine theoretical ideas about linear and

spherical perspective during the course of this research. In that they provide support for my use of a particular approach to drawing these ideas are highly relevant. However, being essentially philosophical or scientific in nature, they are included in the appendix.

The project is predominantly practical in nature. The practical component comprises 80% of the project. However, the exegesis - 20% of the project - is an essential feature for elucidating the theoretical and methodological underpinning of the project, and for documenting work produced during the course of research but not exhibited.

Chapter 1: The Nature of the Project

This research involves an exploration of the way that a framework or system can be used to represent three-dimensional objects on a two-dimensional surface. Various methodologies have been developed and used during the course of the research. Initial investigations into the historical development of the perception of three-dimensional space and the perspective systems used to represent vision and perception have relied on *Historical Analysis*. Texts written by White (1967), Edgerton (1975), Holley (1984), and Gombrich (1982) provided coherent factual accounts as well as proposing idiosyncratic theories about the representation of space. The conjectural nature of much of the material I encountered led me to develop a procedure or attitude I would characterise as *critical and sceptical*. As well as searching the literature for support, I started analysing it for inconsistencies. I also started developing an *experimental* approach towards the collection and development of empirical, objective evidence for my own ideas. The latter approach has provided material which has been made extensive use of in the practical parts of the project.

In Gray and Pirie's (2002) paper *Artistic Research Procedure* the concept of *experimental methodology* is discussed. They characterise this as a *quasi scientific* approach. However, in areas such as my development of a system for measuring three-dimensional space my approach has been as rigorous and *scientific* as possible. In other areas of the research my approach to the production of artwork has been based on *practical experimentation* and *trial-and-error*. Gray and Pirie (2002) discuss complex systems and their dependence on feedback mechanisms, stressing the evolutionary nature of successful systems. This is a key aspect of the system which has become part and parcel of my procedures.

Iterative Design (Knight and Jefsoutine, 2002) is a related approach which involves repeated implementation, testing, feedback, evaluation and change. Such an approach is detectable in sequences of drawings developed in my exhibited work.

An *analytical* approach is taken towards various aspects of the research. For instance, the concept of perspective is broken down into a number of separate issues; only a limited number are examined, and each one separately. Another example is my exploration of the effect of line thickness, firstly in isolation, then applied in compositions. This approach will hopefully enhance the development of a solution to the whole research problem.

Definitions of the terms 'methodology' and 'system' suggest a useful way of interpreting the first of these terms. Methodology is a *system of methods and principles* while a system is a *group or combination of interrelated , interdependent or interacting elements forming a collective entity.* Hence one can view one's methodology as *the* methods and principles one uses in a coordinated system. I will summarise these:

- Reading research provides information which contributes to the development of a theoretical framework underpinning practical work as well as being directly or indirectly relevant to the development of practical work.

- Observational drawing is used to explore and document viewed subject matter. Euclidean principles have been followed in the development of a system which enables the profiles of three-dimensional objects to be measured and represented as seen. A clear emphasis is placed on the representation of the *shapes* we see rather than the *lines* which encompass those shapes. In this sense these drawings can be compared with

the photographic representations of the same subject matter.

- Photography is used in parallel with observational drawing to provide additional support.
- An exploratory or experimental approach is taken towards the development of artworks based on observational drawings. Colour is used intuitively in a variety of ways – to distinguish between separate areas, as an aesthetic feature, and latterly to suggest three-dimensional modelling. Drawing *and* painting have been used as methods over the course of the project. However, exhibited work is exclusively made on paper and as such is described as drawing.

The framework or system mentioned at the start of this chapter revolves around a particular approach the viewer or the artist may take towards the perception of three-dimensional space and is based on a relatively narrow range of representational concepts.

Visual perception is the process in which visual information is translated into a knowledge of our environment through intellectual processes. The eye's retina receives visual information which is interpreted by the mind. In other words the images we see result from an interrelationship between sensory reception and intellectual activity. My research is aimed at the representation of a particular set of visual information which lies somewhere between our *perception* of what we see – or the conventional notion of an interpretation of our surroundings - and the retinal image of the viewed subject – *visual reception.* Visual images are complex and difficult if not impossible to replicate. Most significant in this respect are perhaps the qualities of depth of field and three-dimensionality which come with, respectively, each individual eye's ability to focus, and binocular vision. The drawings with which I start the process of con-

structing images are my attempts to document only a limited number of features of these retinal images. Nonetheless they do represent images, not the raw, sensory information which the mind converts into images. They also emphasise the physical volumes in our surroundings rather than an interpretation of these volumes. I am interested in the size, shape and location of volumes in space rather than texture, colour, name or function. I am not viewing things as objects *per se* but as volumes with particular dimensions and shape. In that they represent an intellectualisation of received visual information, they are *perceptual* representations.

In the narrow sense that I use the term here people's visual perception is remarkably uniform – it has to be: their understanding of the world's physical structure results directly from this. Perception in the wider sense is generally held to be a contingent process. I would not argue this point. However as the essentially physiological activity which I attempt to document here, I would argue that visual perception can be held to be less of a contingent process and more of an absolute, objective or empirical one.

My particular interest is in the nature and content of our field of view and especially in the interrelationship between the 'foveal' region – the central part of the field of view which we see in detail – and the peripheral areas of the field of view. (The concept of foveal vision was developed by Gombrich (Gombrich, 1982)). My theoretical research, carried out alongside this practical art research project, suggests that for one to elucidate or interpret the appearance of these peripheral regions one needs to employ intellectual processes – measurement, geometrical principles, logical arguments - in addition to perceptual ones. I regard this as a significant issue. It is developed more fully in the appendix but it needs to be mentioned at this point. We are used to basing

our perceptions on what is at the centre of the field of view. I am attempting to represent aspects of the field of view seen at any one instant – and that includes the *whole* field of view, not just the central part.

Perspective is a way of regarding situations – the word is derived from the Latin *perspicere,* to look carefully. One definition of perspective is *a measured or objective assessment of a situation, giving all elements their comparative importance* (Encarta Dictionary). In this sense I am taking a particular perspective on the issue of how we see and how best – given the limitations of working by hand on a two-dimensional surface – to represent what we see. But it is another sense of the word which relates to *what* we see. Perspective deals with *the appearance of objects to an observer allowing for the effect of distance from the viewer.* (Encarta Dictionary). Yet another deals with how we represent what we see, *the art of delineating solid objects on plane surfaces so as to give the same impression of relative positions, magnitudes etc, as the actual objects do when viewed from a particular point.* (Concise Oxford English Dictionary). Or it is *the art or theory of suggesting three dimensions on a two dimensional surface* (Collins English Dictionary). Linear perspective is an aspect of representation of visual information rather than vision itself. It involves the representation of how the linear structure of objects changes as they recede from the viewer, size appearing to decrease with increasing distance. This is the fundamental aspect of perspective which I have based this research on.

Much has been written on this topic in the past. Panofsky matches the artistic handling of spatial relations, the particular variant of perspective worked out by a period's artists, with the wider tendencies in philosophy and science. As far as he is concerned perspective construction reveals the way in which the perceiver determines the perception (Holley, 1984).

He also makes the comment that the importance of Italian Renaissance perspective lies in the fact that it is a system of projection – in other words a geometrical construction - that actually coincides with what we see (Moxey, 1995). However, Wartofsky argues that "our seeing the world perspectivally is the product of specific modes of visual praxis - in other words it is learnt from looking at existing pictures - and is not a correct rendering of the way things really look. The convention of linear perspective has taught us how to see." (Holley, 1984. pp. 132-3) He does not argue – like Gombrich does – that a perspective painting works or does not work according to the laws of geometry (Gombrich, 1982). Instead Wartofsky (Holley, 1984) is concerned to discover why a system so transparently ordered by geometrical laws became adopted and has been maintained as the mode of seeing for 500 years – and that period includes the development of photography, a form of representation which I would argue is **not** in rectilinear perspective. I argue this point at greater length in the appendix.

The revelation of such diverse and contradictory conjecture with which the literature is peppered has offered me something of a challenge. It certainly gave greater impetus to my decision to explore this issue in depth. And it suggested that an empirical approach was needed if I was to develop any alternative to counter the results of the conjectural approaches taken previously. My discovery of a different approach to perspective – which was based on my own experimentation with still life drawing – was made independently of these conjectural approaches. But White's account (1967) of the historical development of perspective systems – I first read his book in 1997 - was highly significant in that it provided me with both a supportive framework within which to work and an idiosyncratic opinion to act as a focus for my critique of existing ideas.

I have come to the conclusion that an understanding of the concepts of both

Renaissance linear perspective – the conventional contemporary linear perspective framework which has underpinned the construction of images for the last six hundred years - and spherical or curvilinear perspective – the system with which I am working here - are both necessary for a full understanding of pictorial representation, from the point of view of the art practitioner *and* the viewer. I say this because both systems fail to provide a full and unambiguous representation of visual facts and it is only by understanding in what ways *each one* fails that failings in *both* can be detected. These concepts have a significant bearing on this research project since linear perspective representations of three dimensional objects lie at its heart.

This artistic exploration is systematic just as the theoretical framework on which it is based has evolved as a systematic, scientific enquiry. However, it is inherently an artistic endeavour. As the system has evolved it has remained closely tied to the use of spherical perspective, since I believe that this system enables the accurate representation of *spaces* rather than the lines which *define* spaces. To be effective the system has to be flexible, capable of responding to chance events, changing environments or contexts, etc. In other words it has an evolutionary quality. The project taken as a whole is an exploration of the development or evolution of a system. Its exploration and development has provided a greater understanding of how three-dimensional space is sensed, recognised and represented on a two-dimensional surface. But it has also provided a framework for me to develop my own approach to such representation, incorporating the different aspects of pictorial structure explored in the research.

Whereas the development of a systematic approach may evolve as an aspect of an artistic methodology, my research has also raised the possibility of develop-

ing a system as a structure which can facilitate the construction of art independently of other considerations. I have anticipated there would be foreseen and unforeseen consequences of this approach, especially that serendipitous effects may be generated as a by-product of the process. That a structured, systematic background may make these effects more noticeable and hence detectable may be an interesting benefit of its ordered nature.

Formal elements such as line, tone, colour and shape can stand alone or they can be arranged so as to form an illusion of three dimensional space. Within the spectrum spanned by illusionistic, naturalistic representation on the one hand and abstract non-representation on the other there is scope for producing visual statements whose figurative meaning – the degree to which representations of three-dimensional space can be discerned or identified - is ambiguous. This research project explores compositional interrelationships between one- and two-dimensional shapes and implicit suggestions therein of three-dimensional space, and uses drawing processes to do that.

Chapter 2: The Artworks – A Chronology

The initial stimulus for this research project was a gradually developing aware-ness of different approaches which could be taken towards perception of our physical world and its representation in drawing. These theoretical ideas were more or less intact by the time I started the project; it will become clear that they were an important reference for all of the art work produced.

Drawing is used exclusively in the final part of the project – that part which comprises the practical element of the thesis submission. For the purposes of this project drawing provides a means to construct two-dimensional artworks – sketches, plans, representations of visualisations of three-dimensional struc-tures, completed or finished artworks – using any appropriate media on paper supports. The experimental, exploratory nature of this project suggested drawing as the most appropriate research method to use. As Matthew Biro con-firms: "drawing is able to embody ideas and systems, suggest processes and ex-periments and engage with questions of abstract form and visual percep-tion." (Biro, 2006. p. 75). And Frank Dickinson considers "its directness and ex-pressiveness makes drawing a powerful means of conveying ideas....without nec-essarily being constrained by technical or aesthetic concerns or the need for finish." (Dickinson, 1982. p. 4). However, there is a body of completed paintings produced towards the end of the first year and in the first part of the second which are precursors for the drawings. These are identified as such in the ac-count below.

A drawing (Fig. 1) produced several years before this research commenced exemplifies my increasing interest in representing three-dimensional space rather than the outlines which define three-dimensional forms.

Figure 1. Study drawing – room at night; July, 1999; charcoal on envelope manila; 600 x 400 mm.

Two drawings demonstrate my continued use and investigation of spherical perspective as a drawing system (figs. 2 and 3). Charcoal had become a medium I increasingly appreciated for representation because of its tonal quality, modulated line thickness, line quality and the soft but indelible quality of erased pentimenti.

.Figure 2. Study drawing - still life; April, 2004; charcoal on manila; 340 x 450 mm.

In a drawing (fig. 4) also dating from the time I was starting preparations for this research the wide angle and downward direction of the view were deliberate choices. In it there is an emphasis on the spherical perspective curvature in verticals receding from the viewer.
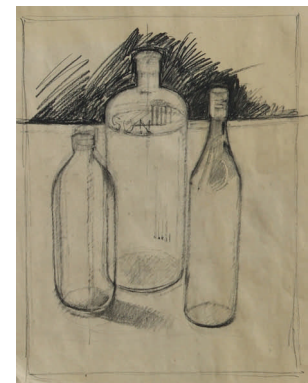
Figure 3. Study drawing – still life; March, 2004; charcoal on grey paper; 200 x 370 mm.

Figure 4. Study drawing – still life; February 2004; charcoal on cartridge; 400 x 580 mm.

A number of drawings (figs. 5, 6, 7) represent the ongoing search for subject matter which would enable the exploration of spherical perspective as a visual/perceptual process as well as providing scope for the production of art work. Boxes and wooden boards piled against the corner of a room are dealt with naturalistically, the drawing style emphasising shape and cast shadows, less attention being paid to modeling of three dimensional form. In figure 8 colour is used in an abstract, unnatural way to 'colour in' and investigate the effect on shapes. Walter Benjamin argues that "the child's view of colour (as used in colouring-in shapes) represents the highest artistic development of the sense of sight; it is sight at its purest, because it is isolated." (Schwabsky, 2003, p.31).

Various subject matter was experimented with at this time. Non-rectilinear material such as landscape or portraiture was rejected – simple geometric forms were found to be preferable vehicles for my increasing interest in shape and colour and the relationship between objects in space. Even the relatively rectilinear forms in still lifes or sparsely furnished domestic interiors, explored extensively in study
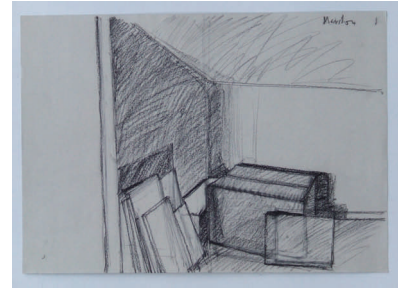
Figure 5. Study drawing - still life; March 2004; charcoal on grey paper; 460 x 400 mm.
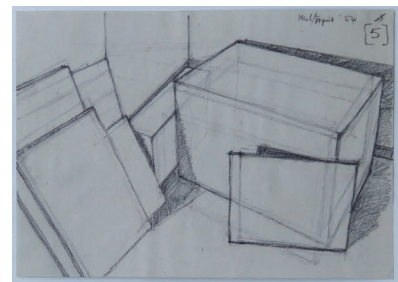
Figure 6. Study drawing – still life; March 2004; charcoal on grey paper; 600 x 410 mm.
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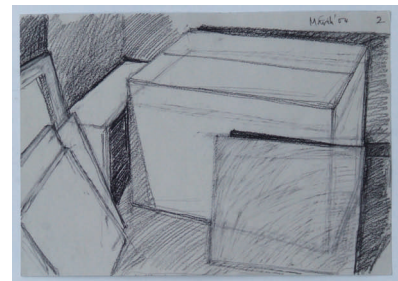
Figure 7. Study drawing – still life; charcoal on grey paper; 600 x 410 mm.

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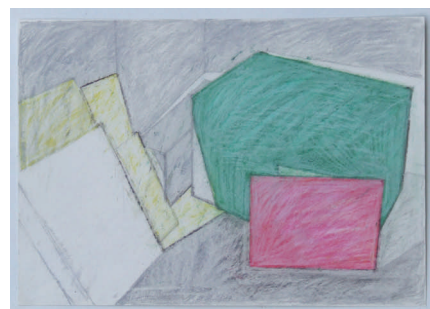
Figure 8. Developmental drawing – still life; charcoal/wax crayon on cartridge; 600 x 410 mm.

drawings (figs. 9, 10, 11, 12) provided subjects which generally appeared too complicated. However, they were relevant to the ongoing investigation into perspective which, at the time, was still fundamental to the research project. There were one or two exceptions which were later utilised as subjects for paintings. For instance, one drawing (refer fig. 18) – the subject matter includes a table, circular carpet, small chest of drawers and a number of boxes – was used as the basis for a painting produced over a year later (refer fig 24).
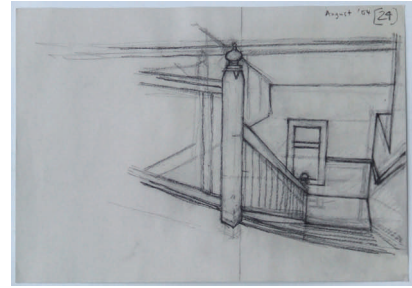
Figure 9. Study drawing – house interior; August 2004; charcoal on grey paper; 450 x 400 mm.
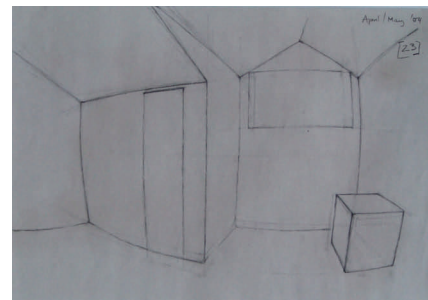
Figure 10. Study drawing – house interior; May 2004; charcoal on grey paper; 580 x 420 mm.
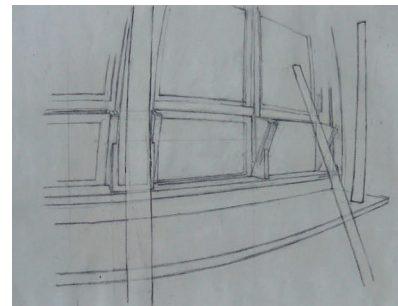
Figure 11. Study drawing – house interior; March 2005; charcoal on grey paper; 580 x 420 mm.
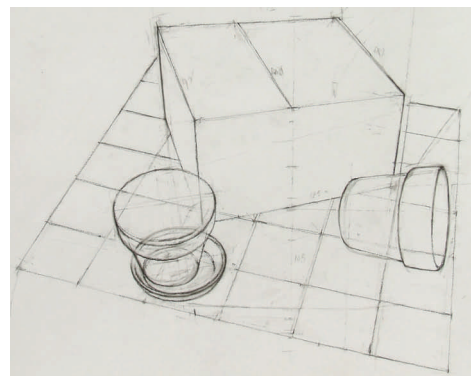
Figure 12. Study drawing – domestic still life; July 2005; charcoal on cartridge; 420 x 330 mm.

Here (fig. 13) subject matter has been narrowed down by excluding all but a collection of boxes. Experimentation was carried out (figs. 13a, 13b, 13c) into the use of tone and varying the degree of naturalism within a fixed linear structure derived from the original study drawing. This suggested exploring the use of line and colour as abstract elements which were more autonomous and could be used in ways other than describing things. Colour is also used to distinguish one area from another.

One drawing (fig. 14) has turned out to be significant in a number of ways. Produced at a time of exploration into subject matter and tone, its interesting features include the downward looking view, strong cast shadows and the simple cuboids as subject matter isolated from any surrounding features.

Figure 13. Study drawing – 'boxes'; April 2004; charcoal on grey paper; 330 x 330 mm.

Figure 13a. Developmental drawing; April 2004; charcoal/oil pastel on grey paper; 330 x 330 mm.

Figure 13b. Developmental drawing; April 2004; charcoal/oil pastel on grey paper; 330 x 330 mm.
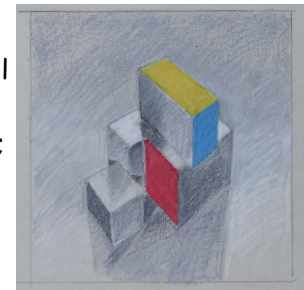
Figure 13c. Developmental drawing; May 2004; charcoal/oil pastel on grey paper; 330 x 330 mm.
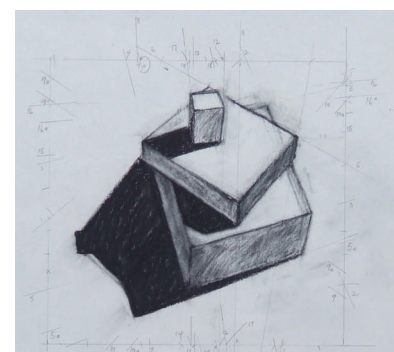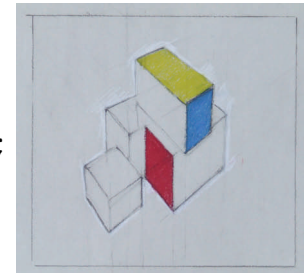
Figure 14. Study drawing – 'boxes'; March 2004; charcoal/pencil on cartridge; 240 x 200 mm.

In a contemporary oil pastel development (fig. 14a) colours are selected arbitrarily but are still used to model tone. Figure 14b depicts a resolved drawing produced almost two years later. And figure 14c shows another resolved work produced in mid 2006. This sequence contains work in several different styles and approaches explored during this research. It emphasises the way that specific subject matter has been central to the development of the project.

A study drawing of boxes, a saucepan and some tin cans on a circular carpet (fig. 15) is by now in line only, tonal modeling having been dispensed with entirely. The investigation of linear perspective was becoming the major preoccupation.

Figure 14a. Developmental drawing; March 2004; charcoal/oil pastel; 400 x 300 mm.

Figure 14b. 'Drawing - 10th October 2005'; pencil/acrylic paint on cartridge; 290 x 300 mm.
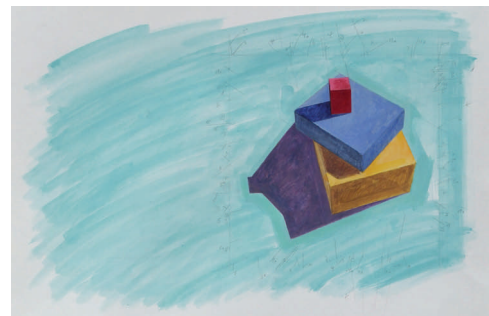
Figure 14c. 'Drawing – 4th July 2006'; pencil/acrylic on cartridge; 500 x 300 mm.
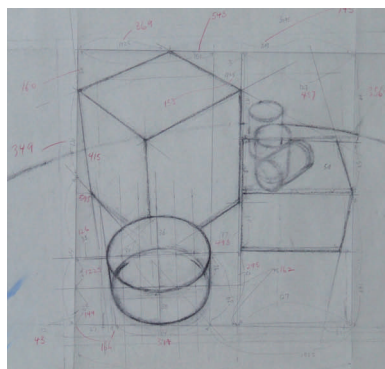
Figure 15. Study drawing – still life objects; April 2004; charcoal on grey paper; 300 x 300 mm.

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Figure 15a shows a developmental study in which experiments are made into the intuitive choices of colour but individual surfaces of the objects are still referred to. In figure 15b the various surfaces are merged and some are excluded. This was a significant development in that I found that ambiguous illusionistic suggestions of three-dimensional space had appeared. This is most obvious where the large cylindrical shape – this was actually a saucepan – obscures the bottom corner of the irregular hexagon – a representation of a large cardboard box. An acrylic painting (fig. 15c) refines these ideas. A sequence of paintings in acrylic on canvas and board, produced towards the end of the first year of research, further developed and explored these ideas. (refer figs. 20 to 28)

Two developmental studies explore different approaches to shape and the ideas of ambiguous spatial statement (figs. 16, 17). Both failed for the same reason – they are too illusionistic of the subject matter they are based on.
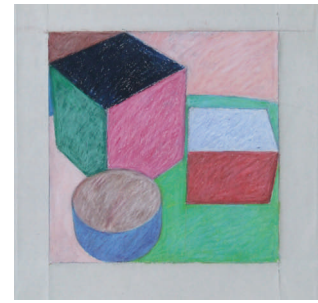
Figure 15a. Developmental drawing; May 2004; charcoal/oil pastel on grey paper; 300 x 300 mm.

Figure 15b. Developmental drawing; June 2004; charcoal/oil pastel on grey paper; 300 x 300 mm.

Figure 15c. Developmental drawing; June 2004; pencil/acrylic on cartridge; 300 x 300 mm.

Figure 16. Developmental drawing; June/July 2004; charcoal/acrylic on cartridge; 250 x 300 mm.

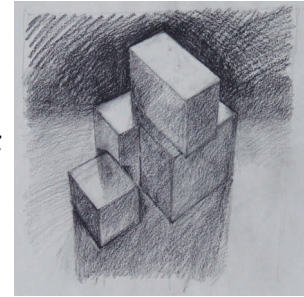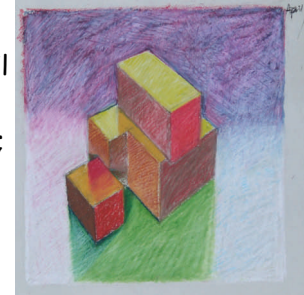Figure 17. Developmental drawing; June/July 2004; acrylic on cartridge; 270 x 300 mm.

Subject matter here (fig. 18) includes a carpet, table and boxes of different shape and size. Attention was paid to their arrangement in light of previous discoveries about ambiguous spatial statement. For instance, the small chest of drawers in the top right corner is placed with a bottom corner at the very edge of the carpet so that the space around its shape in the drawing is cut off into two isolated parts. I also noticed that tension was created by the rectilinear/curvilinear shape only just touching the elliptical one. As Kandinsky once said: "The impact of the acute angle of a triangle on a circle produces an effect no less powerful than the finger of God touching the finger of Adam in Michelangelo." (Van den Boogerd, 1999. p. 36). The drawing was developed through stages with small compositional changes being made (figs. 18a, 18b, 18c), the last of these being a preliminary study for a painting on canvas (refer fig. 24)
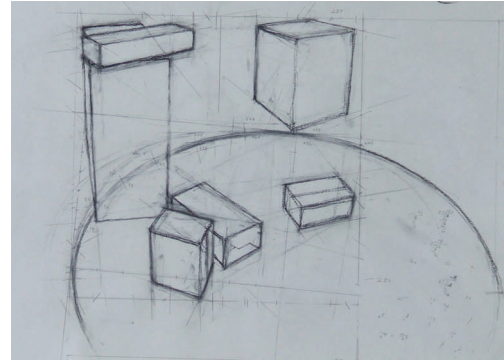
Figure 18.Study drawing – interior with still life objects; April/May 2004; charcoal/pencil on cartridge; 420 x 330 mm
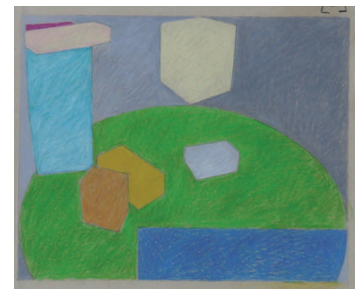
Figure 18a. Developmental drawing; May 2004; oil pastel on manila; 400 x 300 mm.

Figure 18b. Developmental drawing/ finished drawing; May 2004; acrylic on cartridge; 400 x 320 mm

Figure 18c. Developmental study for the painting – 'August 2005' (Fig. 24); November, 2005; oil pastel on

These are drawings (fig 19) of the same box viewed from different angles. Separate developments of these (figs. 19a, 19b, 19c, 19d, 19e) explore the shapes formed by framing them with squares. I found the triangles formed between shape and frame especially interesting, partly because of the ambiguous suggestions of three-dimensionality produced.

By now I had become interested in the geometric shape generated in these drawings of boxes. Robert Mangold suggests why they may have some intrinsic quality which makes them interesting, not only to me. He talks about one of his works in which he inscribes a circle in a 'square' which has only one right angle! In other words an approximately equal sided quadrilateral with one angle 90 degrees and the others close to

Figure 19. Study drawing – four views of the same box; October 2004; pencil/coloured pencil on grey paper, 500 x 390 mm.
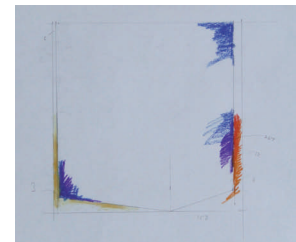
Figures 19a and 19b. Developmental studies for a painting; 20th November 2004; charcoal/oil pastel on cartridge; 300 x 300 mm.
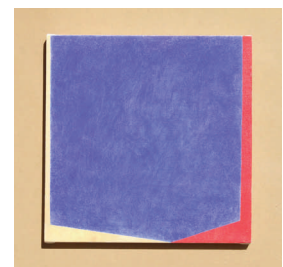
Figures 19c, 19d and 19e. 'Paintings. acrylic on canvas; 295 x 295 mm.

that. "The tensions created cause a viewer to inspect the particularity of the entire work, its specifics. The geometry of the work has lost its most expected feature – its ready submission to generalisation." (Shiff, 2000. p. 47). Hence these shapes are not only unfamiliar but each is unique and incapable of being

defined in a general way.

A number of finished works were produced during a period of several weeks (figs. 20 to 24). These were in acrylic on canvas or hardboard. Extensive experimentation was made into paint application. I wanted to obtain an absolutely flat surface with no texture. My interest in investigating the production of illusions of spatial recession necessitated the development of these paint surfaces which were themselves featureless. Any brushwork or surface texture enables the viewer to identify the paint surface as a structure and I was trying to dissolve the surface so that the illusion of space was emphasised. I found that flat layers of opaque colour could be applied by brush but transparent colours were a different proposition. I finally achieved a satisfactory result by laying down a series of progressively thinner glazes with progressively smaller brushes for each layer. However, the acquisition of a paint spray gun and experimentation with glazes of various strengths led to a more effective and less time consuming approach.

Figure 20. 'Painting – 23rd December 2004'; acrylic on canvas; 700 x 690 mm.

Figure 21. 'Painting – February 3rd 2005'; acrylic on hardboard; 270 x 250 mm.

Figure 22. 'Painting – April 15th 2005'; acrylic on hardboard; 320 x 320 mm.
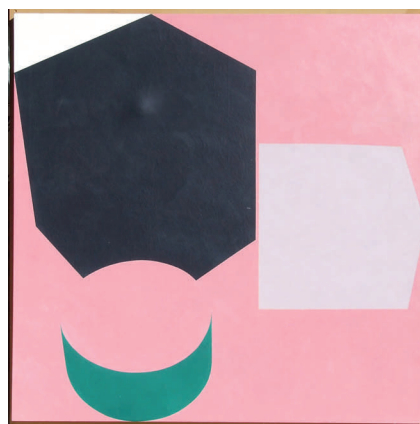
Figure 23. 'Painting – May 25th 2005'; acrylic on canvas; 1100 x 1180 mm.

Figure 24. 'Painting – August 2005'; acrylic on canvas; 560 x 560 mm.

Delicate Low Tack masking tape used in conjunction with *matt medium* to seal the edges was found to be an excellent way of obtaining consistently hard edges.

Two major factors informed the choice of colour. Given that colour had no consciously considered role other than to distinguish one shape from another, intuition and experience were applied. Hue, tonal contrast and pictorial balance were other prime considerations. The spatial illusions created by the various colour and shape combinations were expected but unpredictable in the exploratory phases. Preparatory colour studies were useful but the highly inflexible working process often prevented any major modifications from being made after an area of paint had been resolved. For instance, 'Painting – May 25th, 2005' (refer fig. 23) is a large painting in acrylic on canvas, measuring 1100 x 1180 mm. I had resolved all but one area of colour. Then dark blue paint sprayed onto the final area penetrated the masking and spoiled a previously resolved area - light orange in colour - with dark spots. Many attempts at removing them were futile. Overpainting was impossible – I could not duplicate the effect of spray painting with a brush. I had to respray the whole area but could neither exactly match the original colour nor exactly mask it. The result is that a thin line of different colour surrounds it.

Max Gimblett's expressive paintings (Curnow, 2002) prompted me to experiment with gestural mark making. The use of line as an autonomous formal element in fully resolved finished works, learnt previously from artists such as Mondrian, and Diebenkorn, was also considered. These two ideas were incorporated with previously developed design ideas in a painting based on a previously used study drawing (refer fig. 14). The combination enabled me to develop a new way of constructing illusionistic representations of three-dimensional

space. The development study on paper (refer fig 14b) was further refined in a painting on canvas.

Richard Killeen's cutouts (Pound, 1999) suggested the possibility of developing works on very flat shaped supports – aluminium would be the obvious material for such paintings. I had been considering the problems posed by the sculptural nature of the canvas stretchers. This was a way of obviating these. The previous experiments with gestural mark-making were fresh in my mind at the time, so I explored ways of combining the two approaches. A particular study drawing, produced at the very start of my research (fig. 25) suggested itself because of its compact compositional structure. Developmental studies explored colour and colour combinations (fig 25a). In the last of these I discovered how redrawing the linear frameworks - derived from the boxes in the original study drawing - on top of the painted areas could amplify the ambiguous spatial statement in the work. The final resolved version – in acrylic on card (fig. 25b) – was to act as a preparatory study for a painting on thin aluminium sheet. However, subsequent develop-
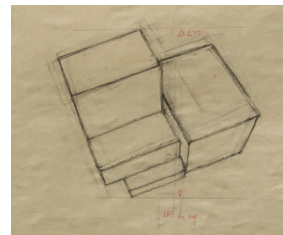
Figure 25. Study drawing – boxes; 3rd March 2004; charcoal on manila; 350 x 350 mm.
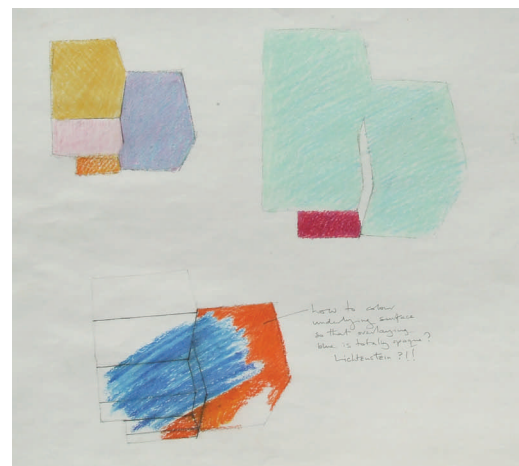
Figure 25a. Developmental drawings; November 2005; charcoal/oil pastel; each c. 150 x 150 mm.
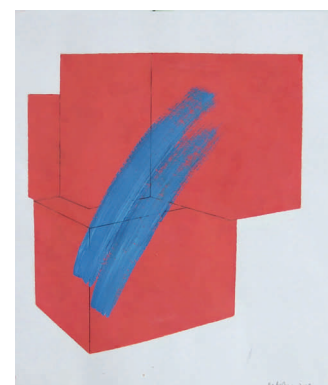
Figure 25b. Developmental drawing/ finished drawing; December, 2005. acrylic on card; 270 x 300 mm.

ments, more experimental in terms of composition, overtook these plans. During this research I gradually became aware that the full development of a particular idea was taking second place to the invention of new ones. From about this time that approach was taken consciously - as soon as one compositional idea was resolved I attempted to move into a new direction. As a result few series of fully resolved works exploring a single idea have been produced.

An article about Nicola Jackson's work in a Listener art column suggested a new approach. Jackson has a fondness for the tondo, the round frame that evidently 'brings all elements into formal unity' (Lonie, 2005. p. 44). It was this phrase which I found most interesting. Several works were produced in this format (figs. 26 to 28) in which I continued to explore ambiguous spatial statement and gestural paint strokes.

Figure 26. 'Drawing (tondo) – 3rd March 2006'; acrylic on cartridge; 320 x 320 mm.
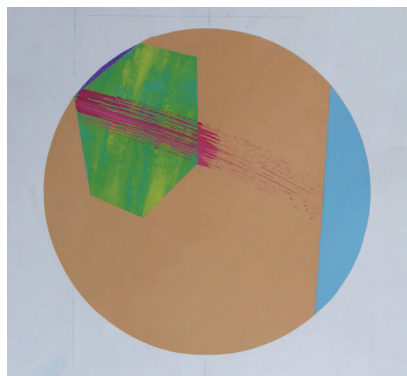
Figure 27. 'Drawing (tondo) – 12th April 2006'; acrylic on cartridge; 310 x 310 mm.

Figure 28. 'Drawing (tondo) – 18th March'; acrylic on cartridge; 300 x 300 mm.

Riduan Tomkins' paintings (Bracey, 1987) have suggested experimenting with compositions using small, isolated shapes on a large, plain field. Many of my study drawings had become festooned with lines and markings. Figure A 13 exemplifies this. These markings include measurements made at the time of drawing the still life study, construction lines enabling the study to be transferred to another sheet, calculations enabling the design to be produced in a smaller scale, measurements made to establish the position of the horizon and vertical vanishing points, dates of the original drawing and subsequent additions, and annotations regarding shadows and other aspects of the original subject or drawing, Different colours were used to distinguish the separate sets of information. These marks had become a feature of interest in their own right, especially as they exposed the underlying systematics of the whole drawing process. It was in a drawing in which I was exploring the idea derived from Tomkins that I first felt able to leave construction lines and annotations in the finished, fully resolved drawing (fig. 29). The drawing process itself - be it in the form of construction lines, measurements or shapes – has progressively been incorporated into my imagery. In a recent review of contem-
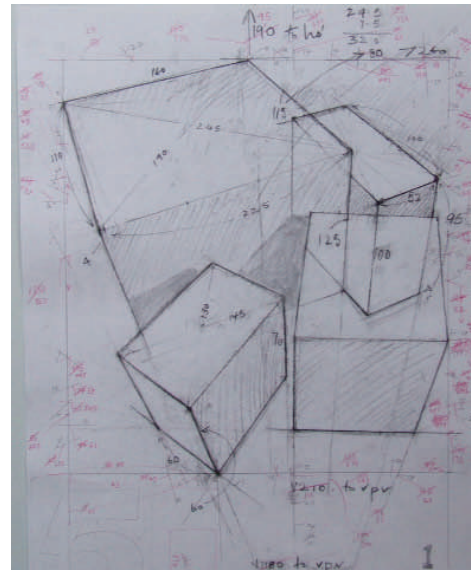
Figure A 13. 'Drawing of *Boxes*. August 2006. charcoal on cartridge 400 x 439 mm.
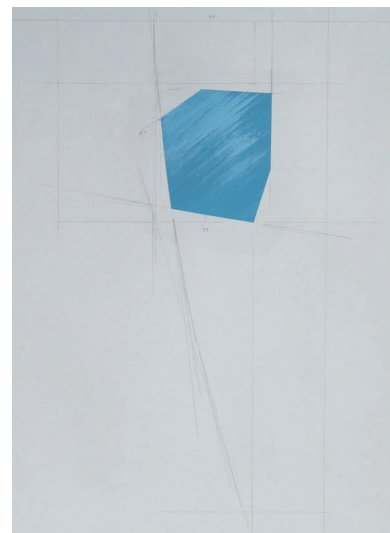
Figure 29. 'Drawing – 3rd June 2006'; pencil/acrylic on cartridge; 300 x 500 mm.

porary painters Brian Muller notes that "to varying degrees they all use the foregrounding of their conceptual structures, their production processes, and the material construct of their paintings as a primary device in their work." (Muller, 2003. p. 33). This aptly describes what had happened – the processes used in the planning of work aimed at representing a particular idea had become a part of the work itself. This was a significant move in that it tended to point to the futility of remaining constrained by the original intention of the research, which is clearly based on the representation of an idea and not on the production of artwork *per se*. A second drawing uses these construction lines as foci for additional areas of colour (fig 29a) and the idea reaches another stage of development in a very late work (fig 29b).

The nature of these artworks was such that its systematic, exploratory nature had become more obvious as a defining feature. I continued to explore the idea of building ambiguous representations of three-dimensional space with various media using drawing processes exclusively. In figure 30 acrylic paint is used loosely for the most part but with mask-

Figure 29a. 'Drawing – 1st July 2006'; pencil/acrylic on cartridge; 300 x 500 mm.
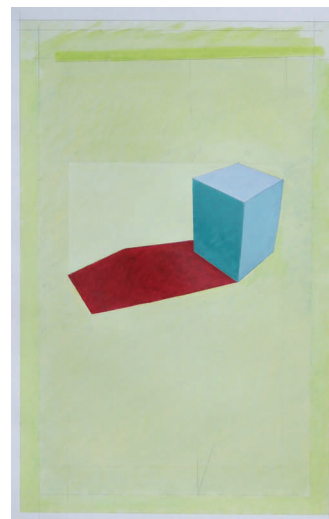
Figure 29b. 'Drawing – Late September 2006'; pencil/acrylic on cartridge; 340 x 530 mm.

Figure 30. 'Drawing – 23rd May 2006'; pencil/acrylic on cartridge; 310 x 300 mm.

ing to produce a specific spatial effect – the horizontal blue stripe is contained at each end by two lengths of masking angled in such a way as to suggest vertical recession in space. In figure 31 masking is used to obtain colour areas with sharp borders using oil pastel. Tone is explored in figure 32. The use of numerous areas of oil pastel is an attempt to explore if and how a suggestion of overlapping in three-dimensional space could be achieved (fig. 33).

In another series of works I began to explore the idea of line as *area*. Construction lines and annotations had by now become autonomous features of the pictorial design (fig. 34). In terms of the original subject matter on which the drawing is based the coloured area is actually a framing device while the figurative representation of a structure is relegated to construction lines. In a drawing in acrylic paint (fig. 35) thin lines of light colour define the borders between contiguous shapes.

In a second acrylic work the main shape is

Figure 31. 'Drawing – 16th May'; pencil/oil pastel on cartridge; 210 x 210 mm.
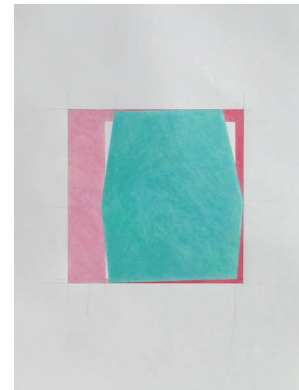
Figure 32. 'Drawing – June 18th 2006'; acrylic on cartridge; 400 x 310 mm.

Figure 33. 'Drawing – 5th June 2006'; pencil/oil pastel on cartridge; 300 x 450 mm.
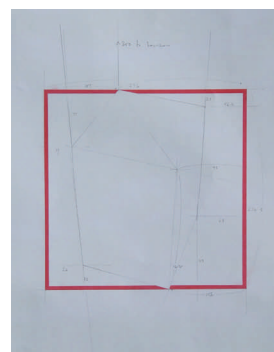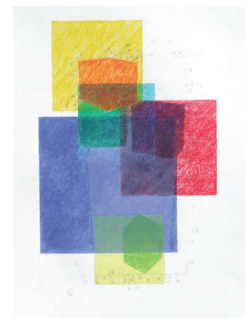
Figure 34. 'Drawing – June 30th 2006'; pencil/oil pastel on cartridge; 470 x 310 mm.

Figure 35. 'Drawing – August 2006'; acrylic/pencil on cartridge; 400 x 500 mm.
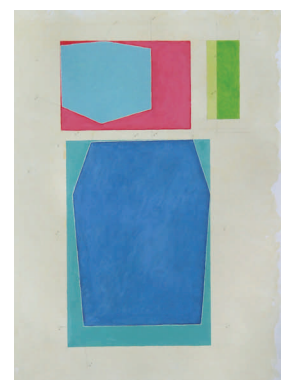
cropped (fig. 36). In another (fig. 37) the bordering line is modulated. This drawing prompted me to experiment further into the ambiguity of illusionistically overlapping shapes and the conflict between perspectival recession in terms of shape and a constancy in line thickness, which suggests flatness (fig. 38). My experiments with line and linear structure are echoed in Ryman's comments: "Line is not a spatial artifice for defining areas that fall on either side, but an actual space within which a given material has been chanelled" (Storr, 1993, p. 33). And John Elderfield (Auping, 1995, p.77) makes this interesting point about Mondrian's line: "I have noticed how Mondrian could make his black lines glossier than the prismatic colour areas, dematerialising them."

Figure 36. 'Drawing – June 13th 2006'; acrylic on cartridge; 380 x 440 mm.
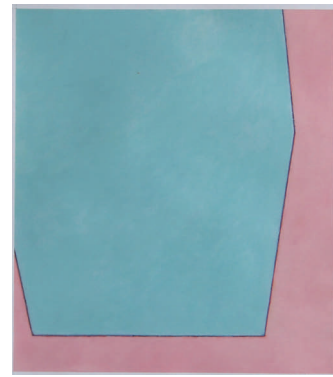
Figure 37. 'Drawing – June 9th 2006;' pencil/acrylic on cartridge; 380 x 400 mm.
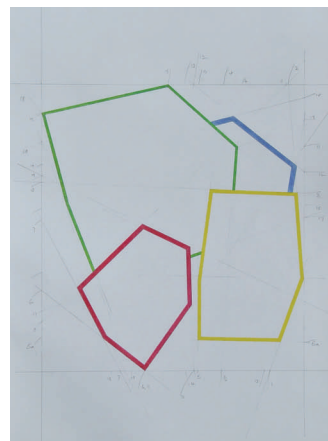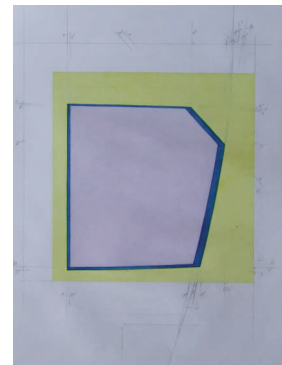
Figure 38. 'Drawing – June 7th 2006'; pencil/oil pastel on cartridge. 320 x 440 mm.

A dynamic between figuration and abstraction has been a major developmental issue that has arisen from this research. It has remained a viable context for exploration; some recent drawings are derived from attempts to reintroduce illusionistic modelling of three dimensional space. It was when I came across Jenny Saville's paintings (Ellis, 2003) that I was prompted to reconsider one of the first decisions I made – to remove illusionistic tonal modelling. An acrylic painting (refer fig. 14c), based on one of my earliest drawings (refer fig. 14) was a first attempt to return to

drawing illusions of three dimensional space using colour. I continued to explore this idea while working with the more abstract compositions. I started producing study drawings in which I paid special attention to cast shadows (figs. 39, 40 and 41). Acrylic drawings were based on these (figs 42 and 43). The incorporation of arbitrary areas of
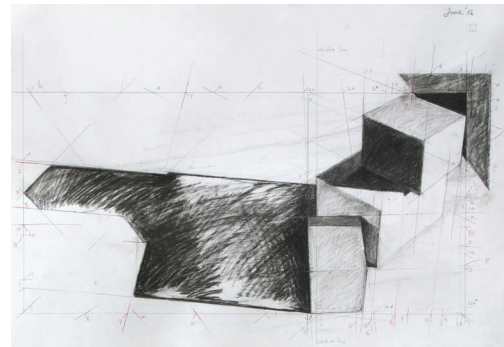
Figure 39. Study drawing – three boxes and cast shadows; June 2006; charcoal on cartridge; 560 x 360 mm.

Figure 40. Study drawing - boxes and cast shadows; 21st May at 11.30 a.m.; charcoal on cartridge; 460 x 280 mm.

Figure 42. 'Drawing 16 July'; pencil/ acrylic on cartridge; 380 x 550 mm.
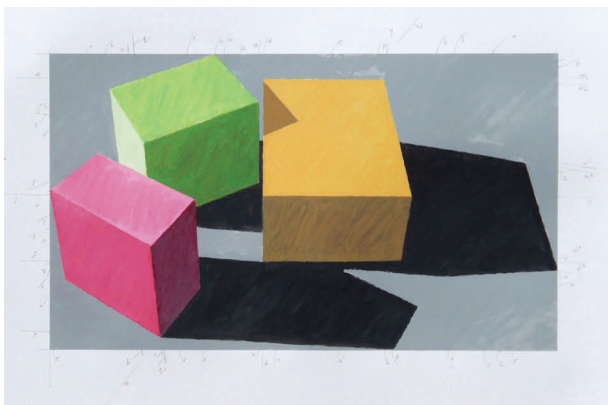
Figure 43. 'Drawing – 31st May 2006'; pencil/ acrylic on cartridge. 430 x 260 mm.
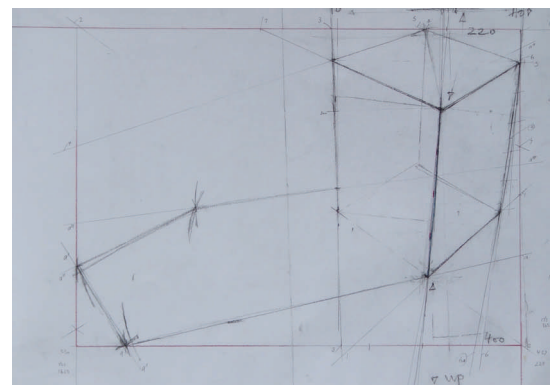
Figure 41. Study drawing – box and cast shadow; 28th August, mid day; charcoal on cartridge; 520 x 400 mm.

colour derived from construction lines into compositions in which tonal modelling has been reintroduced (refer fig. 29b) has now suggested a wide area for further exploration.

Conclusion

In this project I have researched a process whereby two-dimensional images have been constructed in an attempt to represent three-dimensional space. The process has been quasi-scientific in that a set of rules has been established which governs key aspects of the art making process. The exploration is rooted in observational studies of three- dimensional subject matter produced using a measurement process following the principles of spherical perspective. It has resulted in the production of a body of work which I hope is both intrinsically interesting and successfully responds to the challenges posed by the research problem.

Work displaying various degrees of abstraction has been produced during the course of the research. This has resulted from the experimental, evolutionary nature of the practical aspects of the project, from research into contemporary and historical art making practices and suggestions from fellow art practitioners. Perhaps such significant stylistic variations are not to be expected from such a systematic process. Can effective art work be produced by a purely systematic process?

However, the emphasis placed on systematic approaches throughout has provided a surprising result: new ideas have been opened up. In fact the development of new ideas has become a priority while the serial development, or exploration of, successful ideas has taken a back seat. This suggests a future art making approach in which each work is entirely different in concept or facture from previous ones

Much of my reading has explored the systematic approaches taken by artists,

contemporary and historical. It has revealed something I had not previously considered: such approaches are widespread. One wonders if this idea could provide fertile ground for further study.

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Appendix 1: A Brief Critical Review of Two Paradigms for Spatial Representation.

My research project was initially aimed at exploring a theory I had started to develop about our view and perception of three-dimensional space. This theory, clearly 'scientific' in nature, has remained as a backdrop to the production of artwork. Are science and art totally separate disciplines? What constitutes valid art research? This is a summary of the main aspects of the theory.

I am interested in two forms of linear perspective. Perspective in this context means the theory or art of suggesting three dimensions on a two-dimensional surface in order to recreate the appearance and spatial relationships that objects or a scene in recession present to the eye.

Renaissance linear perspective was formalised as a unified way of representation in early 15th century Florence. The original feature of the artworks produced by Donatello, Masaccio, Brunelleschi and their colleagues was that, in these, a set of rules was applied to create a realistic sense of three-dimensional space. The main principles should be well known to us, but the basic rule is that lines in

Figure A1. Robert Gill. A cube and a mirror set up in perspective. 1975. In *Creative Perspective,* London; Thames and Hudson, p. 67.

the subject which are parallel and horizontal are drawn so that, when extended to the horizon they meet at a single point on the horizon. A contemporary linear perspective drawing (fig. A1) shows sets of lines converging to common vanishing point on the horizon.

Consistent application of the rules was often avoided. Piero Della Francesca exemplifies this selective use of linear perspective. In his *Flagellation* (fig. A2) its use is so rigorous that an accurate floor plan for the whole painting can be inferred. On the other hand his *Proving of the True Cross* (fig. A3) has the sense of a more archaic painting with at least two distinct horizons. Artists were obviously aware of the shortcomings of the mathematical rules formulated by Alberti (the system is often referred to as Albertian perspective) and used them flexibly or selectively.
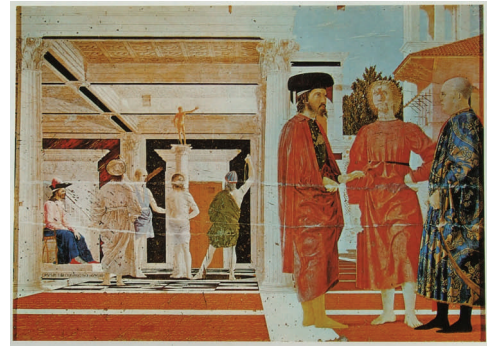
Figure A2. Piero Della Francesca. Flagellation. 1450s.
In *History of Italian Renaissance Art, by Frederick Hartt.* New York:Abrams. p. 230.

Leonardo da Vinci evidently became aware that linear perspective had technical weaknesses. His accounts of his investigations were lost, but in the mid 16th century Benvenuto Cellini bought a manuscript copy of a book by Leonardo – a treatise on perspective. Cellini inferred from this text what Leonardo had discovered. "It entailed the transfer of the subjective appearance of the real world by the projection onto a plane surface of proportions obtained by an intersection of the visual cone by a spherical surface concave to the eye." (White, 1967, p.208). White terms this approach *synthetic perspective.*

Figure A3. Piero Della Francesca. Proving of the True Cross. 1453-5.
In *History of Italian Renaissance Art, by Frederick Hartt.* New York:Abrams. p. 238.

Was anyone else aware that Renaissance linear perspective had its shortcomings? White comments: 'Only in the curvilinear designs of Jean Fouquet is the

essential element of a synthetic system fore-
shadowed' (p. 208). In one of his illustrations
for *The Hours of Etienne Chevalier* (fig A4),
produced in about 1450 after a visit to Italy,
the curvature given to both floor and ceiling
produce the kind of convincing sense of reces-
sion in space found in modern photographs.

In spite of Fouquet's idiosyncratic approach -
and no doubt others produced work along simi-
lar lines - Renaissance linear perspective
seems to have become the prevalent represen-
tational paradigm for the next few hundred
years. It was only with the advent of photog-
raphy that artists were given the opportunity
or incentive to explore different forms of
perspective.

It is clear that many artists worked directly
from photographs. Given his interest in horses
Degas must have been excited to see Muy-
bridge's photos. In fact, after seeing the
first article on these photos in 1875, Degas
copied a number of them from the full publica-
tion of *Animal Locomotion* (fig. A5). But what
I find most interesting is how some material
was being copied directly from photos while
the evidence of a perspective nature available

Figure A4. Jean Fouquet. Annuncia-
tion of the Death of the Virgin.
1460. In *The Hours of Etienne
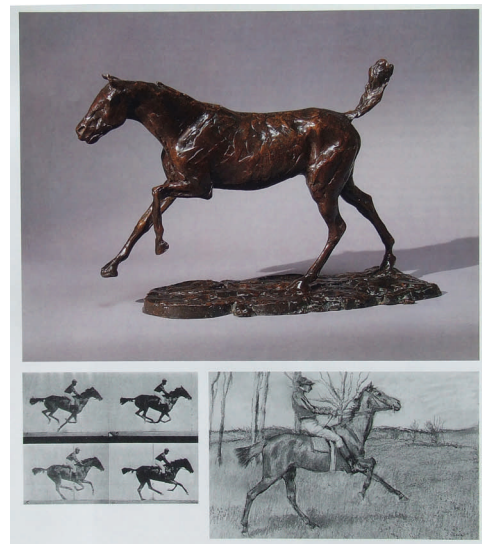Chevalier by Charles Sterling.* Lon-
don; Thames and Hudson p. 41.

Figure A5. Edgar Degas. Sculpture:
Horse Galloping on Right
Foot; 1876. Painting:The Jockey.
1876. Edweard Muybridge. Animal
Locomotion - Horse and Rider at Full
Speed. 1875. In *The Artist and Cam-
era by Dorothy Kosinski,* Yale Uni-
versty Press p. 76.

in photos seems to have been ignored.
Figure A6 is a photo taken by Edouard
Vuillard. It clearly shows straight lines
appearing as curves. A painting by Gus-
tave Caillebotte (fig A7) exemplifies
the continuing use of linear perspective
to provide the prevalent structural
framework for paintings.

Figure A6. Edouard Vuillard. Misia and
Thadee Natanson.
c. 1897-8. Modern print from an original
negative. In *The Artist and Camera by Doro-*
thy Kosinski, Yale Universty Press. p. 256

However, an idiosyncratic painter called
Arthur Parsey did notice. He wrote to
the Royal Academy in 1850 berating
them for failing to see that photogra-
phy had exposed the existence of per-
spective forms other than linear
(Scharff, 1968). He was largely ignored
then and his ideas have remained ob-
scure, in spite of the way that we are
bombarded with photos, video and film
every day which exhibit spherical per-
spective - spherical perspective is a
synonym for White's synthetic per-
spective. I include a modern example
(fig A8).

Figure A7. Gustave Caillebotte. Still Life
with Oysters. 1886.
In *Gustave Caillebotte, Urban Impressionist*
by Anne Distel, New York: Abbeville. p. 240

This is a formal statement of the more
obvious properties of spherical per-
spective: *straight lines in the subject*

Figure A8. *...and they're off. The 3.30 at*
Foxton Beach. Photograph. c. 2004. News
Ltd

appear straight in the picture if they pass through the centre of the field of view. Straight lines which are peripheral in the picture appear curved. The greater the angle subtended between the line and the centre of the field of view the greater the degree of curvature in the line. Since wide-angle photos subtend larger angles at the camera they show greater degrees of curvilinearity at their edges.

Figure A9. Edouard Vuillard. Interior. c. 1902. In *The Artist and the Camera by Dorothy Kosinski,* Yale Universty Press p. 252.

I have searched extensively for drawings and paintings in which any aspect of spherical perspective is used. A painting by Vuillard (fig. A9) is one of the small number I have found – it exhibits a similar approach to that used by Jean Fouquet about four hundred years earlier. The vast majority of drawings and paintings are in one or two point rectilinear perspective. Two examples will suffice (figs. A10 and A11).

Figure A10. Janet Fish. Sentinels (Windex). 1990. In *Janet Fish: Paintings,* New York: Abrams. p.101.

I believe the argument can be extended from photographs to our vision. The camera and the eye have a key feature in common - both are central to a surrounding field of view. *I would argue then that, as a result, images formed by the eye share the spherical perspective fea-*

Figure A11. Yves Belorgy. Red Road Court III April-May-June 1999. In *Contemporary No. 70, 2005* p. 39.

tures of photographs. On occasion I have made comparisons between drawings of a subject and photos taken after the drawing is complete (figs. A12 and A13). This has been as part of my ongoing practical explorations but I use this material here since I believe it can support the argument that photos, our vision and spherical perspective are structurally linked.

Figure A12. David Jowett. *Boxes*. Digital Photograph. August 2006.

Perhaps we should ask why we have largely continued to use linear perspective in representations of three-dimensional space when we are so exposed to spherical perspective in the form of photos, video, film etc.?
Some possible answers are that we don't recognise *any* form of linear perspective, or we can't distinguish between rectilinear two-point perspective and curvilinear spherical perspective, or we can differentiate between them but don't worry about it.

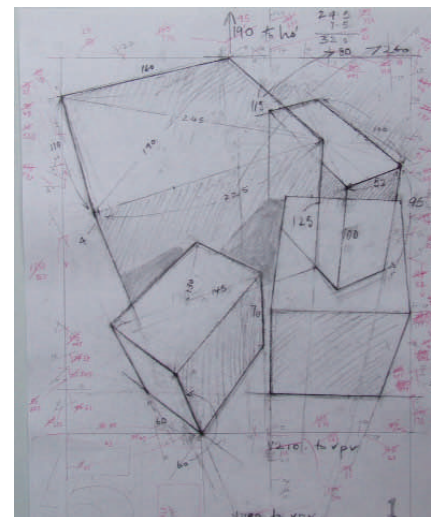Figure A 13. David Jowett. *Drawing of Boxes*. August 2006.

There is a large quantity of literature dealing with spatial representation *from an artistic viewpoint*. None that I can find acknowledge the spherical perspective nature of photos or our vision. This is a small but representative selection of comments from such texts on this issue:

- 'Photography is...a means for automatically producing pictures in perfect

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Renaissance perspective.' And 'every perspective picture represents its subject as it would be seen from a particular point of view at a particular moment.' (Galassi, 1981, p. 12)

- 'The rules of linear (Renaissance) perspective govern retinal and photographic images.' (Reggini, 1979. p. 55)

- 'Photography is the ultimate Renaissance picture. It is the mechanical formulation of the theories of perspective of the Renaissance.' (Hockney, 1988. p. 124)

- In the last chapter of his comprehensive account of *The Discovery and Rediscovery of Pictorial Space* (White, 1967) in which he describes Leonardo's attempts to produce a more realistic representation of the world, Professor John White says this: "There can be no question of accuracy in the curvature of synthetic perspective. They may conceivably be beautiful, but they can never claim to reproduce exactly what is seen, no matter what conditions are postulated." (p. 275)

- 'Jacopo Bellini mastered the mathematics of Florentine linear perspective... He was one of the first Venetian artists to depict the world around him with documentary objectivity.' This is written by Andrew Graham-Dixon in his book *Renaissance* (Graham-Dixon, 1999. p. 245). He later writes: 'The Renaissance has taught us to desire images of living reality... The camera is literally a mechanised way of creating Renaissance perspectives – the *Alberti Box* it has been called ' (p. 324).

These statements – taken together – demonstrate the general consensus which

exists about the related issues of perception, perspective and photography. It is this consensus – and the extent to which it is at odds with the ideas I have discussed – which I believe needs to be examined. My approach may well derive from developments in my attitude over the last few years. My experimental discovery - in my own drawings - of the basic principles which underlie the concept of spherical perspective, came long before I read White's account, and hence before I became aware of the existence of the concept itself. If I had read his account *before* carrying out my practical explorations its significance may well have eluded me, I may well have simply accepted his ideas as expressed above (White, 1967, p. 275).

I will attempt to explain where and why the differences between these two forms of linear perspective exist.

Rectilinear perspective drawings derive their qualities from the way we look at subject matter, then draw it. We view features in the subject one at a time, drawing each in turn as they occupy the centre of the field of view. We link these statements together to form a composition. Now, if one accepts the argument that we see in spherical perspective, then one will realise that as one feature leaves the centre of the field of view its appearance changes. One can not then link it with the next feature unless one somehow represents this changed appearance. **This applies most obviously to vertical straight lines in the subject**. If all verticals are represented as vertical and straight, which is how they appear when they occupy the centre of the field of view, then in our pictorial representations the spaces between vertical lines will remain constant in size as the verticals recede into the distance. This is basically what is happening in Yves Belorgy's painting (refer to fig. A11). However, we are meanwhile perfectly content to represent the spaces between horizontal lines as con-

tracting as they recede into the distance. It occurred to me that I may be able to use some form of experimental approach to demonstrate this effect more graphically. I used a painting by Giacometti - 'Apple on the sideboard' - as the basis for this experiment (fig. A14). I set up a comparable situation and drew it using spherical perspective principles (fig. A15). The resulting drawing contrasts significantly with the painting in obvious ways. Giacometti is either distorting the image or misperceiving the subject. One wonders which. But either way it poses some interesting questions. It would seem to me that we have established a hierarchy in which recession in one plane is represented differently from that in another!

Figure A 14. Alberto Giacometti. Apple on the Sideboard, 1937. In *Alberto Giacometti by Christian Klemm.* New York: Museum of Modern Art. P. 125.
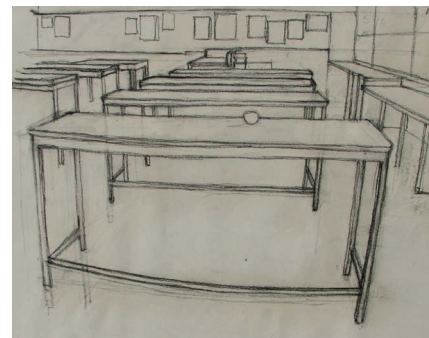

Figure A15 David Jowett. *Drawing after Alberto Giacometti* August 2004.

And what of spherical perspective? This approach yields drawings in which some lines which appear straight when viewed directly in the subject are represented as curves. This is how wider angle photos are structured, and may well be as we see them in our peripheral vision, but it is nonetheless regarded as unrealistic.

To summarise, the Renaissance, rectilinear perspective approach accurately represents lines as seen directly, while curvilinear, spherical perspective accurately represents space as seen at one instant in time.

I do not seek to establish spherical perspective as a superior way of representing three-dimensional space. Art is subjective and self-expressive, not prescriptive. However, I would argue that an awareness of these ideas would seem to enhance our understanding of three-dimensional representations.

Appendix 2: Final Exhibition of Works.

The final exhibition was mounted in the Fishbowl Art Gallery at Nelson Marlborough Institute of Technology. The gallery, originally designed as a student café, suffers from a number of limitations. Natural light levels are high, which is fine for making the artworks visible but makes protection against degradation by UV light an important consideration. The available wall space, though relatively large in total, is broken up by structures such as a concrete pilaster, a housing for electrical switching gear, a cupboard door and a large sliding glass door for egress. The exhibition was initially designed to take advantage of the whole space available. However, after some constructive criticism was made it was realized that this arrangement was far from satisfactory. It had actually incorporated some of the intrusive features mentioned above and provided a rather fractured and incoherent visual experience. It also repeated the chronological, stylistic and technical linkages between works which had been discussed in the exegesis — changing this emphasis would enable a more creative approach to be taken to the display of the works as a whole. Charcoal and pencil study drawings were mounted on the north wall either side of a small window (fig. A16), the distracting effect of the window hence being emphasized. Works on the two larger areas of the east wall were too widely spaced, (fig. A17) and a

Figure A16. Initial installation view—north wall.

Figure A17. Initial installation view—east wall.

small area of wall on the south side of the gallery, impinged on by a sliding glass door, was occupied by a small group of works in oil pastel and acrylic paint.

Constructive criticism of this layout led to its re-evaluation. All works were removed and a second lay-out planned so as to pre-sent a more coherent vis-ual statement in which greater emphasis was placed on forming interre-lationships of an aesthetic as well as a conceptual na-ture. All but one of the works were placed in closer juxtaposition on the east wall. (figs A18, A19, A20 and A21), the excep-tion being a large diptych in charcoal whose scale necessitated its being given a space of its own
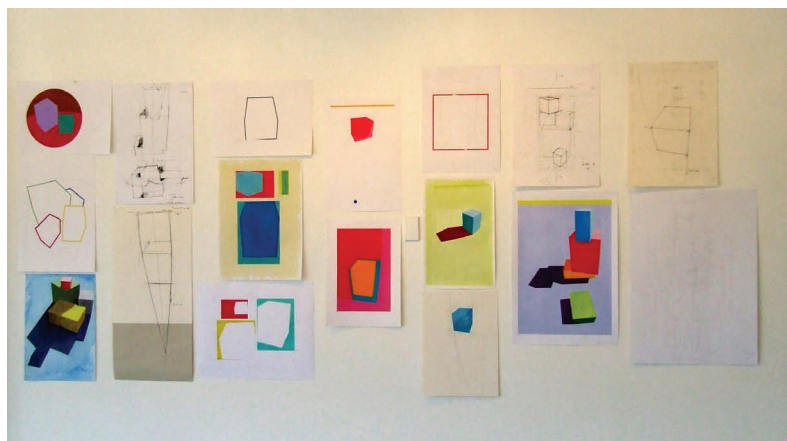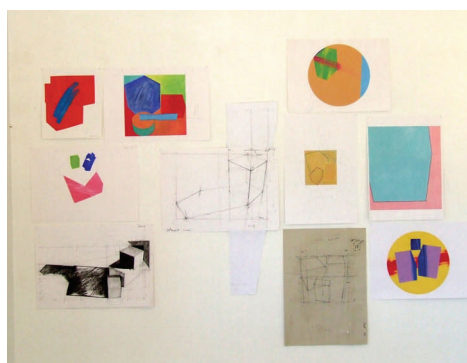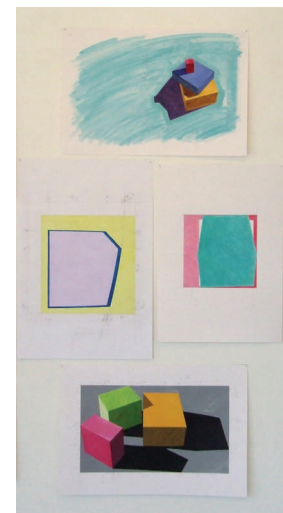

Figure A18 Final installation view.

Figure A19. Final installation view—east wall; detail.

Figures A20 and A21. Final installa-tion views—east wall; detail.

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(fig A 22). A display of packaging boxes—the predominant subject matter for the exhibited art-works—was constructed on the floor opposite the east wall.

A number of works in the exhibition were produced after the exegesis was presented. The diptych mentioned on the previous page (fig.A22) is in a larger scale than used up til then; positive and negative special concepts are explored. A drawing in acrylic (fig. A23) establishes areas delineated both by drawn contours and construction lines. It differs from most of the previous pictures using this compositional approach in that the whole area is painted in solid colour. A study drawing of boxes (fig. A24) spans a wider field of view than had been attempted previously. This idea derived from a composite drawing (fig. A25)—produced a few days before—which combined the visual information from three existing study
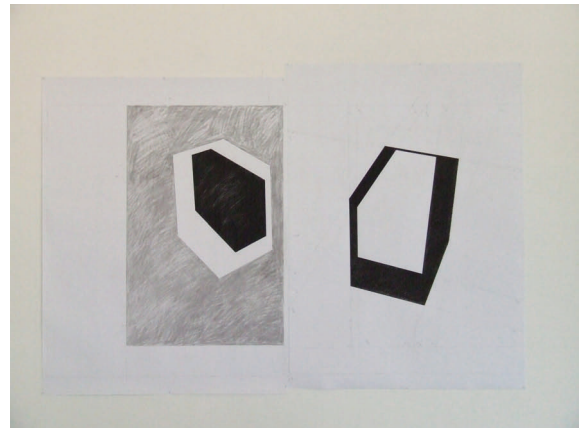

Figure A22 Drawing—'Diptych; November '06.' charcoal on cartridge.

Figure A23. 'Drawing—October 2006' Acrylic on cartridge; 270 x 410 mm.
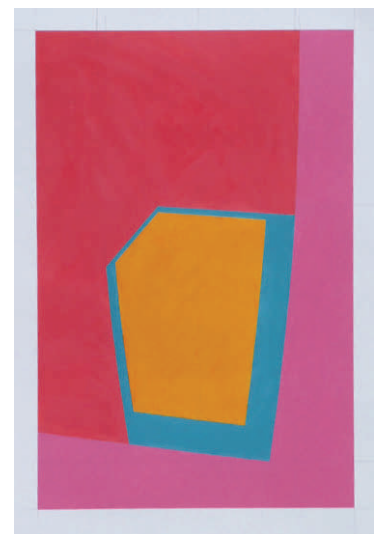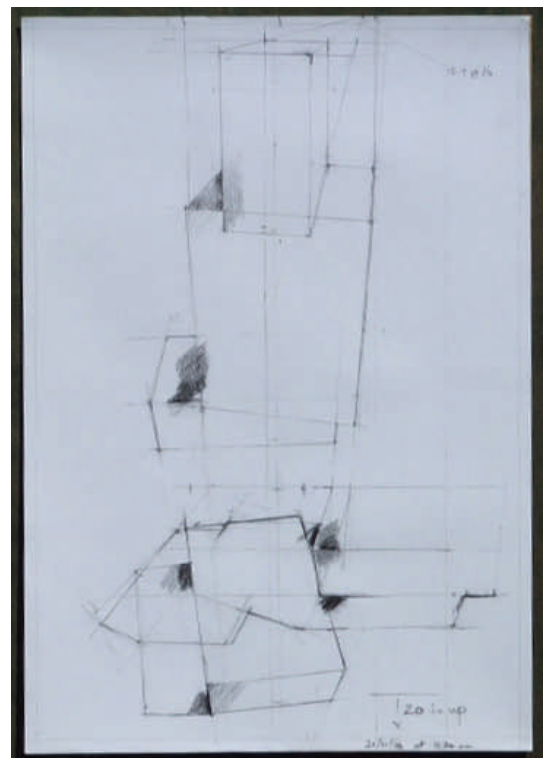
Figure A24. Study drawing—boxes and cast shadows; 21/11/06, 11.30 am.; charcoal on cartridge. 400 x 600 mm.

drawings produced over a period of months. This composite drawing necessitated using graphical approaches so that drawings done on different occasions and using different scales could be unified in one representation.

A large drawing in acrylic (fig. A26) was painted directly from the study drawing shown in figure 24. Though both tonal modeling and cast shadows are suggested in this work I believe it nonetheless retains the spatial ambiguity and abstract qualities which I have tried to incorporate into all the finished works in this project.

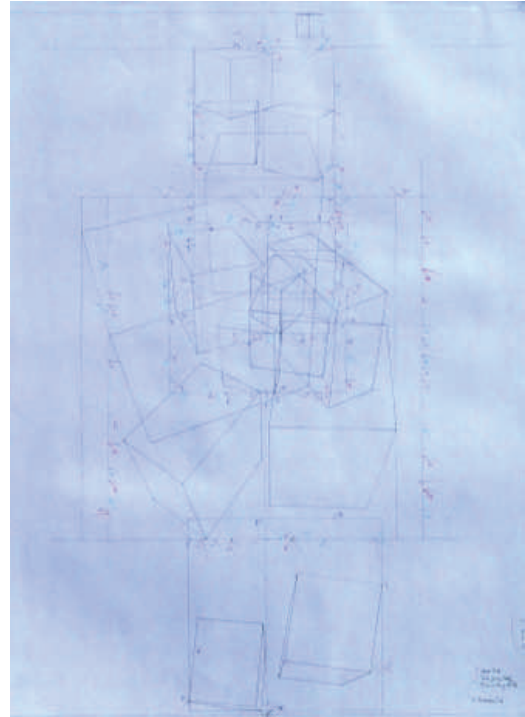Figure 25. Composite drawing—October 2006.; pencil and coloured pencil on cartridge. 500 x 805 mm.

Figure 26. Drawing— 25-27/11/2006; acrylic on cartridge. 450 x 645 mm.