Drawing and Fabrication: an exploration of transition between two and three dimensions.

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Copyright Statement

Abstract

This project originated in an investigation into the hybridisation of digital and handcraft processes in the generation of form. It quickly departed from that, when I realised that the underlying issue was that of relationship and transition between two and three dimensions. It became clear that this was a lens through which my previous practice in both vessel making and sculpture could be usefully viewed and understood and thus it presented rich potential for further research. The initial investigation gave me some useful insight into the value of CAD software for the rigorous language of its menus as guides in analysing the handmade, and also the limitations of its output in delivering the nuance of materiality. It continues to inform my method and thinking about process.

I am exploring the potential for a cyclical and reciprocal relationship between drawing and making, line and form, plane and solid. This embraces exploration of methods for generating a three dimensional solid from a two dimensional image, and then revealing formal or aesthetic qualities of that solid through a two dimensional intervention or analysis, such as that derived from cross section, silhouette or shadow.

Consideration of cast shadows as an example of a three to two dimensional transition have led me to focus on the penumbra, the boundary between light and shade. I am doing this by attempting to realise its material equivalent, the boundary between matter and space. The use of cross section as a method of construction of and intervention in form is a key method in the physical manifestation of this phenomenon.

The boundary of clay, the difference between its presence and absence, is finite and abrupt. The boundary between the light and shade, however, appears infinite in its gradation and thus is inherently indistinct. Thus the notion of transition from the project title becomes crucial. Through exploring transitions between dimensions and between presence and absence I aim to capture ephemeral and fugitive visual qualities in the material object.

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1. *Drawing and Fabrication* book

Preface

This project and thesis comprises, to paraphrase Christopher Frayling, 'research through practice'[1]. Or rather research through practices. The practices are those of making ceramics, drawing and writing. They are all practices of making. The method of the research is through reflective practice in these areas. As a form of action research this is documented in the tests in Appendix 2.

The submission includes this written report, exhibited drawings and ceramic objects (of which images are included in Appendix 1) and the short book 'Drawing and Fabrication'. This book is the product of collaboration between myself and Giulia Garbin, an MA student in Visual Communication at the RCA. The collaboration arose from her interest in my work at the Ceramics and Glass 'Work in Progress' show in the Henry Moore Gallery during November 2011, and subsequent suggestion that we make a book together. The text and images in the book are mine and the design, layout and adaptation or interpretation of images are hers. This collaboration, as is discussed in Chapter 6, drove the development of different written voices. Chapter 4, *Form and Surface* is a result of this. It should be seen as a piece of writing that is less analytical and reflective of the practice in other areas and more a parallel to them.

[1] Derived from Frayling's discussion of Research *into*, *through* or *for* art and design in Royal College of Art Research Papers Vol1, No1.

Acknowledgments

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Giulia Garbin, through her impetus to collaborate and subsequent opening of my eyes to my own research, made an invaluable contribution to this project.

Conor Wilson has been an invaluable fellow student and companion in endless debate.

The hospitality of Will and Nicole Latham has been generous and vital in making this study possible.

Above all, my wife, the amazing Dr Caroline Rye, has my heartfelt thanks.

Author's declaration

During the period of registered study in which this thesis was prepared the author has not been registered for any other academic award or qualification.

The material included in this thesis has not been submitted wholly or in part for any academic award or qualification other than that for which it is now submitted.

Signature

Date

1. Introduction and context

The proposal for this project held the title “How can a hybrid of digital and handcraft methods of production be used to explore the generation of form?” Once I had begun my research this title remained only for a few weeks.

The personal context for this project was a desire to create the space to develop a new body of artwork, and the acknowledgment of a problem or block in the generation of more works in the series of forms that I had been making. This problem was, and in many ways still is, the question or issue that drives the research, and is outlined below.

Between 2000 and 2010 I had been making a series of objects focussed on the expression of tension and resolution between a series of related aesthetic polarities; 'artificial' (mechanical, manmade, ordered, hard, reductive) and 'natural' (organic, soft, disordered, accretive). This focus was linked to an interest in the relationship between process of fabrication and aesthetic

outcome. The relationship between motion and stasis was also represented in the use of cross sections through solidity to reveal aspects of movement and gesture. A key method in developing this expression was the use of positive and negative space – the solid and the void. The ceramic form was made around a plaster solid, which was then removed to create the void.

Increasingly these objects had become based on the use of a spiral. This was for technical and aesthetic reasons. The spiral enabled me to create complex internal spaces in the ceramic object, as it presents a method for getting round the problem of undercuts in mould making. The principle is that of the nut and bolt. Many of the ceramic objects could be seen as a 'nut' from which the plaster 'bolt' is unscrewed. Aesthetically the spiral enabled me to make simultaneous visual reference to the many spiral forms of growth in the natural world and objects such as turbine fans and gear cogs.

Fig 1. Nicholas Lees – 'Solaris', 2004, H 35cm, Stoneware Ceramic and Gold Leaf.

I made the spiral plaster forms by first turning on a lathe or whirler[2] a section of a cone. This was then carved into by hand to form a spiral made up of bulging flutes. I was interested in the possibility of using this reductive method to end up with a form that appeared full and expansive. In order to make this spiral I was generally looking at the plaster 'blank' in profile, and had to visualise the final form in terms of removal of material. This became limiting as the process restricted what I was able to visualise and achieve through it.

Another aspect of the ceramic objects made in this way was the use of cross section as a visual tool – the objects appeared at least to have been sliced from a larger solid – and this led me to thinking about the potential for using cross sections as a starting point in conceiving and making the work.

To this end, I drew some quick outlines that I thought it might be possible to 'spiral through space' or extrude and rotate in

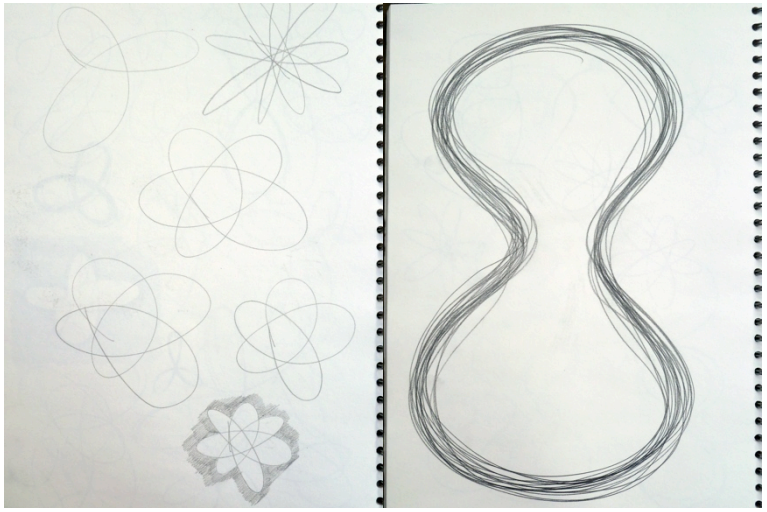
Fig 2. Turned and carved plaster former for 'Solaris'.

[2] A vertical lathe used for making flatware forms.

some way. One of these was the 'propeller' form that proceeded to become the default testing form through much of the first six months of my project. (Figs 3 and 4) My first simple approach to generating form in this way was to cut out a number of the same shape from foam board and then skewer these on a metal rod, which enabled me to quickly visualise a form by then arranging these in a spiral. (Figs 5 and 6. This approach reappears in some of my early tests during the MPhil project; numbers 2, 3 & 5 in Appendix 2).

I realised two things; firstly that I was generating forms that I would not have been able to visualise or execute using the previous method and secondly that this 'additive slice' process was similar to that used by Rapid Prototyping technologies such as 3D printing and Layered Object Manufacture (LOM).

This led me to initiate a brief collaboration with Dr Justin Marshall of the Autonomatic research group at University College Falmouth (UCF) in order to look at methods of using a hand drawn line as a cross section to generate form via digital



Figs 3 and 4. Sketchbook line drawings and 'propeller' sketch.

Figs 5 and 6. Foamboard model and Test 2.

processes. This was successful in presenting a method to deal with the immediate problem I had faced of conceiving and generating forms. It also suggested to me that there was potential for a bigger project based around the use of a combination of digital production methods with a handmade or hand drawn element. This became the basis of my research proposal for an MPhil at the RCA and led to the formulation of the initial question.

Beyond the personal, the context for this proposal was seen to be the current debate and investigation into the uses of and potential for digital processes in the production of craft objects. As outlined in my initial proposal, submitted in June 2010, I was aware of…

> the growing body of practice and research in the field of applied arts related to this theme. A key group are the Autonomatic research cluster at UCF, whose work I am familiar with, particularly through the aforementioned collaboration with Justin Marshall funded through the research budget at Bath School of Art and Design. I am also aware of other work in related areas at the RCA such as

that by Michael Eden into the uses of RP technology in ceramics in his MPhil project. The work of Tavs Jorgensen into the use of hand drawn line with digital apparatus has a relationship to the research I wish to undertake in the means of transition from line to form and 2 to 3 dimensions. The work of Geoffrey Mann informs this proposal through his use of technology to capture movement and ephemerality.

This debate is also represented in the range of work in this field presented at exhibitions such as *LabCraft* (Crafts Council Touring exhibition Sept 2010 to July 2012), and conferences such as *Ex Machina : Exploring digital manufacturing in fine art, crafts and design practice*. at RIBA in February 2009.

As will be seen throughout this written report the project shifted far and fast in terms of its intent, content and thereby also context. The context outlined above remains pertinent, but the work and thinking of the project has become more informed by looking at and thinking about the work of artists such as; David Nash - for his engagement with materiality and change, Rachel Whiteread - for the relationship between

drawing and making and her insights into the boundaries between form and space, and Anthony McCall - for his play with solidity and ephemerality. As is outlined in Chapter 5, debate around the role of craft, process and skill is important to the project and its outcome, but it is not the subject of the research.

2. A narrative of the early development of the project.

In the autumn of 2010, as I started my research at the RCA I felt uncomfortable. This was due to unease about the project's focus on process. I came to realise that it was more about 'how' and less about 'what' or 'why' than I desired. I was especially uncertain about my abilities and interest in the digital aspect of that focus, and aware that to make meaningful progress my knowledge and skills in this area would have to catch up fast.

An early supervision meeting focussed on a series of small spiral tests I had made previously at University College Falmouth. These were made by making a hand drawn outline using a Wacom tablet in Adobe Illustrator (vectorgraphics). This outline was extruded and twisted using Form Z (3D CAD). This 'tube' was then given a wall thickness and constructed as a 'real' object using a Fused Deposit

Fig 7. Plaster form (left) and FDM mould made at UCF.

Manufacture (FDM) machine. The object thus produced was used as a mould for a plaster solid, which was then cut at an oblique angle.

In discussion it became clear that what was most interesting about these objects was not how they were made. Rather it was what they demonstrated about the transformations that can happen in transition between two and three dimensions, and what can be created and revealed by imposing a planar 2D intervention upon the 3D solid. There seemed to be potential here to generate images that cannot be preconceived.

Having realised this it also became clear to me that I could interpret most things I have made in ceramic through the same lens. In my early career I made vessels through the combination and alteration of thrown and extruded parts. To a limited extent I would draw objects before making them, most often in profile. However I mostly worked through direct making, as I found that my ability to visualise 3D form outstripped my ability to render that on paper. Many objects involved cutting

planar sections through the complex curves of thrown forms and this interaction became an important aesthetic interest, albeit without having analysed it in these terms. This reflection, generated by the redefinition of my research project, enables me to find a conceptual link between this work and my sculpture, which has dealt more overtly with cross section as a means of revealing the interaction between two forms, a solid and a void.

From this early stage the project had a new working title of *Drawing and Fabrication; an exploration of transitions between two and three dimensions*. This redefinition of the project did not mean that the original issue of hybridisation of digital and handcraft processes was abandoned altogether, rather this was repositioned to become an important part of the method for investigating the newly defined issue. 3D CAD appeared to offer great potential for finding and visualising means of generating solid forms from 2 dimensional inputs. My initial investigations centred on three areas of work; drawing, making in clay and making in Rhino.

Extrusion

As perhaps the most immediate way of moving from a 2D image to a 3D solid extrusion became the starting point for the practical work. To avoid restricting myself to spiral or helical forms I worked with the idea of extruding along a path and looking at ways of manipulating and transforming the form. I attempted to make forms in parallel in the physical and virtual realms – clay and Rhino (3D CAD).

One thing that became clear from doing this is that the language of CAD menus is significant and powerful in bringing a clarity and rigour to the interpretation of 'handmade' clay forms. An example of this is the distinction between *curve*, *solid* and *surface*. In the early supervision meeting mentioned above we considered a plaster form cast from a CAD generated shell mould, and involving a spiral extrusion of a simple outline comprised of two hand drawn arcs. I initially described how one convex line on the original outline had 'turned into' another concave line when it was seen as the edge of an

Fig 8. Plaster model showing original cross section (bottom) and that made by oblique cut (top). The curve discussed is on the right and then the left of the form.

oblique cut through the solid. However the important distinction is that the second line is in fact the edge of a *surface* that is the result of a planar cut through the *solid* that resulted from a transformation being performed on the original *curve*.
There is a similar phenomenon in understanding the difference between ways of manipulating a clay form as it emerges from the pneumatic extruder. I attempted to manipulate by moving the clay only in the horizontal and also by 'leading' it along a path. Lengths of extrusion manipulated in the latter way have been cut and assembled into more complex objects. Rhino sees this distinction as between *extrude curve along path* and *sweep curve along rail*. In the former the curve or outline remains in the x/z axis and in the latter the curve remains perpendicular to the rail. The clarity of Rhino's distinction focussed my attention on the importance of the axis in which a 2D outline, surface or plane exists.

Another means used to transform clay extrusions has been to cut a straight extrusion into slices and rearrange these into stacks demonstrating a twisting or oscillating movement. This

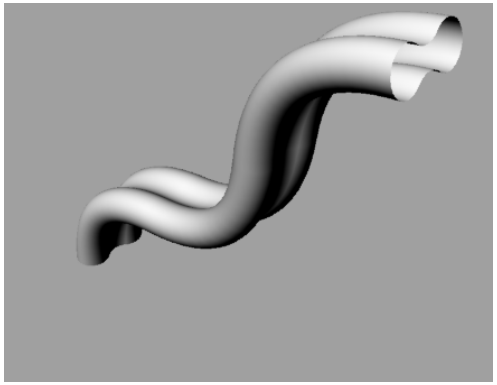


Fig. 9. Rhino render; 'sweep curve along rail' Test 10

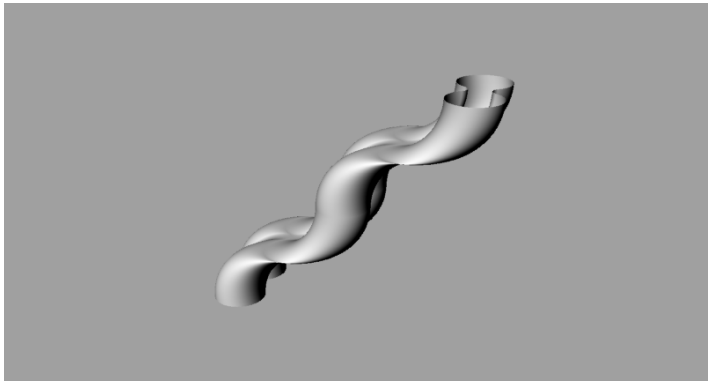


Fig 10. Rhino render; 'extrude curve along path' Test 11

was a practically expedient method to quickly explore some possibilities but has thrown up some aesthetic questions. I have realised that it is very important to be aware of the formal qualities of these objects given by their stepped characteristic. This becomes particularly important when these objects are cut with an oblique plane. The surface that is revealed demonstrates a 'pixelated' echo of the original curve.

Fig. 11. Stepped extruded object sliced. Test 12

Drawing and Print

In order to be able analyse the differences between various processes I restricted myself to one image/outline/curve, based on a propeller shape and also the tension between swell, constriction and stretch of a line. I made a series of drawings developing this image using a method of drawing seeking to emulate carving – the arrival at an outline through repeated action. These images throw up an issue of focus in a different manner to the 'pixelation' issue referred to above. There is a softness to the outline that is at odds with the definition and

hardness of the extrusion die and might relate more to the image/object that is created when the soft clay is manipulated as it emerges from the extruder. There was also a great contrast between this drawn origination and that which I used in Rhino, geometrically generated from two circles filleted together. I later made a series of drawings attempting to combine the hand-drawn and geometric elements and to develop the drawing both in scale and physicality, exploring further the indications of the potential for qualities of solid objects, especially in terms of the 'focus' or definition of the boundaries of those solids.

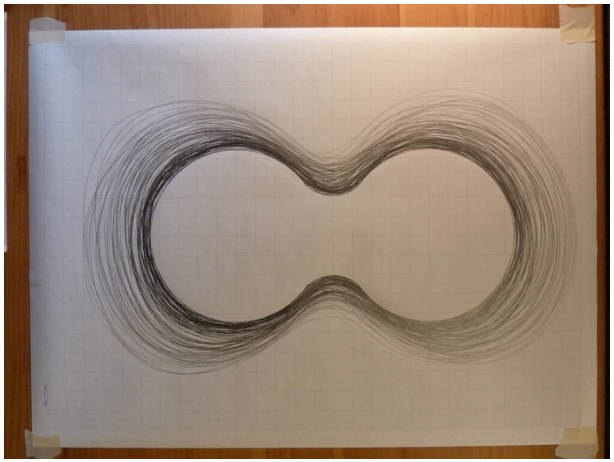


Fig. 12. Drawing from test 33

I experimented with print as a means of creating a 2D image from the altered and cut solid. Block printing from the clay generated images with a physicality and sometimes an indistinctness that stands in an interesting relationship to the original drawing and has resulted from the mediation of that drawing through a 3D process. This translation was the basis of the image used for the Work in Progress show in November

2010. It was noted that these qualities were absent from the Rhino visualisations of the same forms.

A further strategy for looking at the relationship between an object and a 2D image that can be generated from it was to place a cut clay solid onto a flat bed scanner and make a digital image from it. This creates an image that combines the cross section with a fading image or echo of the solid that lies behind it – a curiously subtle combination of two and three dimensional elements, and along with the drawings and prints referred to above some of the earliest indications in the project of the significance of boundary to the investigation. (Fig.14)

Fig.13. *Line , Object, Print.* Image from Work in Progress Show 2010

Cross section, silhouette and shadow

These three phenomena became increasingly significant in the development of the project. They are a series of 2D concepts that have inherent 3D counterparts and as such are valuable areas for investigation.

Cross section is in some ways the origin of this project, in the realisation that 3D printing builds a solid from cross sections, and so could open up new possibilities of form generation as described in the introduction.

Whereas in the context of 3D printing cross section is a tool of fabrication, in many other situations it can be seen to be a tool of analysis. Examples of this include medical (e.g. MRI) scans to reveal and understand biological structures and their problems, as well as slides for microscopic examination used in the medical, biological and paleontological fields.

A cross sectional slice through a tree offers an opportunity for analysis of a particular biological materiality and might help one understand the relationship of that organism to its environment and factors such as weather, soil quality and planting density which might affect rate of growth. It also offers the potential for the analysis of the relationship of that materiality to time and thereby the understanding of histories; climatic and geographical and by extension social. This gives an indication of

the potential for the material to embody and represent the temporal and ephemeral.

Silhouette is the rendering of a 3D form into a 2D image through the relative positioning of light source and viewer. Silhouette relates closely to cross section in that a silhouette is the perception of a particular outline or cross section of an object or solid. The scans of cut clay solids seem to relate closely to this since they contain the cross section revealed as a silhouette through the light of the scanner, and also part of the solid (Fig 14).

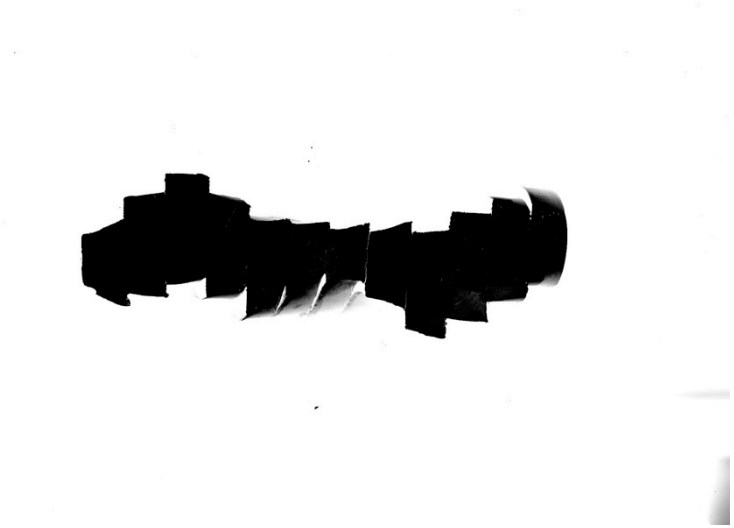


Fig.14. Scan of sliced stepped extruded object. Test 18.

These thoughts were useful in starting to give fresh purpose to the research, but what really made a difference was when it occurred to me that a cast shadow had some crucial similarities to extrusion. The next chapter considers this.

3. Shadows

I came to consider shadows through thinking about extrusion.

Extruding a material such as clay involves the use of a two dimensional plate or die, the hole in which dictates the cross section of a solid. That solid can then be as long as one wishes, or as is permitted by the machine. There are no implicit parameters dictating where the extruded solid begins or ends. The extruded solid, if made of a plastic material, can be manipulated as it emerges from the machine, so that its alignment does not have to remain perpendicular to the axis of the die. It can also be cut, joined and rearranged into a wide variety of forms which may appear disparate but which will always share the common factor of their originating cross section. In the case of clay extrusion a void is made solid and a space is given substance. The process establishes a relationship between presence and absence.

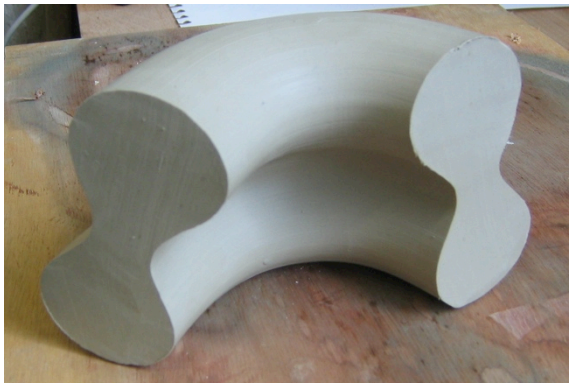


Fig 15. Clay extrusion. Test 8.

Fig 16. Shadow cast by extrusion die. Test 20.

Shadow is a term that in general use encompasses three distinct phenomena. They are; cast shadow, attached shadow and shading. Of these I believe cast shadow relates directly to extrusion. In his introduction to *Shadows and Enlightenment* Michael Baxandall usefully clarifies these terms and defines cast or projected shadow as "that which is caused by a solid intervening between a surface and the light source" (Baxandall, 1995, p4). Furthermore, in discussing the qualities of projected shadow he outlines; " The main specific of projected shadow,… is that it is not self supporting. It is *on* some surface distinct from that which is causing the privation of light. The morphology of this alien surface interferes with its form" (Baxandall, 1995, p60).

It occurred to me that casting a shadow from an object is an equivalent of the process of extrusion, using light instead of clay. The origin of this notion is hard to place, but once the association was lodged in my mind it developed ever greater significance. After having experimented around this theme as outlined later in this section I went to view Anthony McCall's

Vertical Works at Ambika P3. (Fig 17) These seemed to reinforce and help make sense of the association, with the phenomenon of projection being the bridge. The works involve the projection of moving lines in a Quicktime movie into a darkened and misted space. The lines appear to become solid walls, defining a sculptural space, whilst being no more than a conjunction of light and mist. This clarified for me the link between a material phenomenon – extruding clay, and a visual phenomenon – casting shadow. Both can be seen as forms of projection of an image. In shining light through the hole in the extrusion die the light becomes an equivalent of the extruded clay and can be imagined as creating a solid. This can be inverted by using a 'solid' cut-out of the same profile and creating a shaded rather than a lit space, as illustrated in tests 20 and 21 (Appendix 2).

Fig 17. Anthony McCall – Vertical Works

Shadows, according to Gombrich,

> are not part of the real world. We cannot touch them or grasp them and so ordinary parlance often resorts to the metaphor of shadows to describe anything unreal: shadow boxing is not real boxing and the Shadow Chancellor is not

the real chancellor. It was believed by the ancient Greeks that when we take leave of the real world we survive only as shadows amongst shades. (Gombrich, 1995, p17)

In the case of a projected shadow something temporal, elusive and insubstantial is made from a solid object. In the process of the formation of the shadow the three-dimensional solid is rendered as effectively two-dimensional. The shadow is a two-dimensional phenomenon on the surface onto which it is cast even if its 'form' is affected by that surface as indicated by Baxandall. It is merely the lack of light photons reaching that surface and then being bounced back onto the retina of the perceiver.

Projection of a shadow is central to the mythological origins of image making as described by Pliny in his *Natural History*. In Book xxxv he states, in attempting to summarise ideas on the subject, that "all agree that it (painting) began with tracing an outline around a man's shadow and consequently that pictures were originally done in this way"(taken from Stoichita, 1997, p11). The myth, as represented in many painted images since

the Renaissance, is that the daughter of Butades, a potter in Corinth,

> who was in love with a young man; and she, when he was going abroad, drew in outline on the wall the shadow of his face thrown by the lamp. Her father pressed the clay on this and made a relief, which he hardened by exposure to the fire… (taken from Stoichita, 1997, p11).

Thus the myth of the origin of painting, the generation of the two-dimensional image is intertwined with the origin of sculpture, the three-dimensional image.

It seems that in becoming intrigued by what exists in the space between an object and its shadow as an equivalent to extrusion of solids, in pursuit of thoughts about the relationship between the two and three-dimensional realms, I had stumbled on something significant and fundamental about this relationship of which I had previously been unaware.

At first the attempt to solidify the space between an object and its shadow – the equivalent of the mass of the extrusion of clay - seemed a straightforward notion. However it immediately

proved elusive. Where was the boundary? If one shines a light at an object (a cut out profile of the hole in the extrusion die) held above a surface and observes its shadow then it seems clear. However as soon as the hand intervenes in an attempt to model or carve a material in this space then it obscures and alters or destroys the 'form' that it seeks to create or represent. This epitomises the tension between the substantial and insubstantial. The process of giving substance destroys the quality of the illusion – the insubstantial. Furthermore I found that the clay mass that seeks to represent this space and phenomenon of projection is enlivened by the play of light and shade on its surface as it seeks to capture the darkness. This gives it an aura. Once the light is switched off then so is the life and so is the elusive immateriality of the shade, and we are left with the deadening result of a lump of clay whose meaning and whose quality has been extinguished.

Of course the form of the 'shadow space', as I shall call the attempted solid described above, is dependent on several factors. There is a reference to the form of the shadow in the

quote from Baxandall above, relating to the surface on which the shadow is cast. This and the object casting the shadow are two factors. The vital third is the light source, and this has huge bearing on the form and boundary of the ‘shadow space’. All of these factors are modified by alterations in the relative distances between them.

The light source is either the sun or some form of artificial light. The sun acts as an effective single point light source, and therefore can cast an extremely sharp edged shadow. If I hold my hand in strong sunlight a few centimetres above my desk I see a well-defined and sharp edged shadow of even darkness. As I raise my hand away from the desk the image starts to blur at the edges and become less defined and focussed. The shadows of the fingers appear to become thinner as their defined area is eaten into by increasing amounts of light reflected from surrounding surfaces.

In my first experiment with making the ‘shadow space’ I used a spotlight with a tungsten filament reflector bulb. This gives it in

effect a multiple point light source which means that the shadow image projected is not as ‘true’ as with the sun, and the form of the ‘shadow space’ is distorted. The narrowest part of the profile shape was narrower than the distance between the most disparate points of the light source, and so in the projection this narrow part is further reduced in scale, as opposed to the wider parts of the profile shape which are enlarged by the projection. Except when the profile shape is very close to the projection surface the image is blurred or multiple – that is it has distinct bands of tonal intensity derived from the effectively multiple point light source. This is why the task of modelling/carving in the shadow space was so fugitive, and explains the enlivening action of light or half-light on the surface; the boundary was so ill defined.

All but the purest, closely focussed shadows derived from a single point light source have an indefinite edge. This quality began to be the most interesting aspect of them for me. This was in part due to this lack of definition to the boundary being at the heart of the enticingly impossible challenge of the

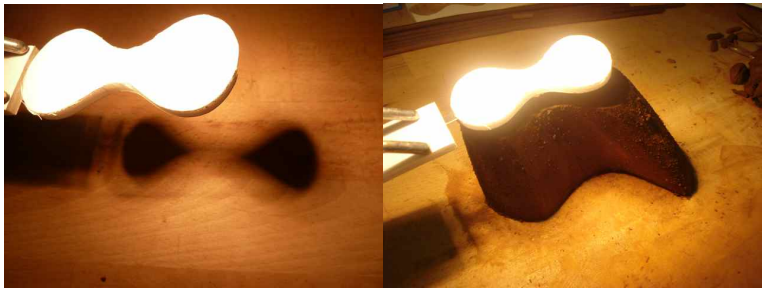


Fig. 18. Photographs of ‘Shadow Space’ experiment.

solidification of the 'shadow space'. There are also other contributing factors to the interest. The blur at the edges of the projected shadow image seemed to give the two-dimensional cast shadow image a three-dimensional quality. This blur is in fact the *penumbra*, whose difference from the full shadow or *umbra* is described by Baxandall thus;

> Extended (light) sources produce softer-edged shadows with a divide between the umbra, the part masked from the whole area of the light source, and penumbra, the border zone masked only form a proportion of it. (Baxandall, 1995, p5)

In this instance the blurred edge or penumbra is acting in the manner of *shading*, the graphic device used in order to create the illusion of solidity and three-dimensionality.

Thus I find that the concentration on the problematic of the boundary of the shadow brings me to consider further the ambiguity of the role of the shadow in understanding transitions between two and three dimensions. The cast shadow is an insubstantial two-dimensional rendering of a solid through that solid's ability to obscure light from a surface.

However when one is in the illusory, two-dimensional pictoral realm, then shading, the rendering of cast and attached shadows, is the device that is used to create the semblance of solid three-dimensionality. As Gombrich puts it; "And yet there are situations when the appearance of a shadow testifies to the solidity of an object, for what casts a shadow must be real". (Gombrich p17)

This ambiguous relationship between the real and the illusory, object and image revealed through the study of shadow is seen in the paintings of Brad Lochore. In a painting such as his *Wall Tree Shadow* (2003) he presents a blurred painted image of the shadows cast by a branch.

> Although derived from a projection of a mis en scène constructed from a dried out branch, leaves and a simple tungsten light, this static motif is splayed across the canvas like the anamorphic vanitas in Holbein's The Ambassadors. This transposition results in paintings which appear to be images of speed, flux and transition, disrupting the genre of the still life or nature morte by its very opposite.
>
> (Victoria Miro Gallery website, 1998)

Fig. 19. Brad Lochore – Wall Tree Shadow. Oil on Aluminium, 125 x 250 cm, 2003

At the start of this chapter I outlined a characteristic of extrusion of a plastic material, namely the potential for manipulation of the resulting solid, and for changes in direction of the extrusion. This is in opposition to a key characteristic of projected shadow as a related phenomenon being that light always travels in a straight line. It is this fact that means that the three-dimensional solid is ‘simplified’ to the projection of its profile or silhouette, however it is also this fact that means that the shadow of the simple profile shape can be rendered as having a ‘shaded’ edge through the creation of a penumbra by the extended nature of the light source. In this case the fact that light travels in a straight line gives complexity to a flat, planar object in the casting of its shadow.

Many of the phenomena relating to cast shadows, attached shadows, and shading that I have been attempting to describe are much more ably and more visually described by Leonardo in the drawing of light from a window falling upon a sphere.

What it shows particularly well is the effect of an extended light source and the complexities of transition from full and partial shadow, both attached and projected. It is in a sense a drawing of the 'shadow space', and due to its point of view and cross-sectional analysis, makes no reference to the projected shadow image of the sphere on a surface.

The other main distinction upon which I have not so far dwelt is the fact that the projected shadow, unlike the clay extrusion, has an implicit start and finish. It has been mentioned that the surface on which the shadow is cast is significant in dictating its form, and this applies also to my notion of the 'shadow space'. One has only to think of one's shadow cast obliquely by the sun onto a staircase to be aware of this. However if one thinks of a shadow projected onto long grass, then one becomes aware of another key condition of the surface; the extent to which its smoothness or irregularity dictates the quality of delineation or focus of the shadow. This could be seen to hint at potential for experimenting with the materiality of the rendition of the shadow.

Fig. 20. Leonardo da Vinci, from Baxandall (1995), plate XVI.

This final thought about the effect of the morphology of the surface onto which the shadow is projected leads me to ponder that what I have achieved through these wanderings through notions of shadows in relation to making, is some insight into qualities of objects. The problem of the boundary of the shadow and the ambiguities that the subject highlights in relation to the interactions between two and three dimensions seem to lead to understandings of qualities of objects, not necessarily the content of those objects. These qualities seem to relate to the indefinite, the temporal, the insubstantial, the ambiguous and the blurring of boundaries. Thus in some way they seem to point to characteristics that define the analogue and the hand made as opposed to the digital and mechanically produced, when framed in the light of the debate between the digital and the analogue. This may be somewhat akin to what Junichiro Tanizaki was getting at in his strange book "In Praise of Shadows" in which he calls for an appreciation of the aesthetic benefit of darkness, obscurity and a beauty that is not clear cut and brightly lit.

4. Form and Surface

These thoughts were triggered by this comment from Fiona Bradley concerning the work of Rachel Whiteread;

> The surface of the sculpture provides the site of exchange between destruction and creation, the oscillation between what is known and what is other. It is this surface which locates the viewer in relation to the sculpture, physically and mentally. (Krauss, 1996, p12).

The surface is the interface between presence and absence, something and nothing. I blur the boundary between form and space by increasing the surface area of the object. The nature and definition of a form is determined by the relationship between its surface area and its volume. Texture is an increase in surface area. A fuzzy line has a long edge. Membranes that need to be porous or osmotic, such as the gut lining, achieve better performance by folding to increase surface area. Heat exchangers use large surface area to facilitate the passage of energy from one body to another. My objects use large surface

area to confuse the boundary of perception of an object from space.

Surface is the interface between two and three dimensions. Surface in itself is a 2D notion, but it is also the boundary of a 3D form.

3D CAD makes the form through calculating surfaces. It does not make the substance; the surface represents the substance. Surface is form, because it is what we perceive of the form. What is beneath the surface we can only interpret, unless the surface is transparent. Light makes a surface by coming back to us. In the case of opacity if we wish to increase the level of ambiguity or passage across the surface we increase the surface area. The more surface area a given volume has, the less taut and defined it is. It is complex and folded.

Smooth taut surface, encompassing the maximum possible volume is associated with youth, vigour, and growth. Complex,

folded surface where the volume is diminishing in relation to it is associated with age decay and recession. The grape and the raisin.

When turning an object on the lathe surface is a temporal record. It is the result of a decision; when to stop – when the reduction has met the expansion. When I have achieved enough surface area and adequately penetrated the boundary of the presence of the object. This renders its relationship with the space beyond that which it occupies or contains complex and ambiguous.

The line in the hedge is a record of an action and a decision. How high to set the cutting arm attached to the tractor. This decision leaves a trace, but this reductive imposition upon the expansion of growth is, as a boundary, made indeterminate, porous and ambiguous through the subsequent summer's surge of thin spindly growth. Lines reach out in contravention of the drawn line and the surface that was made on the hedge.

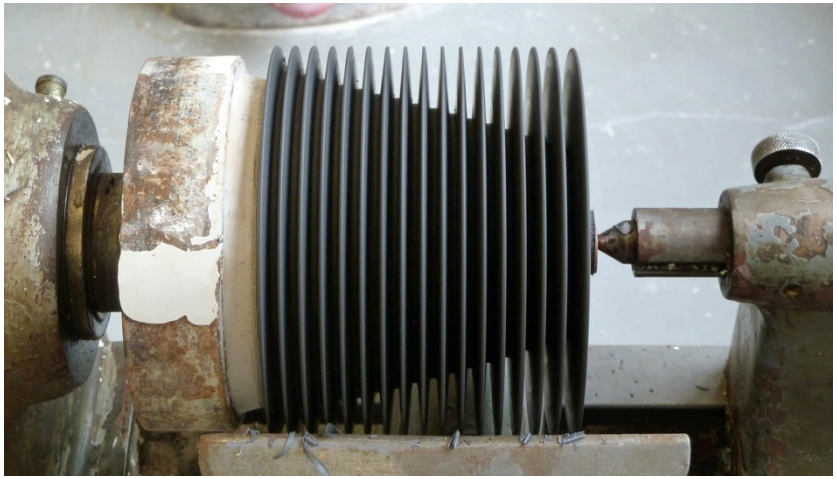


Fig. 21. Object on the lathe. May 2012.

Fig. 22. A hedge near Selborne. February 2012.

I paint water on to heavy paper, leaving a sharp edge between the wet and the dry. Wetness defines a form or an outline. I use the edge of a card to print ink lines that bridge this boundary. The line on dry paper remains defined and distinct, blurred only by unsteadiness of hand, deterioration of the card edge, or movement of the paper as they meet. The wet line instantly blurs, the ink bleeds and moves, extending its realm and its boundary along and around the fibres of the paper, transported beyond itself by the water. The line becomes a form, or a representation of a mass; at least the representation of the shadow of a presence. The presence of the water is rendered visible. At first the line had a boundary, an edge. The blurring is caused by the infinite extension of that boundary. The extension of the length of the boundary of the line renders it indistinct and enables it to help me represent the complexity and ambiguity of the line in the hedge.

Surface is a line and a boundary, but also a plane and a sheet. A cross section is a surface resulting from a cut through a solid. Or rather two mirrored surfaces if the form is cut in two. Do

Fig. 23. *Drawing 12.04*. 2012. Ink on paper. 57cm x76cm.

these surfaces have any depth? Do the planes have any thickness? 3D printing indicates the possibility that they do. In order to be made real and given substance the virtual CAD form is understood as a stack of cross sections or slices whose thickness is used to construct the solid.

I use the slice as a technique to build the ambiguous form (jigger)[3], or an intervention into the form to render it ambiguous (lathe). The slice is additive and reductive; constructive and analytical. There is an ambiguous relationship between the use of the slice to build the form and the use of the slice to blur the boundary of the form. This relates to the relationship between the volume of the form and its surface area, that in turn dictates its definition and apparent solidity.

[3] A jigger machine is used in the manufacture of plates in ceramics.
See test 60 in Appendix 2.

5. Process, control and skill: the making of things.

One of the reasons for working in clay is that it involves a peculiar level of interaction between maker and matter, and the material has a perhaps unique ability to record that interaction. This can be seen as a tension between control and chaos, or form and formlessness. Relatively little making in clay involves simply hands and clay – most often there is a process, tool, mould or machine that sets some formal parameters for the making and creates the location for negotiation between maker and material, control and chaos. The material has no inherent form and so we use processes and tools to give it form. This also makes the material a fascinating site for understanding the relationship between the workmanship of risk and the workmanship of certainty as proposed by David Pye in *The Nature and Art of Workmanship*. His distinction is useful in its analysis of what is happening in making and its freedom from defining the outcome of that making. Broadly he

proposes a polarity between risk and certainty in the relationship between action and outcome in making in which one very seldom if ever sees a manifestation of pure risk or pure certainty. All is a result of negotiation between these extremes. His analysis also separates manual and mental skill and proposes an understanding of skill (in Glenn Adamson's discussion of his thesis in *Thinking through craft*) as "the capacity to achieve constraint manually within the context of the workmanship of risk" (Adamson 2007, p73).

The fact that clay so readily moves between physical states makes the boundary of interaction between maker and material especially elastic and even fluid. It is in different states a liquid, a plastic material and a resistant material. In a standard making process the material moves from liquid to soft and malleable to part dry but workable to dry and brittle to hot and soft again to hard and fixed and workable only by tools. In each different state the boundary of control moves, and the means, through hands and tools, that have to be used to exert it vary. Skill is

important to me. I love acquiring and using it. However it is a means and not an end in my work. I am interested in it as the site of boundary of an interaction between maker, material and process. A heightening of skill seems to me to be a sharpening of focus on that interaction This is a fine line. It is exciting when one can only just perceive that an object has been made by hand, but also not quite understand how that hand has worked. Manufacture and 'manual facture' in concert.

The ceramic objects made for this project exist in a territory of uncertainty where the viewer is not immediately sure if they are made by hand or by machine. Implicit in this is a demonstration of skill that can induce a sense of wonder. The realisation that a visual effect has clearly had to be worked for can engender greater respect in the viewer.

Had these objects been conceived as prototypes and then milled by machine from a resistant and unchanging material they would have achieved some of the same visual effect, but would not have induced the same wonder. There is also the

perhaps more crucial fact that they could probably not have come into being in a different way. They are not the result of resolved thinking and conception then executed in material, they are the result of their own making, and their conception lies in that process. The objects arise from my experience of ceramic processes and the realisation that lathe turning would be a way of intervening in the substance of the clay and thus a method with which to materialise the qualities I perceived in a cast shadow. The decisions about form are driven by the parameters of that process as much as they are by visual concerns. This understanding of process led me to use simple conical forms. These can be thrown with cross sections of varying thickness in order to be cut into on the lathe and lend themselves to the demands of the process of turning. The turning of the object is to some extent carefully planned. I measure the interior of the thrown object and draw this on graph paper as a cross section. Using these measurements I turn a plaster chuck onto which the clay object can be secured. I then turn the clay object to 'true' centredness. Having

measured the external dimensions of the object I mark out where I plan to turn the grooves on my drawing. However the act of turning is contemplative and interactive, demonstrating an iterative process. This has a close relationship between problem finding and problem solving, as explored by Richard Sennet in *The Craftsman* as distinctive of craftsmanship, both within one object and between progressive objects.

At the same time as this, much of the visual and process reference of this work is industrial. There is conscious visual reference to electrical insulators and tableware. This reference also exists in the processes used. Throwing and turning porcelain is a key process of Wedgwood, whose material is also used here and turning porcelain is a key process of insulator manufacture. I have taken the processes of the workmanship of certainty and appropriated them for the workmanship of risk. It is relevant here to consider the comparison made by David Pye between a hand thrown earthenware crock lid and an industrially produced ceramic insulator. (Pye 1968. Plates 7&8). These are part of his

Fig. 24. Pye 1968. Plates 7&8

selection of images chosen "to contrast the workmanship of risk and that of certainty". (Pye 1968. p83). In my case, I am jumping to and fro across that boundary using the wheel, the process of the risk based lid, to generate my original form, and then using the lathe, the process of the certainty based insulator, to impose a form upon this. However this opposition is, as Pye notes, not that simple as the potter's wheel is itself "an exact shape determining system" (Pye 1968. p85) and it is the choices made in the use of it that make visible the workmanship of risk. I am then using firing as a process with which to shift the boundary of control through the allowance of some pyroplastic[4] movement in the ceramic body.

The negotiation between machine and hand and between certainty and uncertainty has run through this project. The early experiments with CAD, originating in an attempt to find a solution to a particular problem of form generation began to demonstrate this. It was seen that an aspect of working in CAD

[4] Pyroplasticity is the softening of ceramic through the action of heat.

as opposed to clay was the precision of language that was required by Rhino to produce a version of something that could be made 'unthinkingly' and in a less consciously defined manner in clay. This was taken as a challenge to hone my approach to hand making, applying the rules of Rhino menus to the manipulation of clay extrusion. The pneumatic extruder – the most mechanical form of extruder available to me – became a means of making things more 'by hand' as the foot operated pneumatic power left both hands free to engage in the manipulation of soft clay. However one of the main reasons for leaving behind the digital aspect of the project was the realisation of the absolute and certain nature of the boundary of a digital form. This is no doubt something I could have addressed and made the sight of my investigation. As Tanya Harrod has noted, contemporary investigation in this field has often focussed on "celebrating the constant slippage between the perfection of the file and the translation into production". (Alfody,S. *ed.* 2007 p234.) However, as was outlined in Chapter 2, I felt that my interest lay in embracing a sense of

this slippage as a site of investigation, without it necessarily involving digital production processes. In the latter stages of making the work for exhibition this negotiation became precise and narrowly focussed. During discussion of my work at the Ceramics and Glass Work in Progress show in November 2011, I focussed in on the bottom third part of one object (*fig 25*) that demonstrated the 'best' balance between control as expressed in the precise hand making of an object and 'chaos' as expressed in the subsequent movement of the material in its return to softness in the kiln. Here was the decision to exclude experiments with other materials and discount the objects that had cracked, having been turned from solid blocks not thrown pots. The rest of the making existed within these parameters. Taking soft clay, giving it structure and form via the wheel, turning that precisely and in a measured way with custom made tools, so that it is barely perceptible that the object is hand made, then committing the object to the kiln and letting some movement happen through pyroplasticity that serves to direct the observer to the hand in the object. I have realised that the movement of fins in the kiln is controlled through variation in

Fig. 25. Object shown at Work in Progress Show November 2011.

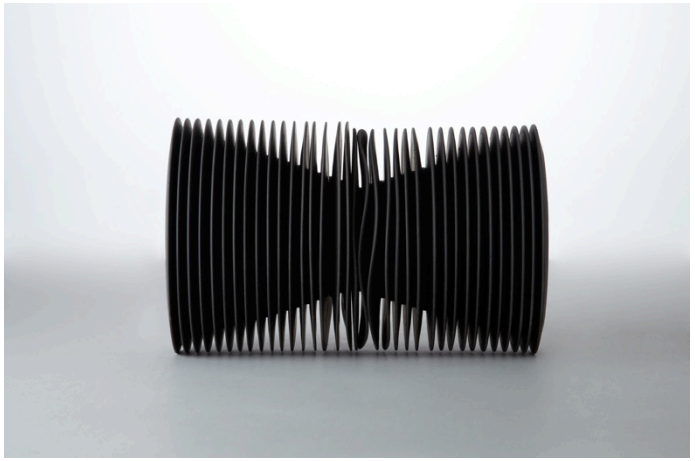


Fig. 26. *Object 12.06.* Wedgewood black jasper. W 23cm.

depth of turning. Thus in a piece such as *Object 12.06* the 'wavy' area of deeply turned fins, where the thrown pot wall was thicker, is framed between areas of shallow fins which have maintained their 'mechanical' precision. This is paralleled in a drawing such as *Drawing 12.03* in which the blurred area is framed within dry 'precise' lines from which the blur originated. Thus in the two modes of making there is equivalence in the negotiation between movement and stasis, control and chaos.

The two *Stacks* shown in the RCA *Show 2012* demonstrate some of the same issues. In developing jiggering as a process for making these objects I struggled to prevent the discs from excessive warping in drying and firing. Ironically, since being arguably made in a more constrained and controlled manner than the turned objects, between mould and profile the forms were less likely to hold their shape due to the memory of handling in placing and removal from the mould. I changed the material from porcelain to stoneware in order to achieve more stability, but time also served to undermine this quest and

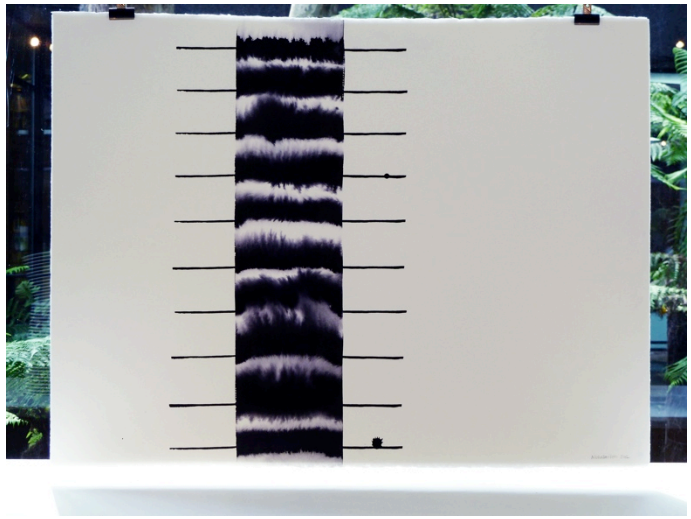


Fig. 27. *Drawing 12.03.* Ink on paper. 57x76 cm.

Fig. 28. Stack of discs from test 60.

adjust my intention. Living with the stack of test pieces for the small jiggered discs on my desk (see test 60) led me gradually to appreciate their qualities more. This is partly as the more there were of them the more sense they made – they read as intentional, and partly because over time I saw that they had a dynamic visual quality, expressive of the uncertainty of boundary which had become the focus of my project, that I was in danger of removing from the work with too much control. The large *Stack* I exhibited is more robust and solid, in keeping with its scale. This piece and the accumulation of discs from test 60 can be seen to act as framing parameters for the dance between hand, machine and material in finding an interaction between control and chaos.

Fig. 29. *Stack.* Height 70cm. As shown in *Show 2012* at RCA.

6. Reflections on the finished practical work.

Between 19th June and 1st July 2012 I spent most of my days in the Henry Moore Gallery at the RCA during the graduate show. I attempted to learn from the exhibition of the work from my research project and understand what I had done.

I came to realise that the ideas relating to boundaries that I was seeking to embody in the work also provide a useful metaphor for understanding the work and what has been achieved through it.

The objects are vessels and as such contain space. They also occupy space, but they do this much more ambiguously. Depending on point of view one is uncertain of the extent of that space. The works contain some subject matter – what has been put into them – but they also interact and relate to a series of other subject matters and contexts in a complex and ambiguous manner. The subject matter is the research that has led up to them, an enquiry into transition between two and

Fig. 30. View of display at *Show 2012* in Henry Moore Gallery.

three dimensions. This might not be directly obvious, except in the relationship between the objects and the drawings, of which more later. The subject matter is shadows, the attempt to embody this insubstantial phenomenon and create the penumbra of material. The subject matter is Ceramics; they are objects about Ceramics as a set of processes and a discipline. The references to industrial products, tableware and electrical, is conscious and welcome as is the relationship of this to craft practice as discussed in the previous chapter.

Displaying the work made very clear the significance of point of view. The placement of the objects is extremely important. I had first realised at the Work in Progress (WIP) show in November 2011 and then acted upon some of my conclusions in the final show. This is on a functional level; having the work in front of a window meant that the light coming from behind them activated the ambiguity of the outline of the form, and having much of it near eye level meant that the visual effect was within the range of the majority of viewers. I had realised from earlier attempts to show the work that alignment was

important in relation to the issue of eye level. Obviously eye level varies from person to person, and so having the finned objects only aligned vertically limits the potential for their perception (although it can encourage some entertaining bobbing up and down from the viewer). At the WIP show in November 2011 I showed one object with a conical base. This could be rolled around, effectively moving the required eye level of the object. I did not pursue this aspect, although the notion of an interactive and kinetic element to the work is an interesting one. There is an echo of this object in *Object 12.10*, the last piece of work I completed during the research period. Here I have joined two separate thrown/turned parts, having first ground them down so that they meet at an angle. The perception of this object changes as one moves around it in in the x, y and z axes. It upsets the vertical and horizontal conformity of all the other works and indicates a direction for further development of work based on this research.

A simpler solution, presented during discussion at the WIP show, is to lie the objects down meaning that their visual effect

Fig. 31. Object with conical base.

Fig. 32. *Object 12.10.* Parian H 29cm.

is perceived through moving across or past them from any height. This alignment also makes the objects seem to float above the surface and to some extent escape the normal confines of gravity and placement on a surface. It also makes the interior visible, and this is very important. I was astonished to discover during a discussion with fellow research students that my neighbour in the studio had no idea that these objects were vessels. This was because I had always kept them upright on a shelf at eye level. To me it was so obvious that they were vessels that I had not noticed what I was concealing. These are containers of *and* occupiers of space – vessels - and the dialogue between that containment and occupation is more subtle and complex than if it was merely between matter and space. The horizontal alignment, whilst providing visual access to the fact of the vessel, did liberate me from the conventional notion of vessel as having an opening and a base. The double-ended vessel objects both contain space and reject that containment by implying it at both ends.

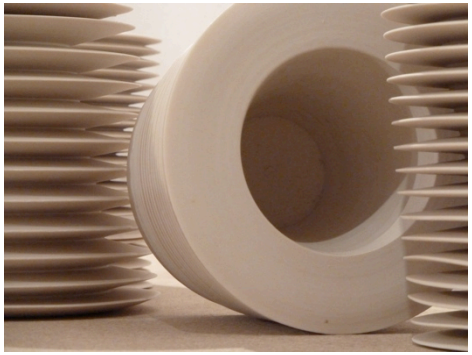


Fig. 33. Display at WIP show, one object having been placed horizontally.

There is also a sense of containment or definition of the ambiguous space within the fins between the sharp interior profile and the surface above which it floats. I had used porcelain for its fineness and colour, but had not really considered the fact of translucency. I discovered that the fineness of form I had achieved meant that translucency became another way in which the complexity of relationship between contained and occupied space was demonstrated.

Distance and scale are further issues relating to point of view or position of perception. I did not realise until I had made the larger *Stack*, assembled and displayed it, that it would demand a totally different type of looking in order to be understood. At a distance of two metres one saw a static and definite stack of discs. At a distance of twenty metres the object became animated and started to disappear and move and began to be as shimmering and defocussed as the drawing that I placed next to it. Having understood this I realised that the vertical thrown/turned objects could be animated and understood by moving to and from them as well as up and down next to them

Fig. 34. *Object 12.03.* Parian, H 13cm In *Show 2012,* demonstrating translucency.

This animation and exploration of the ambiguity of the objects could be seen as like the action of focussing a camera, one is changing their character and definition by altering ones position or focal length relative to the object. This is similar to the change in definition of a cast shadow achieved by moving the shadow-casting object closer to or further from the surface onto which the light does or doesn't fall.

I had realised this earlier in another context, but had failed to translate the significance. From photographing the objects I knew that the most successful results came from moving the camera away from the objects and then zooming back in on to them, both giving distance from the object and concentrating attention upon it. In a tutorial with Marek Cecula (Visiting Professor in Ceramics and Glass) shortly before the final show I realised that he was just not understanding what I was showing him and talking to him about. However when I showed him photographs of the objects he understood – his perception of what was in front of him was directed and altered. The photos gave him the virtual distance within the

Fig. 35. *Stack* and *Drawing 12.02* displayed at *Show 2012* and photographed using zoom.

cramped confines of the studios to understand the work.

The ambiguity of an individual's perception of the objects can be seen to relate metaphorically to the worlds of ideas that surround them. This is a closely defined and focussed body of work but one that has a wealth of different allusion and relationship to the worlds of art, design and craft.

As indicated in the Introduction I am aware of how the context for this project and its outcomes has shifted. In experiencing and reflecting on the exhibition that I had mounted I was led to think about other works I had experienced during my research period that had informed my thinking. Anthony McCall's installation (*Vertical Works* presented by Spruth Magers at Ambika P3 University of Westminster 1st to 27th March 2011) was an astonishing demonstration of the possibility to produce something apparently substantial and definite with no more than light and smoke. I felt I was trying to do the opposite. The exhibition of Rachel Whiteread's drawings (in the exhibition *Rachel Whiteread Drawings* at Tate Britain 8 September 2010 –

16 January 2011) inspired development of my understanding of the potential relationship between drawing and making, through seeing drawings with an amazing materiality and physical presence. Gerhard Richter's paintings (in the exhibition *Gerhard Richter: Panorama* at Tate Modern 6 October 2011 – 8 January 2012) fascinated through their use of blurring to create an unsettling distance between the viewer and his subject matter as well as drawing attention to his medium and process.

Above all, perhaps it is important to discuss how the work is framed by an awareness of that of two other makers with which it shares at least some visual, if not necessarily conceptual, concerns. The first of these is David Nash. His series of *'Crack and Warp Columns'* use the mechanism of the slice through a solid not necessarily to achieve the same optical qualities that I seek, but in a way that relates significantly to some of the thoughts in Chapter 4; *Form and Surface*. This is demonstrated by this description of the version of this work on display at Kew Gardens from June 2012 to April 2013;

Fig. 36. David Nash. *Crack and Warp Column* in the temperate house at Kew. 2012.

> Each of these cuts increased the column's surface area enabling the dry surrounding air to quickly evaporate and decrease the water content of the fresh wood. Consequently, the thin layers cracked and warped dramatically. The final sculpture is dictated by the nature of the wood itself.
> (Royal Botanic Gardens, Kew website, 2012)

Thus we can see that Nash is using the slice as a site of interaction with material in a manner related to the discussion in Chapter 5. This gives an effect that is similar to that achieved in my ceramic through heat work in the kiln, via a phenomenon of surface area akin to those mentioned in the my text *Form and Surface.*

The second is the designer Gareth Neal. Also working in wood, although in a very different context to Nash, he uses the slice as an optical tool in a manner that relates closely to my method. However, this work has a very different sense of the interaction between maker and material, and is in fact the site of an interaction between maker, material and digital technology as demonstrated by the inclusion in the exhibition

Fig. 37. Gareth Neal. *Louis table.*

LabCraft. Hence the use of the slice here may have some similar origins in the tendency of digital processes to use slices as mechanisms of construction.

Another significant discovery from experiencing the exhibited work was the interrelation of the objects. When making a series of objects it is very easy to consider them in isolation, discrete from one another. As I displayed them this became impossible, and I discovered that what happened when they were perceived to overlap indicates a whole new area of research. The overlap between finned objects creates visual illusions related to Moiré patterns as one moves in relation to them and make me think that these and the related science of perception as well as Op Art could be other potentially relevant areas for future contextual investigation

It is also important to consider all the elements of the research project that aren't there in this close definition of the finished work, that were deemed to be diversions along the road, or stages in that road that have been passed. The 'drawings with

Fig. 38. Objects displayed at Show 2012, demonstrating some effects of overlap.

clay' of tests 34 to 37 inspired by the drawing on paper of test 33 are not here in the flesh, but they are surpassed by their virtual presence in the final objects. The material experiments of tests 30 to 32 and 57 are not here but their presence is felt in the development of a technique to achieve visually what they attempted materially, and in the enjoyment of the materiality represented in the movement and wave of turned fins.

Perhaps the most important physical absence is any outcome of the brief foray into a notion of wrapping a 'hard' skeletal turned form in soft viscous opaque glaze. This idea emerged from thinking about the turned forms (before I had fully grasped the complexity in their simplicity) in conjunction with the material tests and would, I thought, add a new layer, physically and conceptually. I worked this idea up into a proposal for Jerwood Makers Open. This, thankfully, was unsuccessful, but what it did do was make me have to visualise ideas and objects that I had not yet made. Prior to this point, and for a long time, the project had borne the title "Drawing and Fabrication", but drawing was the poor relation in this. The

Fig. 39. A drawing to visualize glaze on a turned form. Test 52.

main outcome of the glaze experiment was to get me to draw and think about the role of drawing in a new way. Rather than drawing as being merely the origination of a form it was both a reflection upon and envisaging of the potential for form and became an image making activity in its own right. This process moved a stage further when I looked at and photographed hedges, and started to make drawings as an abstracted representation using the material properties of paper, water and ink of the phenomena I saw in them. From this point drawing became a truly parallel activity of making to that using clay. In coming to display the work for exhibition it became important that the drawings were shown alongside and with equal status to the ceramic objects. Working on both drawing and ceramic enabled me to not have to incorporate every quality that I wanted into either one or the other. Most particularly the drawings could contain more softness and uncertainty than the ceramics. Thus in the final event the transition between two and three dimensions of the project title became something more like a symbiotic interaction.

These two facets of this project came to help guide and inform each other and be like two parts of the same whole where the boundary between them is as complex as the boundaries expressed in the works.

As I write this report and reflect upon the outcome of the practical elements of my project, it is also important to note that there is a vital third area of activity in this research project; the activity of writing. Writing within this project takes multiple roles and voices. One of these is analytical and reflective, evaluating tests done and examining ideas and phenomena that relate to them. Another is more speculative and is more akin to the process of making than a reflection upon it. This is predominantly represented in the text dealing with form and surface. This text arose from collaboration with Giulia Garbin from MA visual communication to make a book about this project. The nature of this collaboration deepened as it developed. Her use of and insight into the images I created helped to drive the direction in which I took those. We also decided to include short texts on a range of issues relating to

the project. One of these texts was a condensation of the chapter ‘Shadows’, and maintains much of its conventional academic voice. Another was the text ‘Form and Surface’ which was written as a short speculation about some issues and ideas around the making. This context enabled me to experiment with a different voice, more associative and assertive than traditionally argued. At a Programme research group forum in which we read texts that we had recently written, a fellow student remarked that this text made her understand much about the objects she had seen on my desk, and contained, in both its content and style, aesthetic qualities that were not so overt in the ceramic. It has also been remarked by a fellow researcher that the changes in textual voice between different pieces of writing from precision to conjecture have some parallel in the interaction between control and movement in the drawing and ceramic. The book collaboration became a vital part of the project as a whole, being a location in which the three activities of making writing, making drawing and making ceramics could find common and

equal ground. For me one of the most significant outcomes has been to achieve a greater parity between these activities.

7. Conclusion

This project has become, above all, about boundaries. The original intention was to research the possibilities of the boundary between what is digitally and manually produced. Through practical investigation I then moved on to looking at the boundary of objects, as a site for understanding the qualitative boundary between the digitally and the manually crafted. This research led me towards the boundary between two and three dimensions and between making and drawing. In some senses the project came full circle in remaining with the notion of slice or cross section identified as a key benefit of digital processes and using this to develop aesthetic qualities that were seen as defining the analogue and blurring binary opposition.

The conclusions from this are embedded in the products of this project; artworks in ceramic, artworks on paper and writing. I shall attempt to summarise some key findings here.

The slice is a mechanism of construction and analysis. Its use in practical and theoretic investigation has given insight into some difference between digitally and manually produced form.

Establishing a conceptual and practical relationship between extrusion as a making technique and cast shadow has enabled me to develop understanding of interactions between ephemeral visual phenomena and immutable physical objects.

Consideration of surface as the interface between form and viewer has brought an associative breadth to the making of objects, and assisted in the mechanism of achieving the interaction between ephemerality and physicality.

Drawing attention to the significance of relative physical location between object and viewer enables this to be used to demonstrate potential uncertainty of boundary between an object and space.

Investigation of the role of craft, process and skill in the making of work has enabled this ongoing debate to be understood as the site of interaction between maker and material as related to the oppositions described above. I have, however, deliberately avoided discussion of the contextual siting of the artworks produced in the art, applied art or craft markets.

Above all, the project has demonstrated, through reflective practical investigation, the potential for complex and symbiotic interaction between the practices of making, drawing and writing in the development of research through art and design.

Appendix 1

Images of finished work

View of display shelf of objects and drawings in Henry Moore Gallery at RCA, June 2012.
Photo: Ester Segarra

View of display shelf of objects and drawings in Henry Moore Gallery at RCA, June 2012.
Photo: Ester Segarra

Object 12.01, *Object 12.02*, *Object 12.03* (left to right)
Wedgwood black jasper and parian.
Maximum height 21cm.
Photo: Ester Segarra

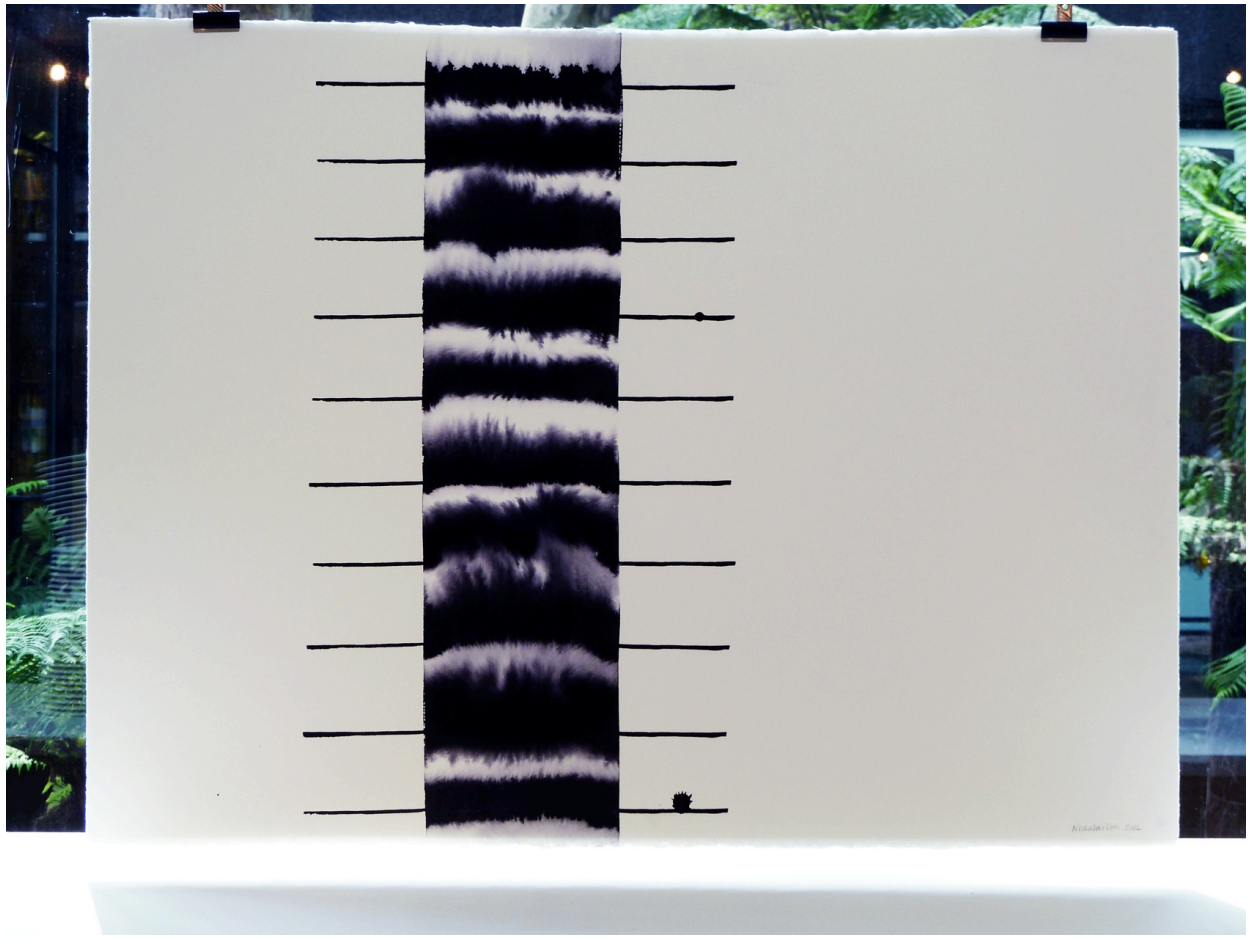
Object 12.02 and *Object 12.03*
Parian
Maximum height 13cm
Photo: Ester Segarra

Object 12.07 and *Object 12.06*
Parian and Wedgwood black jasper
Maximum height 28cm
Photo: Ester Segarra

Object 21.10
Parian
Height 29cm
Photos: Ester Segarra

Object 12.12, *Object 12.11* and *Object 12.13*
Parian and Wedgwood black jasper
Maximum height 23cm
Photo: Ester Segarra

Drawing 12.02 and *Stack*
Ink on paper and stoneware
Maximum height 70cm
Photo: Ester Segarra



Drawing 12.03
Ink on paper
Height 57cm
Photo: the author

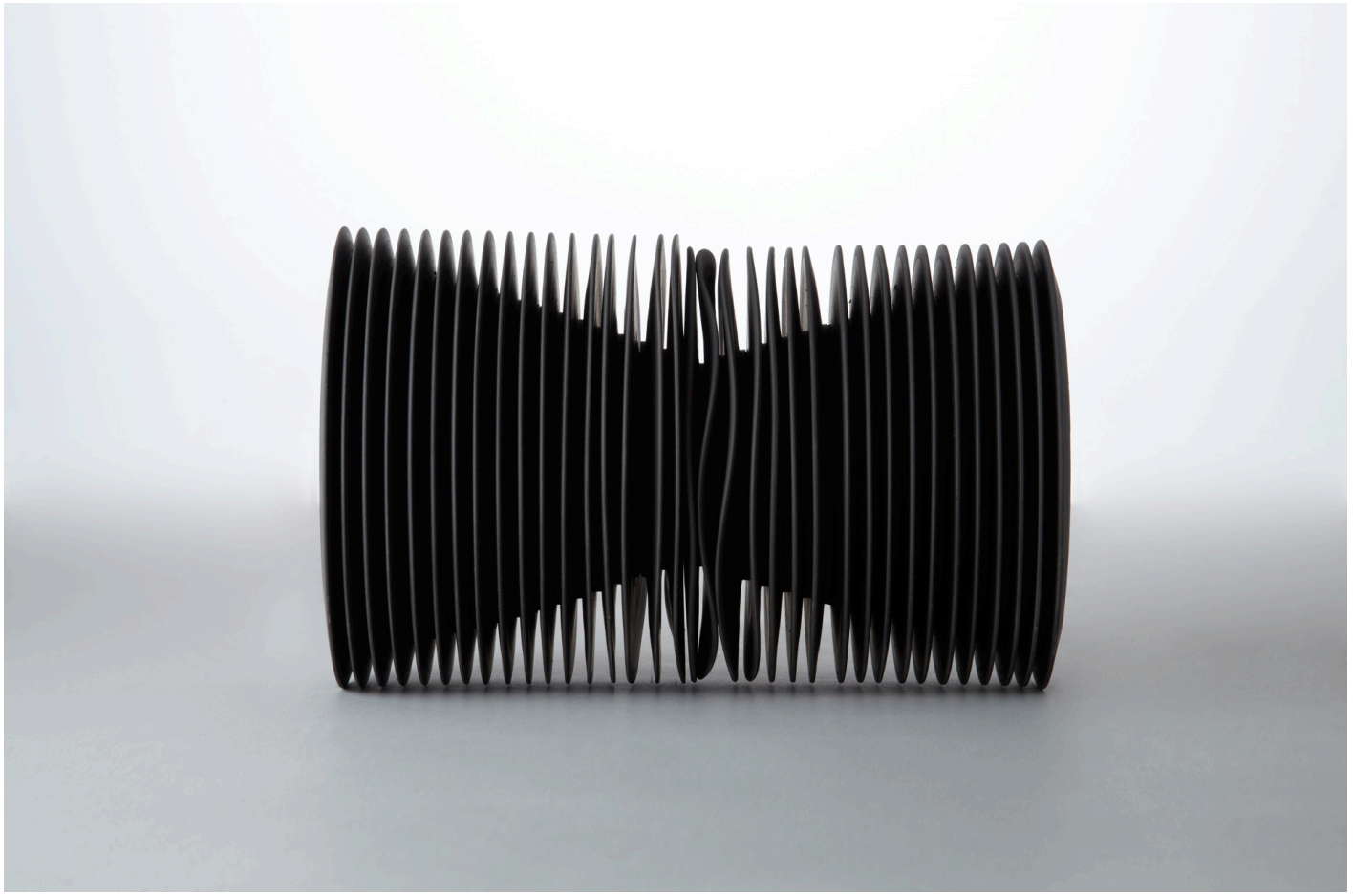
Drawing 12.04
Ink on paper
Height 57cm
Photo: the author

Object 12.12
Parian
Height 23cm
Photo: Matthew Booth

Object 12.03
Parian
Height 13cm
Photo: Matthew Booth

Object 12.13
Wedgwood black jasper
Height 21cm
Photo: Matthew Booth

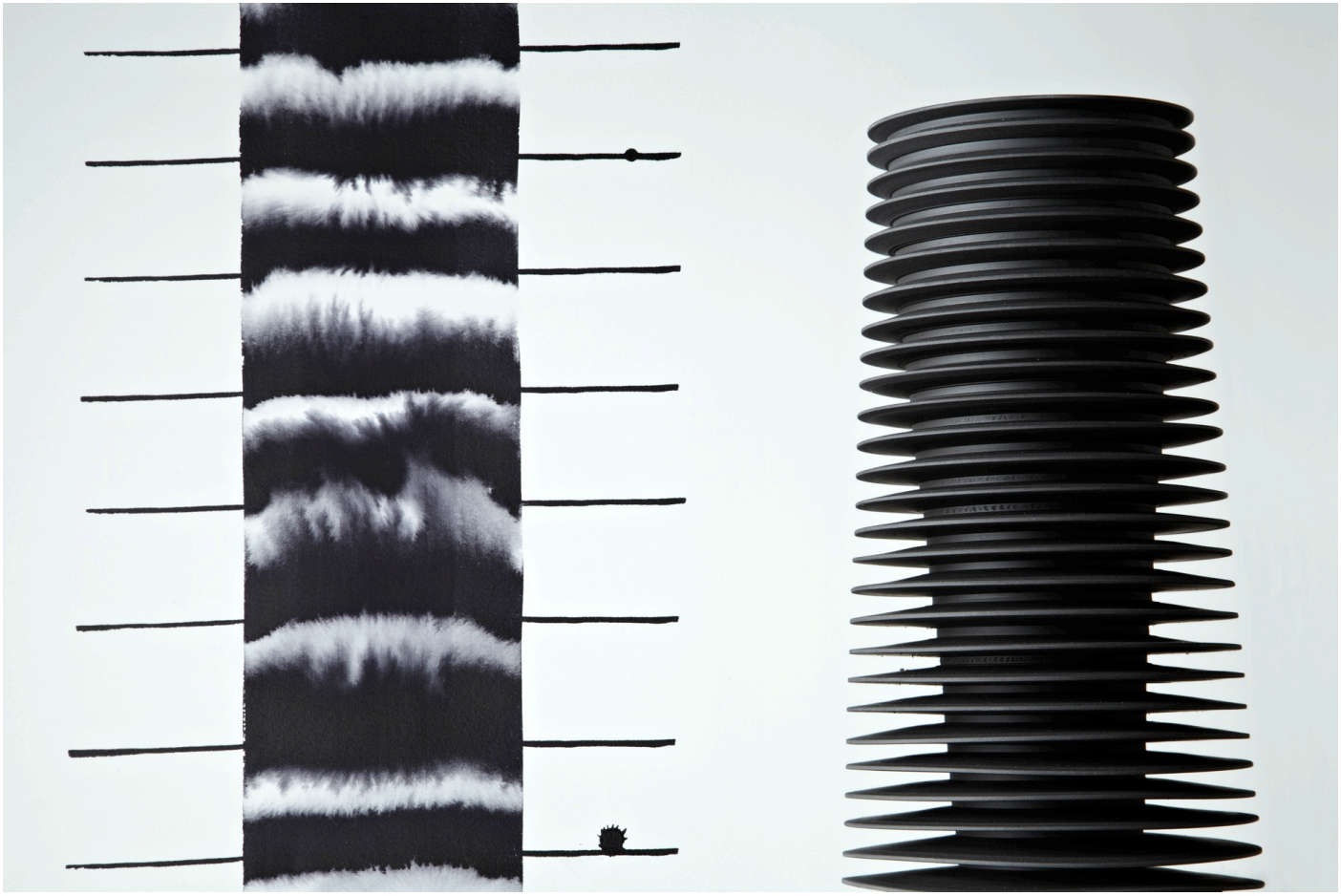
Object 12.09
Wedgwood black jasper
Height 27cm
Photo: Matthew Booth



Object 12.06
Wedgwood black jasper
Width 23cm
Photo: Matthew Booth

Object 12.02
Parian
Width 20cm
Photo: Matthew Booth

Object 12.07 and *Object 12.13*
Parian and Wedgwood black jasper
Maximum height 21cm
Photo: Matthew Booth



Drawing 12.03 and Object 12.13
Ink on paper and Wedgwood black jasper
57x76cm and 21cm height
Photo: Matthew Booth

Appendix 2

The tests.

Test number; 1

Date: 26/10/10

Aim

To discover the potential for one of various manipulations of a cross section as it is extruded into a solid. A parallel activity to work in Rhino.

Action

A length of extruded clay has been twisted. This was done when leather hard so that it could be manipulated, but keep its extruded form.

Conclusion

There is limited potential for this form of manipulation owing to the restricted range of movement and distortion that happens to the object. It would be better to adjust the object as it comes from the extruder, which could be facilitated by using the pneumatic extruder, as it is hands free.

Test number; 2

Date: 1/11/10

Aim

To discover the potential for one of various manipulations of a cross section as it is extruded into a solid

Action

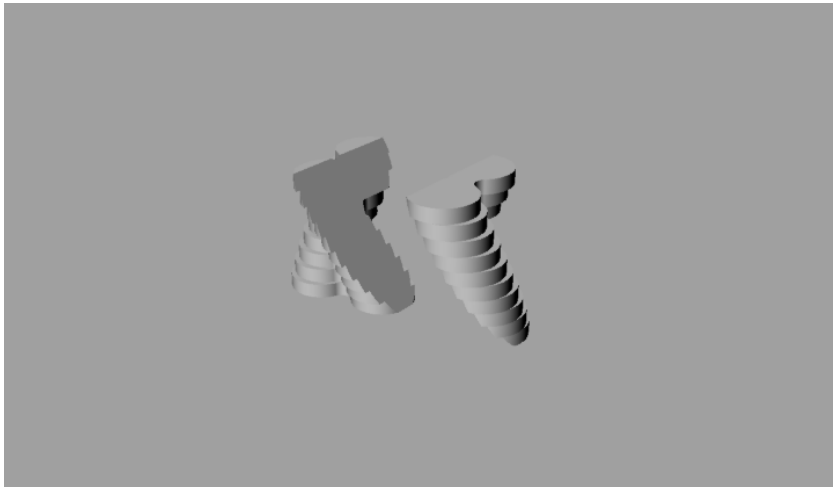
An extruded length of clay has been cut into 1cm thick slices which have been rearranged into a spiralling stack.

Conclusion

This is a clay recreation of the foam board shapes made before the MPhil started. As with all the stepped pieces it is a useful visualisation technique, but introduces a very different set of formal qualities as pointed out by Bruce Gernand on 9/11/10 and Martin Smith.

Test number; 3

Date: 1/11/10



Aim

To replicate test 2 in Rhino.

Action

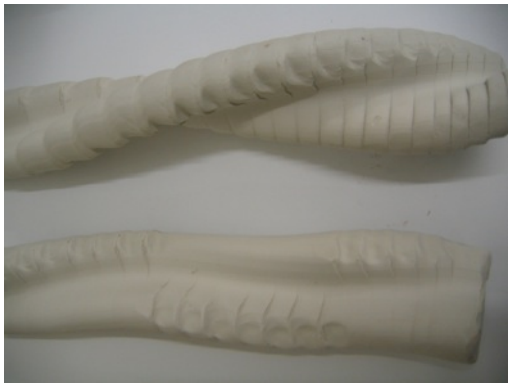
Curve drawn with 2 circles filleted together and then joined ➔ extruded and capped ➔ this object then repeatedly copied and placed on top of the last and offset by 5° rotation from the centre point of the original curve ➔ this was then cut through using a Boolean split based on an extruded curve drawn at an angle to the object.

Conclusion

Somehow the stepped aesthetic seems even more dominant in the virtual model. It is useful to be able to split the object and quickly view a cross section, but this cross section is much less interesting than the one cut in clay and its subsequent print.

Test number; 4

Date: 4/11/10



Aim

An attempt to directly manipulate a version of the cut and reassembled 'stepped' extruded objects

Action

Using the pneumatic extruder I made regular staged extrusion by repeated stopping and starting using the foot pedal. At each stage I manipulated the clay only laterally. One piece is made as a spiral and the other with an oscillation.

Conclusion

There is an interesting contrast between the 'hard' side of the object where the step is only made by the extrusion die and the 'soft' side with hand prints, and the distortion of the soft clay in between.

Using timed steps on the pedal gave regularly increasing intervals on the extrusion owing to the changes in pressure as clay leaves the machine, and the effect of gravity on the hanging extrusion.

Test number; 5

Date: 1/11/2010

Aim

To discover the potential for one of various manipulations of a cross section as it is extruded into a solid.

Action

An extruded length of clay has been cut into 1cm thick slices which have then been realigned to produce an oscillating wave movement.

Conclusion

This enables a more rigid manipulation of the extruded form than that achieved by manipulation during extrusion. I must however be aware of the formal qualities that are introduced through the stepped technique.

Test number; 6

Date: *27/10/10*

Aim

To discover the potential for one of various manipulations of a cross section as it is extruded into a solid.

Action

Two parts of an extruded solid were cut and mitred together

Conclusion

This is a very roughly made test. It demonstrates the importance of the quality of the join when cutting and assembling pieces. Its significance lay in its presentation. All spiral and other tests had been presented 'standing up' but this was shown in tutorial lying down and indicated the importance of opening up attitudes to viewpoint and axis.

Test number; 7

Date: 10/11/10

Aim

Based on the simple mitred clay extrusion, to make a test in a different material allowing greater speed and playfulness.

Action

I used a selection of pieces of wood dowel cut at varying lengths and angles, joined using a glue gun. The task I set was to assemble pieces such that I ended up back at the beginning of the 'jointed extrusion'.

Conclusion

The misses and overhangs of the joins are the most interesting aspects, being glimpses of the varying cross sections of the form, depending on the angle of the cut. They have the precision that is lacking in the clay versions showing the suitability of resistant material to this approach. Recutting the assembled form may reveal new unpredictable cross sections.

Test number; 8

Date: 4/11/10

Aim

To discover the potential for one of various manipulations of a cross section as it is extruded into a solid.

Action

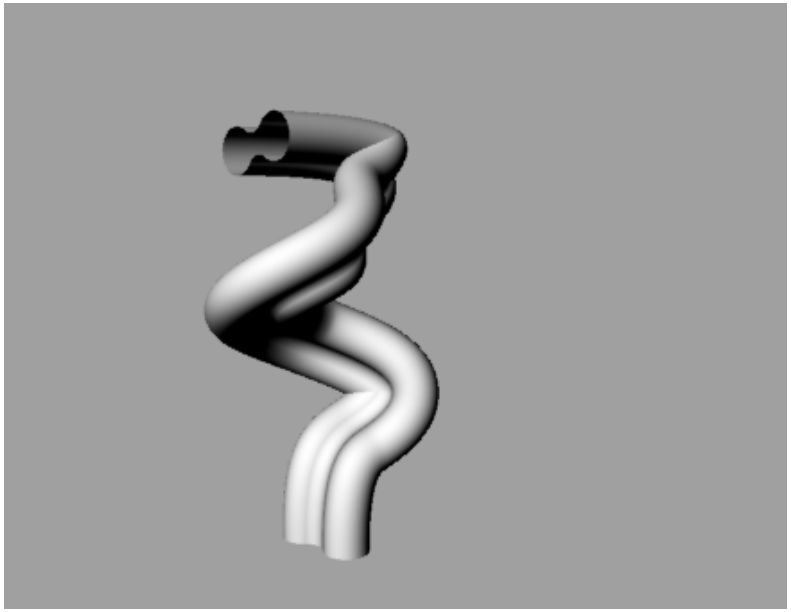
One of several parts made using the pneumatic extruder in order to 'extrude along a path'.

Conclusion

This technique allows movement of the solid through an axis without distortion – i.e. the cross section remains perpendicular to the line of the curve.

Test number; 9

Date: 7/11/10



Aim

To replicate in Rhino the manipulation of a clay extrusion as in test 8.

Action

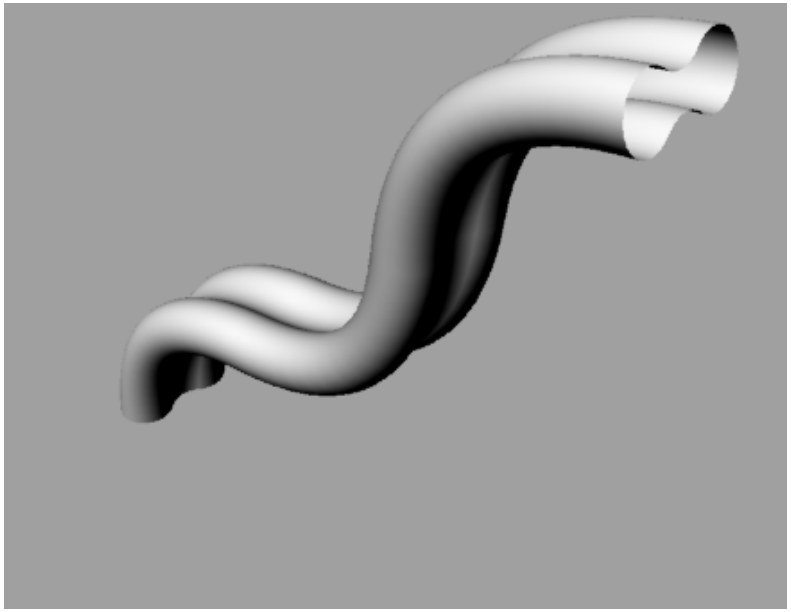
A curve was made as in test 3. I then drew a random curve with multiple direction changes which was used as a rail for the instruction 'sweep along a rail'.

Conclusion

An interesting form, which would be possible as a solid, but not by single clay extrusion. Where the bends are too tight the form folds in on itself, creating sharp angles. In clay this would only be possible through cutting parts out of the extrusion, by which technique one would tend to lose the soft outer edge of the curve.

Test number; 10

Date: 7/11/10



Aim

To make a Rhino form along the same principle as test 9, without the folded angles.

Action

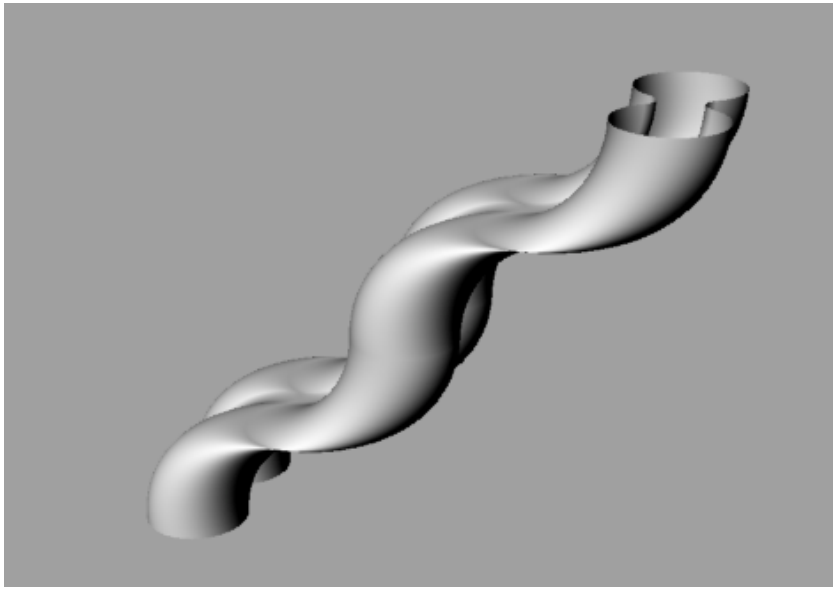
The same originating curve as test 9, but the curve used for the rail has much less tight bends which are only in one axis.

Conclusion

I have managed to 'iron out' the folds so that this is something I could make with clay extrusion, but it ends up looking much less interesting than the form in test 9. Using Rhino only to do what is possible in clay might be pointless. To pursue this I would have to think differently about the relationship between the two.

Test number; 11

Date: 7/11/10



Aim

To compare the effect of 'extrude along a path' to 'sweep along a rail' in Rhino, as related to clay extrusion.

Action

The same originating curve as in tests 9 and 10., extrude along a path with multiple curves.

Conclusion

In this instruction the original curve (or extrusion die) stays in alignment with the x axis rather than perpendicular to the path curve. This creates an extrusion with very little volume and a totally different formal quality than would come from the clay extruder. What this really tells me is something about the precision of Rhino instruction menus, and how different that way of working is to extruding soft clay.

Test number; 12

Date: 22/11/10

Aim

To find out what happens when a new cross sectional analysis/intervention is made into a form built from an altered extrusion.

Action

A length of extruded clay has been cut into 1cm thick slices. These have then been rearranged into an oscillating wave pattern as in test 5. This form has then been bisected along a diagonal.

Conclusion

The new cross section reveals an unpredictable planar shape. There is an interesting suggestion of a pixelated version of the original outline made through the rearranging and slicing.

Test number; 13

Date: 22/11/10

Aim

To find out what happens when a new cross sectional analysis/intervention is made in a form built from an altered extrusion.

Action

A length of extruded clay has been cut into 1cm thick slices. These have then been rearranged into an oscillating wave pattern as in test 3. This form has then been bisected along a diagonal.

Conclusion

The new cross section reveals an unpredictable planar shape. There is an interesting suggestion of a pixelated version of the original outline made through the rearranging and slicing.

Test number; 14

Date: 23/11/10

Aim

To make a new 2 dimensional image from the cross section plane made in the clay object from test 13. Completing a cycle from 2D to 3D to 2D.

Action

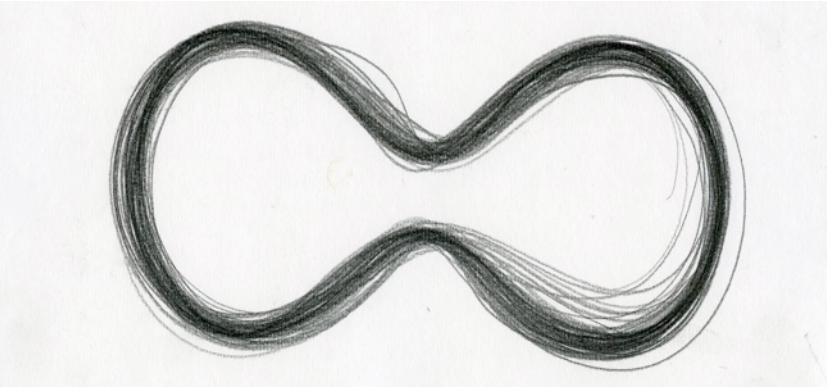
The leather hard clay piece was dipped in Indian ink and used as a printing block onto cartridge paper.

Conclusion

The translation back into 2D makes an image that could not otherwise have been arrived at. Perhaps its chief interest is in the materiality of the print. The inaccuracy of the edges and unevenness in the ink give an interest to the image that derives from its process.

Test number; 15

Date: 12/11/10



Aim

To make a drawing which generates an outline to be used for an extrusion die. The process of the drawing is intended to relate to carving clay or plaster.

Action

A continuous pencil line repeats the outline shape, concentrating on the balance between swell and constriction and attempting to arrive by repetition at a defined outline.

Conclusion

The drawing has to be approximated from in order to make an extrusion die, which cannot have the uncertainty of outline. The repeated line in the drawing acts to give liveliness, a sense of movement and an apparent three dimensionality to the image.

Test number; 16

Date: 14/11/10

Aim

To make an object originating in the drawing in test 15, that can then be cut and used as a printing block for a new 2D image. This is in order to make a 3 part – 2D/3D/2D image for Work in Progress show.

Action

The object was assembled from a selection of parts that had been manipulated as they emerged from the pneumatic extruder following the principle of 'sweep along rail'. The piece had to fit within 1/3 of an A3 sheet, have movement in multiple axes and be able to be cut roughly in half lengthways, giving 2 cohesive objects.

Conclusion

There is an inevitable process of composition in this attempt to make a form which is successful in its own right as well as being a staging post. The possible figurative reference was not pre-considered. As with other extruded, cut and joined forms the joints become focal points.

Test number; 17

Date: 18/11/10

Aim

To make a 2D image from the form in test 16.

Action

The form in test 16 was bisected roughly into halves. One of these parts was then dipped into Indian ink and used as printing block.

Conclusion

This has generated an image that could not otherwise have been imagined. The original outline reappears in unexpected distortions. A lot of the quality of the image lies in its imperfect edge, which recovers some of the liveliness of the original drawing in a different form.

Test number; 18

Date: 13/12/10

Aim

To make a 2D image from the object in test 12.

Action

The flat face of the clay object was scanned on the flatbed scanner

Conclusion

The image contains element of the 2D and 3D. There is the intense black of the flat face, but also a fading image of parts of the 3D from lying behind that. This relates to the 3 dimensionality given by the repeated line in test 15 and the quality given by the indefinite edge of the print in test 17.

Test number; 19

Date: 13/12/10

Aim

To create a 2D image from a form similar to that in test 16

Action

The form was approximately bisected and then the flat face of it was scanned on a flat bed scanner.

Conclusion

The image contains element of the 2D and 3D. There is the intense black of the flat face, but also a fading image of parts of the 3D from lying behind that. This relates to the 3 dimensionality given by the repeated line in test 15 and the quality given by the indefinite edge of the print in test 17

Test number; 20

Date: 20/1/11

Aim

To visualise some thoughts about the relevance of shadow and silhouette as notions containing a relevant relationship between 2D and 3D.

To think about the potential relationship between cast shadow and extrusion.

Action

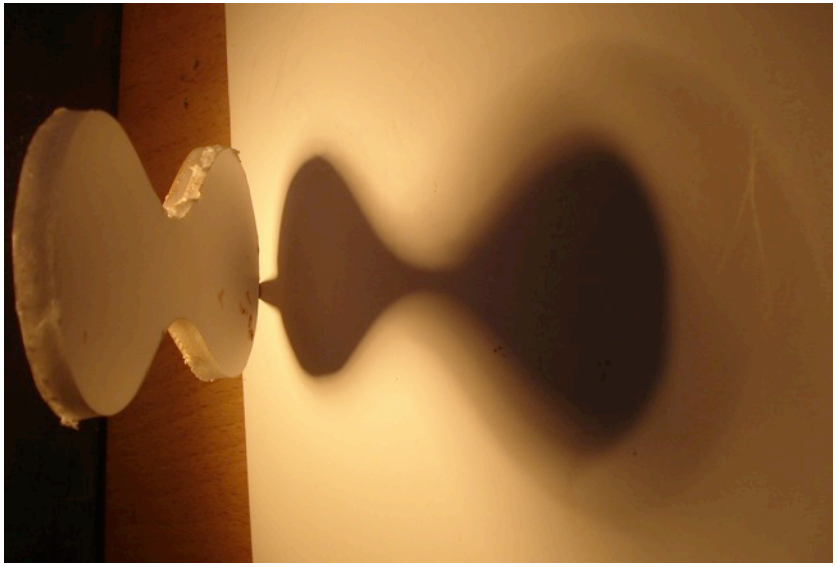
A small desk light is shone at the aluminium extrusion die, creating an image on white paper.

Conclusion

This is exciting, but it is uncertain how to make something from it. The complexity of the transition from the light to the shade relates to the scans in tests 18 and 19, and back to the line drawing in test 15. Is there a possibility to imagine and to make the lit space between die and paper into an object?

Test number; 21

Date: 20/1/11



Aim

To visualise some thoughts about the relevance of shadow and silhouette as notions containing a relevant relationship between 2D and 3D.

To think about the potential relationship between cast shadow and extrusion.

Action

A piece of foam board cut to the outline from the extrusion die in test 20 is held in front of the desk light in order to cast a shadow on the white paper.

Conclusion

This is the inverse of test 20 and equally exciting, but it is uncertain how to make something from it. The complexity of the transition from the light to the shade relates to the scans in tests 18 and 19, and back to the line drawing in test 15. Is there a possibility to imagine and to make the shaded space between foam board and paper into an object?

Test number; 22

Date: 20/1/11

Aim

To make a clay solid in the space illuminated by the light passing through the extrusion die.

Action

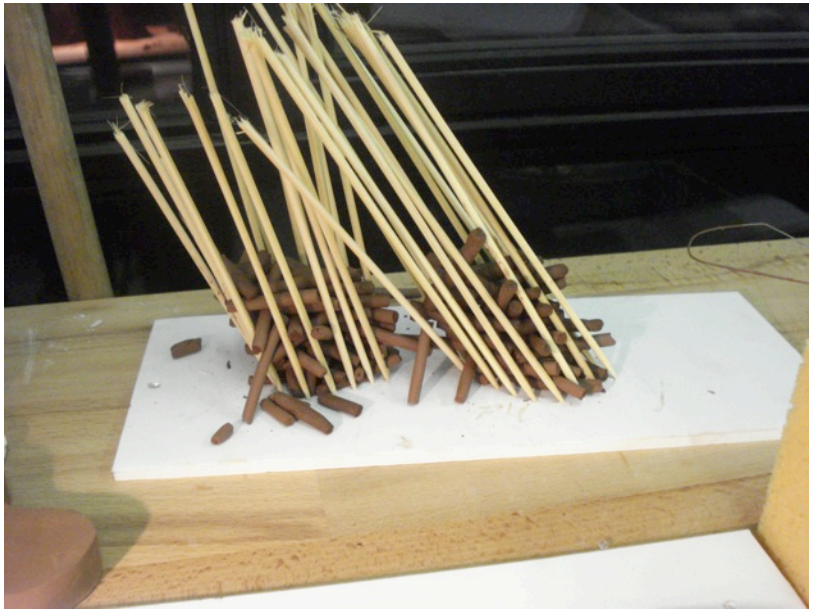
The solid was modelled by building up clay, adding it only where the light fell upon it.

Conclusion

This was very difficult to do due to the ephemerality of the image in test 21. The hand doing the modelling casts its own shadow and makes it hard to see where to put the clay. The test as illustrated above looks quite interesting, but when the light is turned off and the die removed you lose the interesting spots of leaking light (aura?) and have a dull object looking like a badly handmade version of the extrusions.

Test number; 23

Date: 25/1/11



Aim

An attempt to make a form in the 'shadow space' (between foam board cut-out and its cast shadow) that has an indefinite edge, like the shadow.

Action

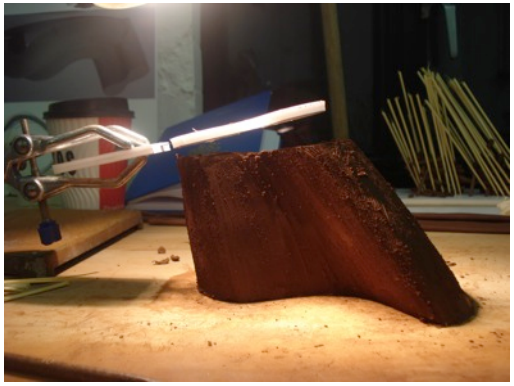
Whilst casting the shadow, the wooden skewers were stuck into the foam board base to describe the edges of the shadow. The resultant 'basket' was filled with small sticks of clay which leaked out between the containing wooden skewers.

Conclusion

Entertaining and possibly interesting, but not really set up well enough. The sticks need holding in shape. The relative scale of the basket and the clay parts needs consideration.

Test number; 24

Date: 1/2/11



Aim

To carve back a lump of clay until it only occupies the shadow space of the foam board cut-out. This is similar to but the inverse of test 22.

Action

A shadow was cast with the piece of foam board and a lump of clay placed underneath it, very roughly modelled to size. I then tried to carve that back until it only occupied the shaded space.

Conclusion

This was extremely difficult to do as it is very difficult to tell if the shadow on the clay is cast by the foam board or the clay itself. Also the hand and tool create fresh shadows whenever they try to act on the object, making it even harder to determine where the edge of the clay object should be. The test makes an interesting image when in process as above, but a very boring lump of clay once the light is turned off and the apparatus removed.

Test number; 24a

Date: 1/2/11

Aim

To record the process of making and finishing test 24.

Action

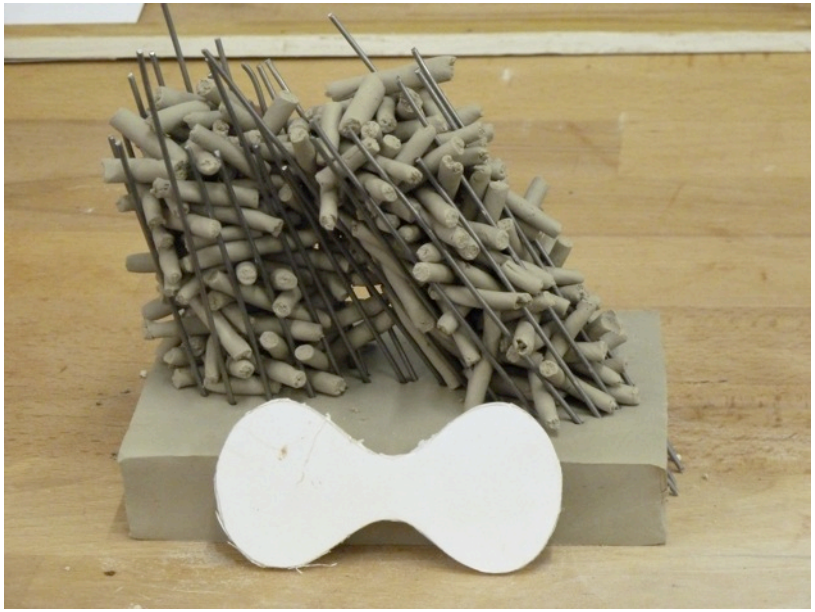
The clay object has been removed from the site of the test.

Conclusion

The difference between the shadow and outline of the object demonstrated by the clay shavings illustrates the difficulty of the task. The remains of the test set up are more interesting than the object that was made. This is a more informative record of the ephemerality of the task than the clay object, of which I learn more by its absence.

Test number; 25

Date: 15/2/11



Aim

To remake test 23, eliminate some of the problems and end up with a fired ceramic object

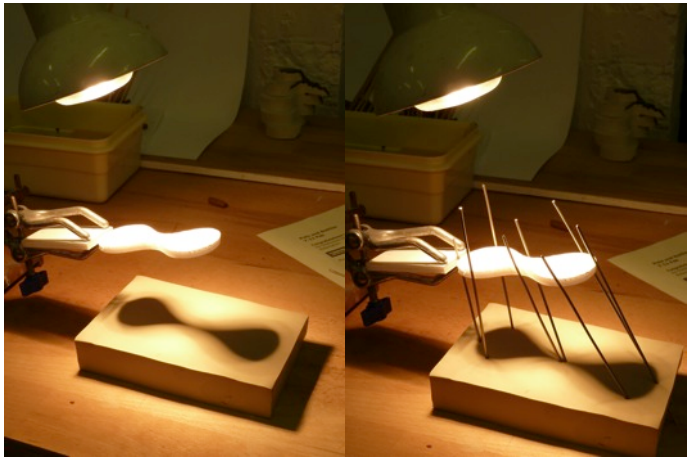
Action

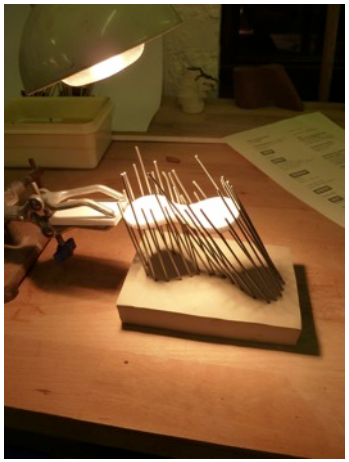
A 2cm thick clay base with Canthal wire rods stuck into it defining the edge of the shadow space. This has been filled with short (c 2cm) lengths of rolled clay coils, dropped in and allowed to protrude or fall through the basket. Those that fell right through were picked up.

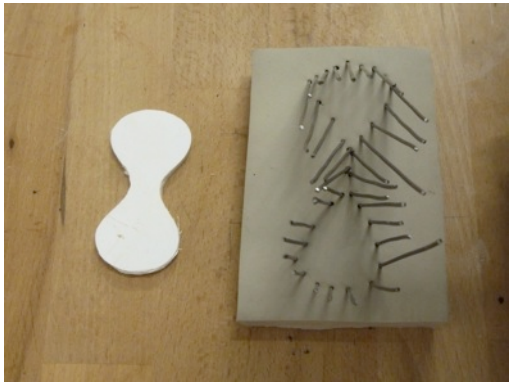
Conclusion

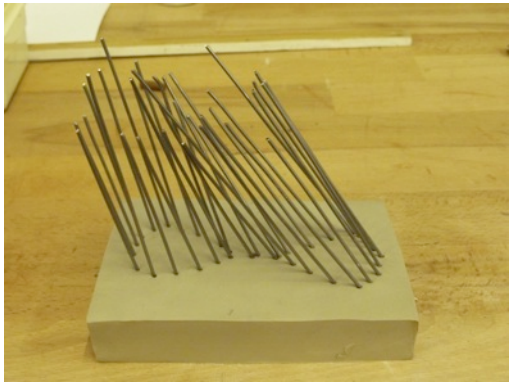
An abstract hedgehog. There is some sense of a fuzzy edge, but not enough contrast between solid and space. The centre is not dense enough.

Photographs of stages of making test 25.









Test number; 26

Date: 15/2/11

Aim

To use the properties of spraying in order to make a clay 'form' with a blurred edge.

Action

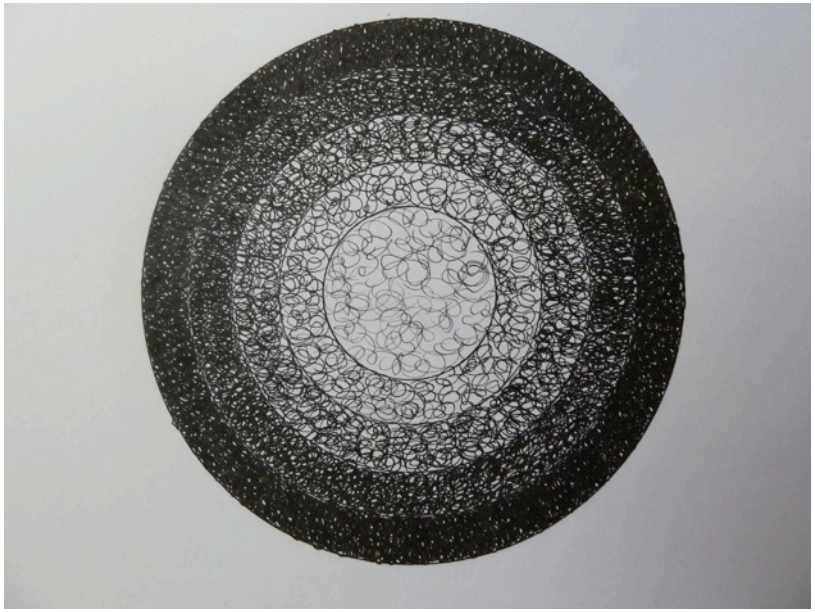
The aluminium extrusion die was held at varying distances from a plaster batt. Casting slip was sprayed through the die and onto the batt using a glaze spray gun.

Conclusion

This had to be done gradually in order to let the slip dry and not run. It is very difficult to build up a significant thickness. The test at bottom left of the left hand image seemed most successful, where the spray gun was held further away from the die. The trajectory of the slip can be seen to mimic that of light beams and the inexact focus of the spray gives the blurred edge. This test gives an interesting image, but not much of an object.

Test number; 27

Date: 20/2/11



Aim

A sketchbook drawing thinking about the edges of shadows interpreted as a graduated change in density of mark.

Action

I drew a series of concentric rings with compasses and black pen. I then drew into these with the black pen attempting to make random marks creating different tonal value in each ring .

Conclusion

This drawing proved a very useful thinking process, giving rise to thoughts about how I might use the relationship between a fixed hard boundary and softer marks to represent some of the qualities seen in the image from tests 20 and 21. This same notion could be used to create form using mould structures?

Test number; 28

Date: 28/2/11

Aim

To make a multi layered mould that could be used for various clay tests derived from the ideas presented by the drawing in test 27.

Action

My first attempt at sledging plaster. A 1m long piece which is intended to be cut in half in order to be used as a series of 2 part moulds. The sledging was done in layers, with the profile being recut each time according to outlines produced by a rhino drawing in which the initial curve (the centre form) had been repeatedly offset by 1cm. The offsetting of the curve turns the concave curve in the centre into an angle.

Conclusion

This mould proved to be a useful piece of making, although I never actually made with it the form I had envisaged. In some ways it was too deterministic, but it did enable some of the subsequent open ended tests.

Test number; 29

Date: 15/3/11

Aim

To find a way to use the sledged mould to make a tonally graduated object.

Action

The clay is 4 separate mixes for different tones.

From bottom up;

200g terracotta + 800g superwhite

300g terracotta + 700g superwhite

400g terracotta + 600g superwhite

500g terracotta + 500g superwhite

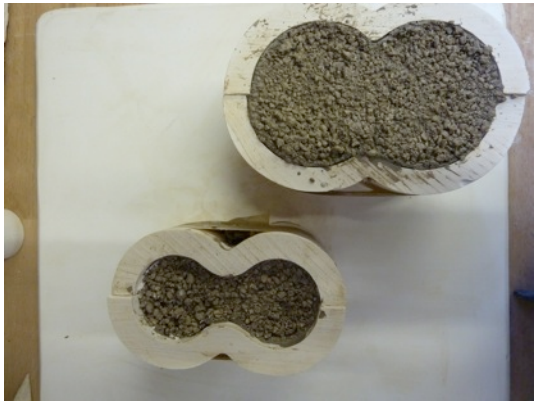
The object was made by filling the outer mould parts with loosely packed lumps of clay, then placing next pair of mould parts over this and filling with lumps of next clay mix etc..

Conclusion

A ziggurat. Not much to say. It could possibly be cut through to reveal something else.

Test number; 30

Date: 31/3/11



Aim

To make a spot test as preparation for making a line blend of substantiality in order to use the mould from test 28 to materialise the drawing from test 27.

Action

Perlite soaked in water and mixed with casting slip at the ratio 1litre LTW slip: 1kg wet perlite. In the larger test the perlite was sieved and left to drain in order to have less 'spare' water around it.

Conclusion

There is too much water, meaning that the slip loses consistency and doesn't hold the perlite evenly suspended. There is then also a skin of slip cast against the mould, masking the consistency of the bulk. These tests did stay intact in firing to 1140°c.

Repeat with unsoaked perlite?

Test number; 31

Date: 1/4/11

Aim

To build on test 30 and make another attempt at spot test for a line blend of substantiality. How much dry perlite can I get into a volume of casting slip – how insubstantial and open can I make the clay?

Action

I used volume measurements of LTW casting slip and dry perlite. I managed to get 1.5 litres of perlite into 0.5 litres of slip. This was packed into a mould, dried very fast and could be released after 30 minutes.

Conclusion

This is more successful than test 30, having an even consistency and structure throughout. Could one go further and have even less slip – 2 or 2.5 litres perlite to 0.5 litres slip?

This fired successfully to 1140°c – a bit crumbly but nice and light.

Test number; 32

Date: 7/4/11

Aim

To make an object with a layered line blend of substance in the multi layer sledged mould.

Action

I planned to fill the smallest core mould, let this dry, then remove the mould and place larger mould around it and fill the gap with the next stage of the blend etc.

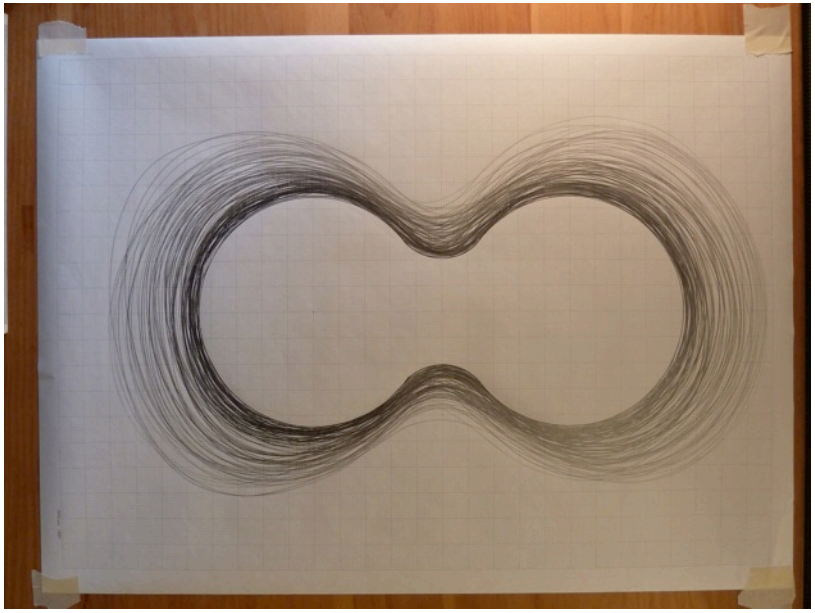
Volumetric ratio of mixes was to be 2 Perlite;1 Slip in core followed by 3:1, 4:1 etc. as moving outwards.

Conclusion

I never got beyond the core, owing to the difficulties of filling the mould which can be seen in the photo. However there is something interesting in the gradation of density produced by this difficulty – maybe I need a less formulaic and more 'handmade' solution?

Test number; 33

Date: 10/3/11



Aim

To make a drawing that incorporates a precise (moulded) element with a freer repeat line element in order to consider the relationship between mould and hand making and between a definite and indefinite edge to a form.

Action

On graph paper the internal outline was drawn precisely with pencil and compasses. Then this was drawn around with a continuous gestural line, attempting to have greatest density of repeat nearest to the original outline. Any mark that strayed inside the original outline was then rubbed out to preserve the clarity of the interior form.

Conclusion

What was most interesting about this was the unexpected sense of three dimensionality that came from the repeated line. It makes the blank centre either appear to be proud or recede. This is partly because it acts in the manner of shading, but it also has a sense of movement and ambiguity.

Test number; 34

Date: 5/4/11

Aim

To make a clay form with some of the properties and qualities of the drawing in test 33, using clay extrusion as a 3 dimensional line.

Action

Lengths of extruded tube in superwhite clay were wrapped around s section of the core from the sledged mould from test 28. These were then compressed within two of the outer sections of the mould.

Conclusion

It is hard to get the kind of relationship between the inner form and the extruded 'line' as in the drawing. The use of the outer mould sections goes beyond what is indicated by the drawings, but it generates some interesting qualities of hard/soft contrast – more than the interior.

Test number; 35

Date: 5/4/11

Aim

Following on from test 34, another attempt to use extruded 'lines' between plaster mould forms.

Action

The extruded tubes were arranged onto the plaster core at right angles to the alignment from test 34, and then compressed with the outer mould parts. This alignment makes for a closer fit to the inner form.

Conclusion

An interesting form. As with test 34 the main quality is in the hard/soft tension of the clay/plaster meeting. Do I now need to find a different form?

Test number; 36

Date: 5/4/11

Aim

A further test derived from the drawing in test 33, using a finer clay 'line'.

Action

As previously the clay extrusion was wrapped around the inner form, attempting to follow it closely at first. The coils were then compressed within outer parts of the mould, which broke in the process and left the marks of the broken edges.

Conclusion

An interesting test. The inner surface works well as a representation of a drawn line. The variation of mark on the outside left by the broken mould works well – the mix of confinement and free line movement. It lacks the ambiguity of the drawing.

Test number; 37

Date: 5/4/11

Aim

To find another way of 'drawing' with clay in a space between mould boundaries.

Action

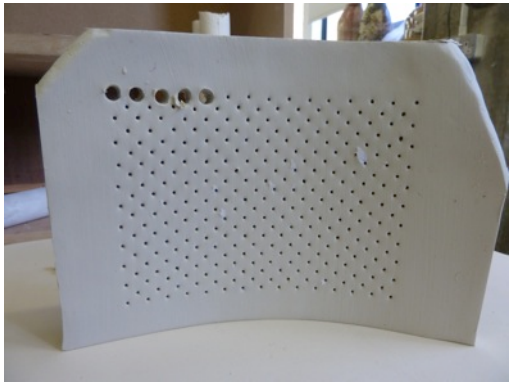
I adapted a silicone dispenser gun to extrude soft clay in the hope that I could use it as a 3D drawing tool. This was used to deposit clay in a space between two mould parts.

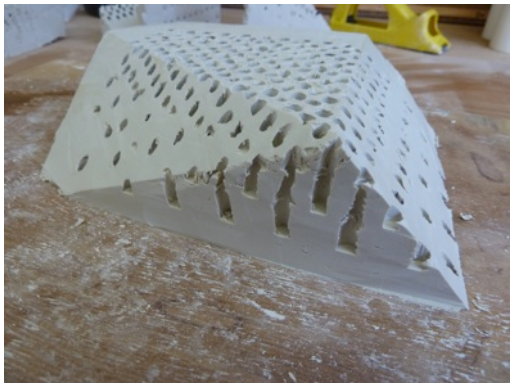
Conclusion

This did not have the drawn line quality that I wanted. In order to be able to manually extrude the clay it had to be made very soft – almost a slurry - and so did not have any of the qualities of movement or dynamism of a drawn line.

Test number; 38

Date: 7/4/11





Aim

Based on a suggestion from Annie Cattrell to think about perforation and perforated edges.

An attempt to use perforation as a means of achieving a varying density/solidity of the clay mass.

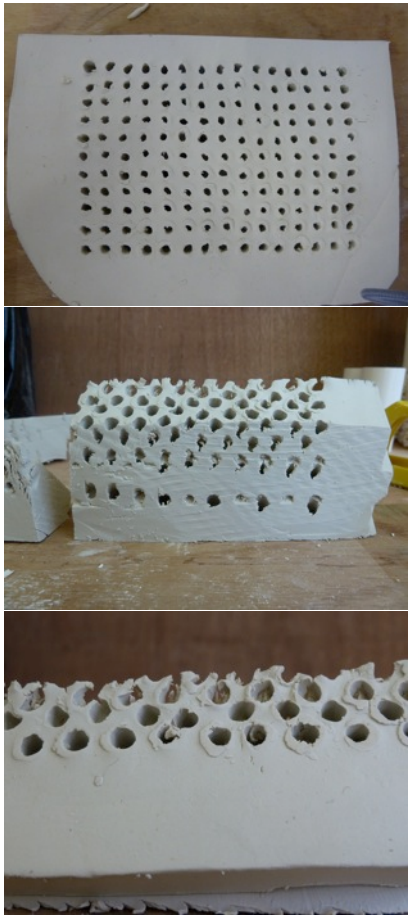
Action

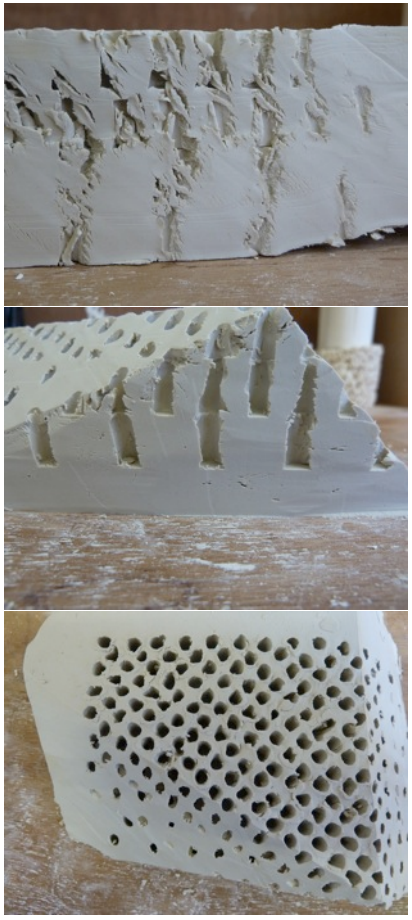
Rolled out four 1cm thick slabs of porcelain and perforated them by marking out a grid using graph paper and pin pricks followed by a clay hole maker. The four slabs were perforated at decreasing densities. They were then laid on top of each other and stuck together. The resulting block was cut through at various angles.

Conclusion

This was laborious, but there is something in it. It has a resonance of a magnified newspaper photo – a kind of 3D dot matrix shading. Some interesting qualities form the inexactness of the process, and the various parts make strong photographic images.

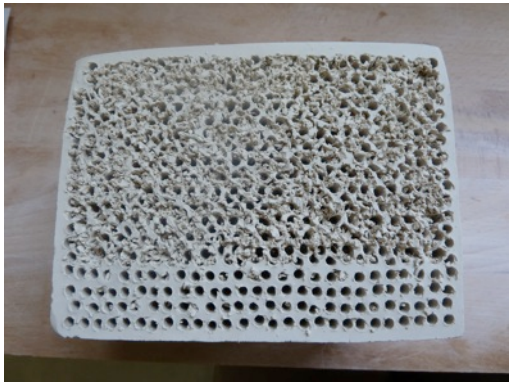
Further images relating to test 38.

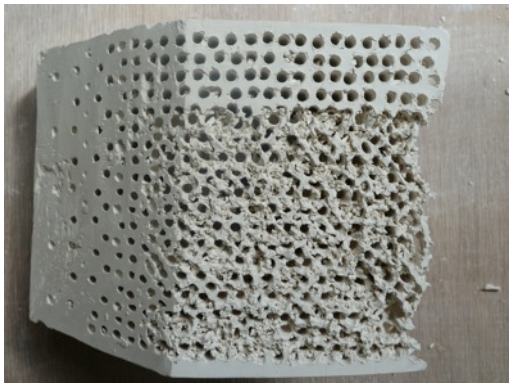




Test number; 39

Date: 23/5/11





Aim

To try a different approach to making an object similar to test 38.

Action

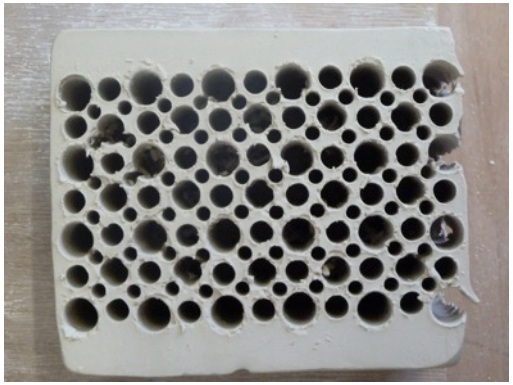
I used a pillar drill with 4mm drill bit on a block of leather hard porcelain. 10mm intervals were marked on the outside of the block to indicate different depths to drill to. The block is drilled with holes at increasing frequency as they become shallower. Once leather hard the block was cut at oblique angles to reveal the varied substance of interior.

Conclusion

This worked quite well, although not as interesting after the cut as I had hoped whilst making it. This process does achieve the sense of transition that I am after, but I am uncertain what its formal application might be.

Test number; 40

Date: 23/5/11



Aim

Further to test 39, to see what happens when the hole diameter is changed along with the frequency at different depths.

Action

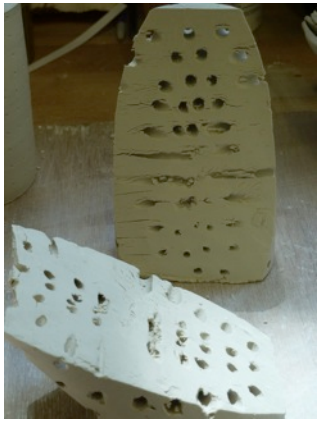
A leather hard block of porcelain was drilled with 3 different diameter drill bits – largest deepest and lowest frequency.

Conclusion

Similar moderate success as test 39. This was an important part of thinking through material qualities related to shadows and focus, but did not get me any further in terms of form.

Test number; 41

Date: 23/5/11



Aim

To discover the effect of drilled 'shading' on a different form. By having a convergence of holes at the centre of the cylinder, I hoped to create a void or shadow – increased insubstantiality.

Action

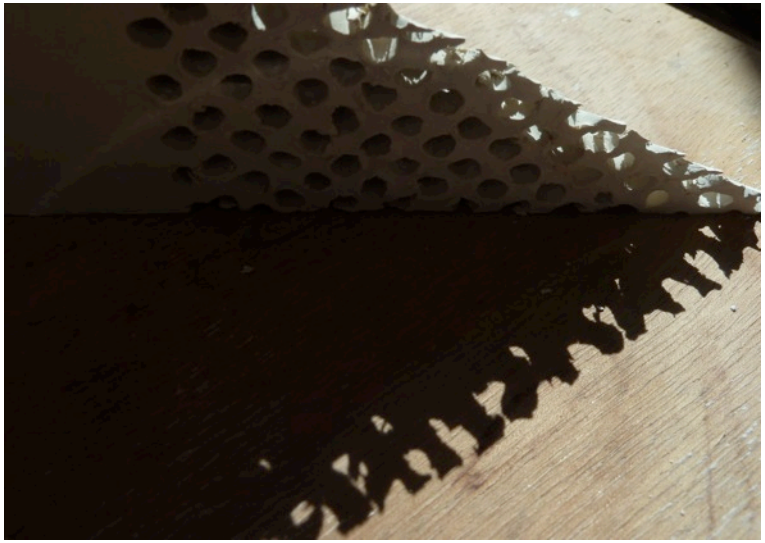
A lump of porcelain was roughly shaped and then turned to a cylinder on the wheel.. This was left to go leather hard and then drilled according to a simple grid with the depth set to the centre of the cylinder. The object was then cut through at an angle to reveal the interior.

Conclusion

The change in form from the block has brought a new element, but there was not really what I expected I the interior. It may need more holes of a finer diameter. Photographing this object in strong sunlight on my desk indicated the potential for light and shade cast on the objects.

Test number; 42

Date: 8/6/11



Aim

To learn about the objects made by drilling porcelain through photographing them in strong sunlight.

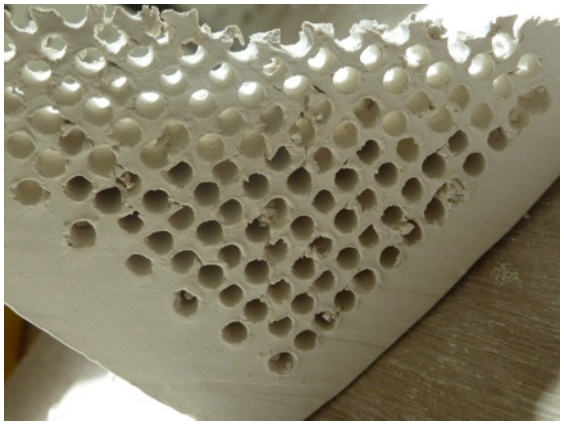
Action

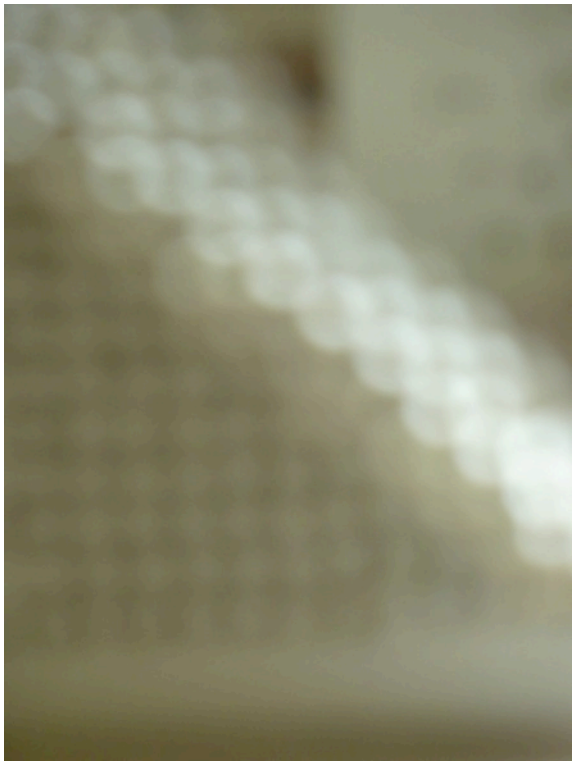
I photographed a number of the cut up drilled blocks, along with their shadows, both in and out of focus.

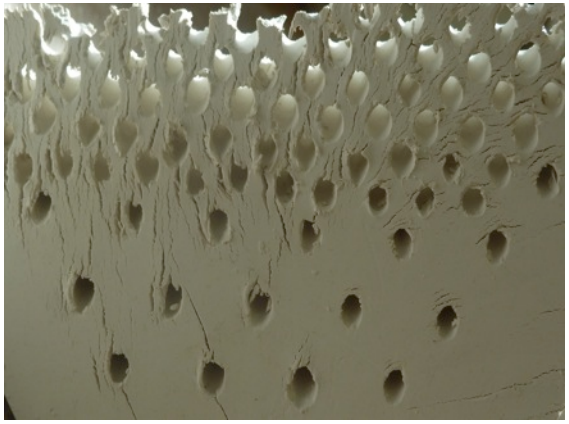
Conclusion

This produced some very interesting results. It completes a circle by returning the objects to the images of shadows and shadow edges by which they were inspired. There is an issue of ephemerality in that the images are better than the objects – but somehow the images show potential and hope.

Further images of drilled objects and their shadows.







Test number; 43

Date: 17/6/11

Aim

To find another way to interrupt the solidity of a clay object in order to blur the boundary between matter and space.

Action

I used a thick thrown porcelain vessel that I had originally intended to drill. This was stuck back down to the wheel and then grooves turned into it at 1cm intervals using a variety of tools – potters knife and dentist tools.

Conclusion

This has something about it. It is more refined and simpler than the drilling, but also giving more complexity and nuance in the change in apparent boundary of the form according to viewpoint. This was a return to more ostensibly 'ceramic' process. It was backbreaking on the potters wheel - as Stefan pointed out I should use the pot lathe.

Test number; 44

Date: 22/6/11

Aim

A variation on test 43 to see what difference an alternative frequency of turned 'fin' makes.

Action

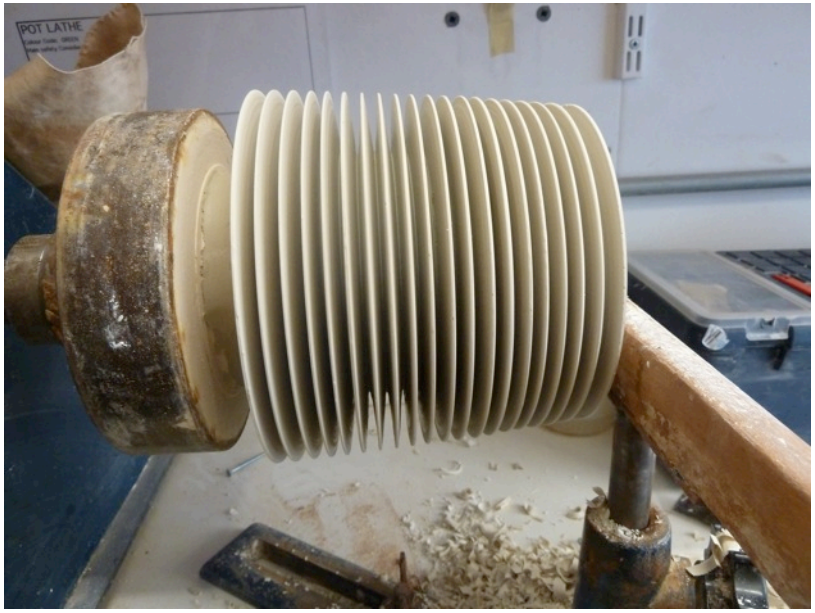
A thrown porcelain vessel of tapering wall thickness turned on the potters wheel using a square ended tool.

Conclusion

This has some of the same effect but none of the subtlety of test 43 – the fin frequency needs to be closer.

Test number; 45

Date: 24/6/11



Aim

To make a similar object to test 43, but using the pot lathe and aiming for a higher level of finish.

Action

A pot thrown using special porcelain with tapering wall thickness dried to leather hard. I measured the inside of it and turned a plaster chuck to fit. The pot was then stuck onto the chuck and turned with grooves at an interval of 0.8cm to depths reflecting the interior space and determined from a cross sectional drawing of the object.

Conclusion

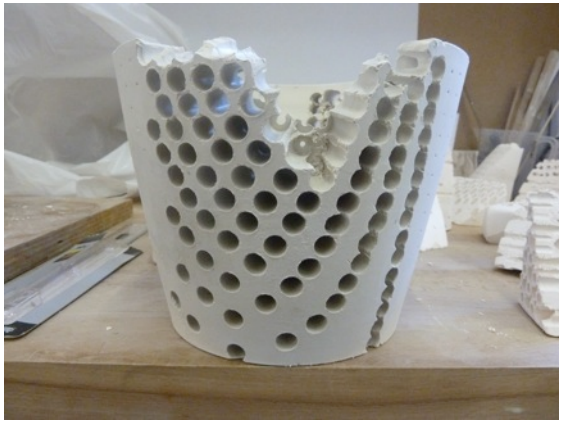
This felt like the first resolved and successful object of the project. It was the first time that I have effectively decided to remake a previous test and 'do it properly'. By doing something very simple I have made something complex in its implications and potential. The object is perhaps best recorded by moving rather than static image. I am beginning to learn about the significance of viewpoint.

A question was what would happen in the firing. I expected some movement/slumping – in fact there was almost none at 1250°c.

Further images of the object from test 45

Test number; 46

Date: 29/6/11



Aim

To use the drilling techniques of tests 40 and 41 on a vessel form

Action

Porcelain vessel thrown with tapering wall thickness and left to leather hard.

I measured the object and made a net of its surface using Rhino, onto which was laid out a grid of hole markers. These were in bands increasing frequency of holes as one goes up the object.. This made the pattern of curved lines. The object was set perpendicular to the drill (i.e. the flat base vertical) and the depth set so that it would penetrate right through the wall half way up the object.

Conclusion

This had some interesting aspects but it is very clunky. There is too much going on with the vessel, the pattern the drill depth etc. This test and direction has been superseded by the turning in tests 43-45.

Test number; 47

Date: 13/10/11

Aim

To develop from test 45 and explore a different gradient of varying depth in turning and its effect on the fired object.

Action

The thrown clay vessel was one of a series made in June and left wrapped up to dry very slowly over the summer break. It was turned using a combination of adapted cold chisel and woodworking chisel which had been ground down to a taper in the metal workshop.

Fired to 1245°c.

Conclusion

This was a very successful piece. The effect of firing can be seen between the two illustrations, where the bottom few fins have moved, a quality that is offset against the maintained precision of the shorter top fins.

Test number; 49

Date: 21/10/11

Aim

A group of small test pieces made in order to test some ideas about wrapping these forms in viscous glaze.

Action

Thrown as a roughly repeated group of forms. Turned with 1cm intervals relatively roughly and quickly.

Conclusion

The significance of these in this state is due to the training in turning they gave. The larger pieces take most of a day of sustained concentration and as such there is a tightness and little freedom in the activity. I turned nine of these and the last one took half the time of the first, and was the best result. An example of confidence and quality coming through craft training.

Test number; 50

Date: 17/11/11

Aim

To test the potential of thickly applied earthenware glaze in forming a soft, viscous mask over the hard turned form to add a dimension to its uncertainty of boundary.

Action

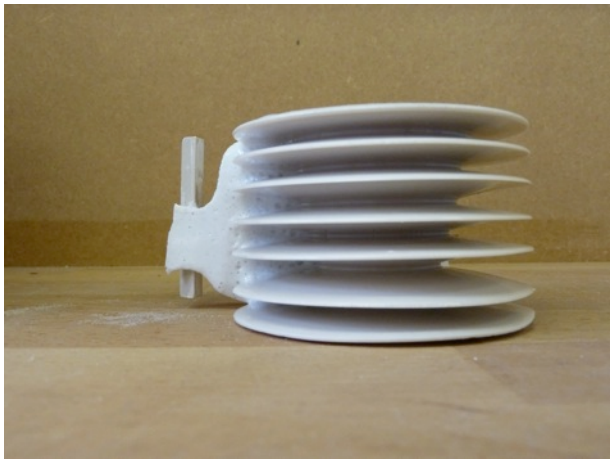
Glaze is; Calcium Borate Frit 75
Cornish Stone 25

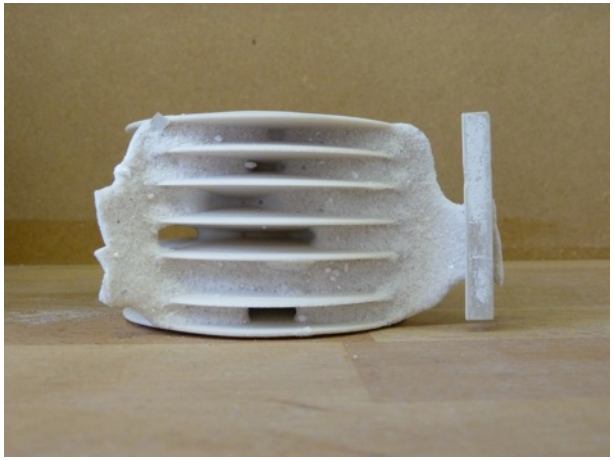
Mixed as a thick paste and applied to the biscuit fired object. The objects fired as shown in order to see flow/gravity in both planes. Fired to 990°c.

Conclusion

The glaze shrunk and flowed a lot, so did not wrap the form in the way that I had hoped. However these objects continued to intrigue and to in form my view of the work through the introduction of an accidental and fluid element.

Images of fired piece from test 50.





Test number; 51

Date: 25/11/11

Aim

To test the potential for using viscous feldspathic stoneware glazes to wrap and soften a hard turned finned form.

Action

Glaze is; Nepheline Syenite 50
Wollasonite 50

This is applied as a thick paste to 3 clay bodies;
Valentines textured black, Special porcelain and Valentines smooth black. (top to bottom in image)

Conclusion

The glaze bulk was not enough/its shrinkage was too much. The glaze is too opaque to be able to see much of the body through it. Not a success as it stands, but thought provoking. There is something to be learnt from the softness and movement of the glaze. One of the main outcomes of these tests was the introduction of a black clay body. This was done initially so that it might be seen through a semi opaque white glaze, but became significant as a bare body, having a different sense of presence and light/shade to the porcelain.

Test number; 52

Date: 2/11/11

Aim

To visualise the proposal to wrap a turned form in thick glaze.

Action

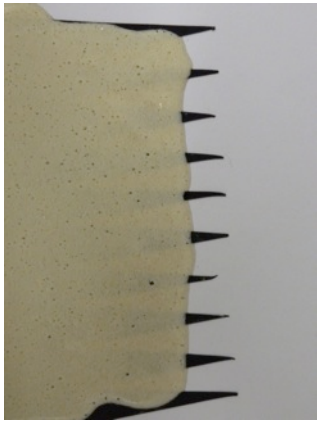
I cut out the outline of a form from black paper, laid this on top of white paper and then poured white ink and tipped the image to make it spread over the 'zig zag' area.

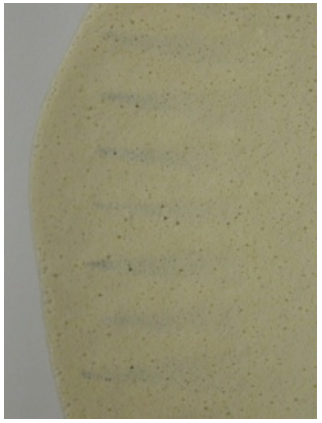
Conclusion

More of a thinking piece than anything else, this image was transient, and appears different in other images as the ink moved and dried. There are some fantastic qualities in the relationship between the hard cut edge and the fluid.

Test number; 53

Date: 4/11/11





Aim

Another attempt to visualise the potential for wrapping a turned form in thick opaque glaze.

Action

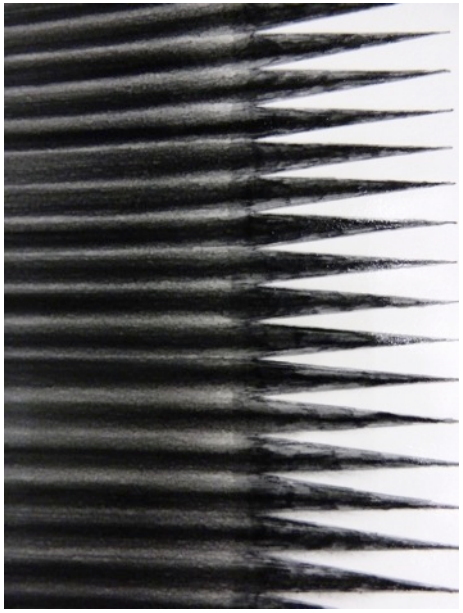
I cut the outline of a turned form in black paper and laid this on a sheet of white paper. I then poured over this sanding sealer that had been thickened and opacified with china clay. This concoction was an attempt to imitate viscous glaze.

Conclusion

Interesting images, indicating the potential for part covering a form and exploring the potential for tension between hidden/revealed as well as hard/soft. It also made me think about how hard it will be to see any of the body through a glaze.

Test number; 54

Date: 4/11/11



Aim

A further test to visualise a hard edged turned form become softened and blurred.

Action

I measured out and drew the zig zag edge using a ruler. I then filled in to one side of it with the same fine tipped black pen with water soluble ink. I then dipped the drawing from the shaded side up to the tips of the black points in water and let it drain downwards (right to left in the image).

Conclusion

This was interesting for the softened remnant of the original drawing and the enigmatic stripy image made by the running ink to the left of the image.

Test number; 55

Date: 4/11/11

Aim

Another attempt at visualisation as in tests 52 to 54

Action

Heavy Fabriano paper was soaked in water. I then printed onto it with a small wedge shaped block of MDF and Indian ink. When this had dried I reprinted over it the same image, giving the darker and more definite marks.

Conclusion

This was in some ways more abstracted and trying less to be directionally representational then the previous 3 drawings. There is a lot of potential in the simple combination of wet and dry paper of an adequate quality and ink printing.

Test number; 56

Date: 24/11/11

Aim

To make a more resolved drawing based on test 55 as an image in its own right and on a larger scale.

Action

A1 sheet of Fabriano paper soaked in water and then printed onto with MDF wedge dipped in Indian ink.

Conclusion

In the image one can see the record of the paper drying out and the print becoming more precise as the printing moves from bottom to top. One can also see the effect of the MDF being re-dipped in ink as the process continued. This drawing is again more abstracted from the original intent of these tests, but is subtler in the way that it combines hard and soft elements. Shown alongside the work at WIP show it in fact seemed to illustrate some visual qualities of the unglazed turned objects.

Test number; 57

Date: 8/11/11

Aim

To examine the potential for a combination of intervention into the form through turning and adaptation of the material through addition of perlite.

Action

2 litres porcelain casting slip mixed with 1 kg molochite (30-85 grade). A plaster chuck was dipped into this until a 4mm layer was cast onto it. The remaining porcelain slip was mixed with as much perlite as could be got into it and this mix was built up in layers around the chuck. When leather hard this was turned on the pot lathe.

Conclusion

Some interest here in undermining the control that I am beginning to have on the lathe through material alteration. However this seemed too crusty and to lack the subtlety of other turned work. There is some interesting to the drawing in test 56. Also seemed to be moving in material a bit too close to pre MPhil work. Fired successfully to 1260°c.

Test number; 58

Date: 30/11/11

Aim

An experiment with an approach to scale to think about the issue of viewing height and perception of the objects..

Action

I used a series of small pieces made for glaze testing and stacked them up, stuck together with PVA glue as part of the display for Work in Progress exhibition.

Conclusion

Due to the proportion of this object there is an intimation of greater scale. It begins to demand that the viewer move around it if they realise that what is perceived of the object changes with viewpoint. I liked the quickly assembled nature of this piece and it carries the first indication of dealing with scale through assembly.

Test number; 59

Date: 21/11/11

Aim

To increase the scale of a turned object – bigger than I am any good at throwing for the initial 'blank'.

Action

25 kg porcelain was wedged and shaped into a rough cylinder. This was dried slowly inside a newspaper 'tent' for 2 weeks, with occasional turning. The block was then turned to true on the whirler and the centre point marked in the top. A pilot hole was drilled and then the lathe spindle chuck was hammered into the block. The piece was then turned on the pot lathe.

Conclusion

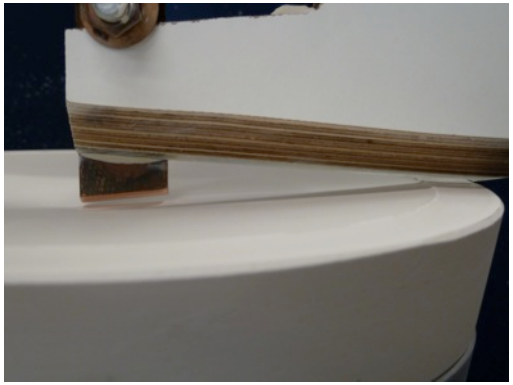
This is one of 3 similar tests, which presented a range of technical issues relating to getting them onto the lathe and then off the spindle. They cracked and warped a lot in different ways and at different stages in the process; hammering in the spindle, during turning, drying and firing.

They had some interesting expressive qualities, partly though cracking, and many people liked the energy. I concluded that the way to deal with scale is through an additive not a subtractive process.

Further images of test 59 and others similar.

Test number; 60

Date: Jan 2012



Aim

To use jolleying as an additive process, investigating the potential of this for making stackable porcelain discs, with possibility to vary the internal diameter.

Action

I made shallow cone moulds and jiggering profile as illustrated with an adjustable part to make the hole in the middle. I learnt how to produce discs with this using Special Porcelain.

Conclusion

There were several issues with batting out to the right size and angle, avoiding chatter on the clay, and most of all getting the discs to release form the mould. However there is definitely a lot of potential in this. The fins move about a lot in the firing with the memory of distortion during handling in removal and assembly. I was initially not happy with this but looking at stack of poppadums on my desk over time began to see value in it as an offset to precision of turned forms.

Fired piece from test 60.

This is an accumulation of various jiggered Special Porcelain discs with different levels of distortion as I worked on resolving the making/mould release issues. These pieces were stacked on my desk as ‘failed’ tests, but increasingly came to represent some of the qualities of the ink and water drawings.

Test number; 61

Date: 21/2/12

Aim

To test the possibility of varying the internal dimension of a stack of jiggered discs.

Action

5 discs jiggered with a change in internal radius of 0.5cm between each. These were stacked and luted together with slip and the interior smoothed down to a gradient.

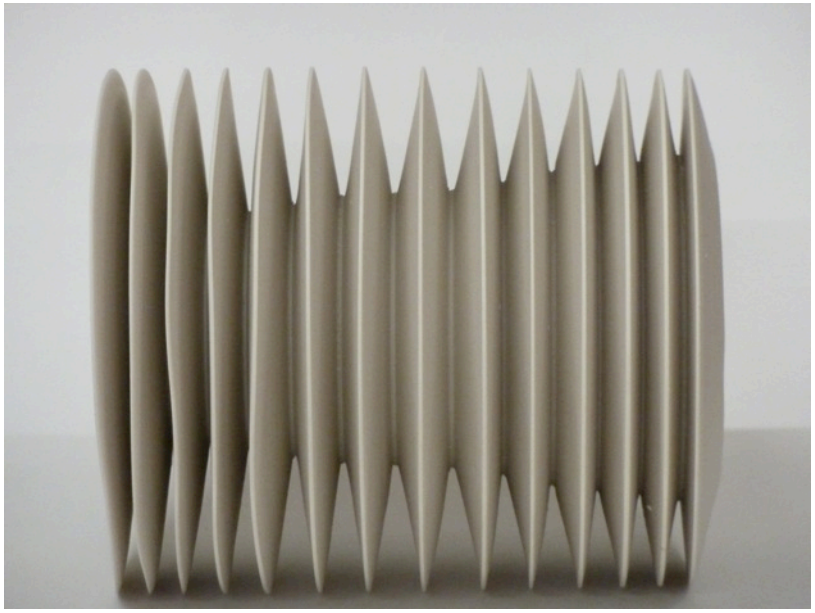
The piece was fired to 1260°c.

Conclusion

Looked good when made but in the firing it slumped outwards. There is an inherent instability and outward pull in the form. Might have been better if the interior had come back in again. May also be better to fire the parts separately and stack and join after firing, as indicated by the image from test 60a.

Test number; 62

Date: 15/2/12



Aim

To see the visual effect of varying the interval between fins on a turned object.

Action

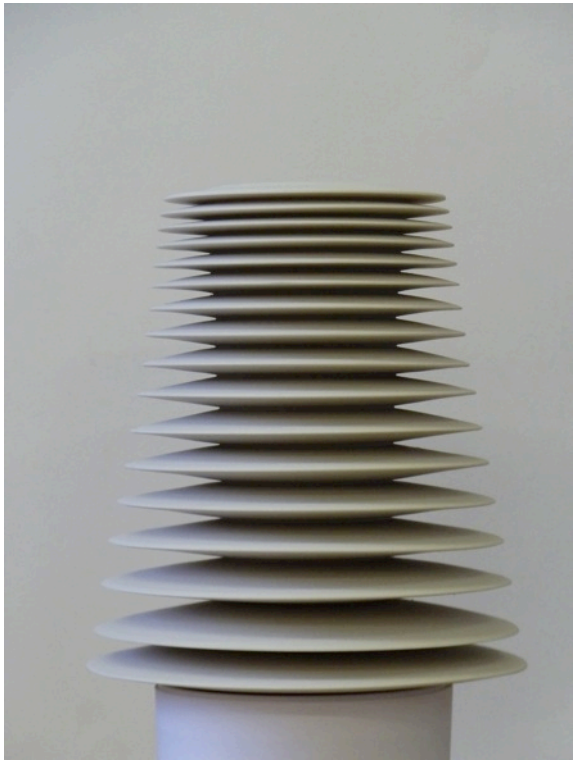
An object thrown using Special Porcelain and then turned such that the interval starts at 0.8cm at one end, increases by 0.1 cm with each gap as far as the middle and then decreases again. Fired to 1260°c.

Conclusion

Quite successful, but this probably needs to be done over a longer/taller piece and a greater change in interval. There is the indication of an interesting sense of movement across the piece that may help to lead the eye around it.

Test number; 63

Date: 29/3/12



Aim

To see the effect of a variation in interval between fins working in one direction only.

Action

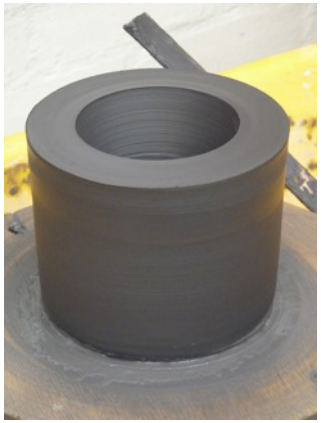
An object thrown in Special Porcelain with inverse conical interior and exterior. This was turned with the interval beginning at 0.5 cm at the top and then increasing by 0.1 cm with each fin working down the object. Fired to 1260°c.

Conclusion

This has a more visible change than test 62, but as the interval opens up the subtlety of the optical effect is lost. Again I conclude that this idea needs a much longer span over which to work, perhaps with an oscillating interval.

Test number; 64

Date: 22/2/12



Aim

To see how a black body differs to porcelain in visual effect in a thrown/turned object.

Action

Thrown with Black Jasper clay body from Wedgwood. Turned on pot lathe using 0.8 cm interval.

Conclusion

This is a fantastic body. Turning this was one of the most pleasurable processes I have done. Visually a smooth fine jet black in combination with great working properties. Seems appropriate that I am using 'Wedgwood' techniques. The black works very well. The internal silhouette is stronger whilst the smooth sheen of the body gives a slight reflectivity that serves to increase the uncertainty of boundary between space contained and occupied.

Test number; 65

Date: 29/3/12

Aim

To look at the relative material quality and tone of bone china as compared to Special Porcelain.

Action

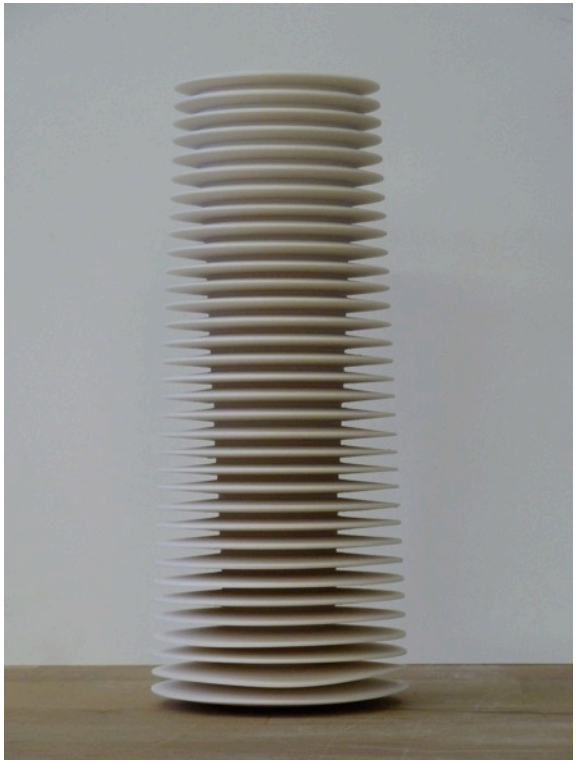
An object thrown using bone china with cylindrical exterior and conical interior. Turned with 1cm intervals.
Fired to 1240°c.

Conclusion

The body is much whiter than porcelain – a much cooler tone than the creaminess of porcelain. This could feel a little austere. Fired at this temp it is also quite matt and chalky in finish. I fear that going higher to get more sheen will cause slump.
Interesting perhaps in combination with other bodies, but not the sole way forward.

Test number; 66

Date: 25/4/12



Aim

To test the qualities of Parian Porcelain as opposed to other white bodies.

Action

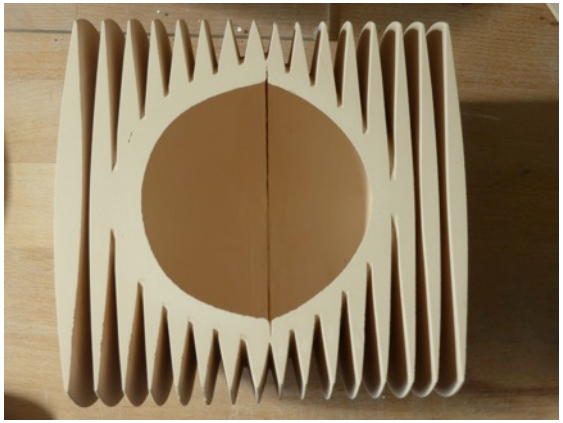
A tall thin thrown object with inverse conical interior and exterior. Turned with 0.75 cm intervals. Fired to 1250°c.

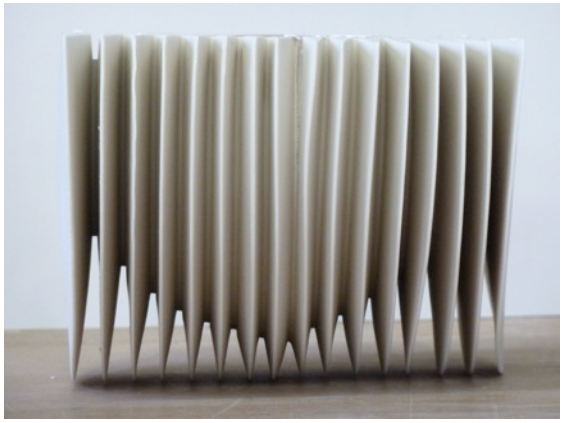
Conclusion

I had feared that Parian, owing to its self-glazing and fluxing properties could slump badly. In fact it was a great success. The body is good to throw and turn, with relatively fast drying to a turnable state. The colour is great – whiter than Special Porcelain, which looks grey and drab next to it and warmer and creamier than Bone China. The surface sheen works very well. The body shows good stability with just a small amount of (desired) movement in the deepest fins at the bottom. The best body to use for work for exhibition.

Test number; 67

Date: 28/3/12





Aim

To make horizontally oriented object, meaning that the optical effect of boundary uncertainty is not related to eye level, but could function as one moves past or around the object.

Action

I threw 2 objects with cylindrical exteriors and hemispherical interiors. These were turned separately then joined and subsequently biscuit fired. The object was then cut on the diamond saw to reveal the interior. It was then fired to 1260°c.

Conclusion

Quite intriguing but too much like an engine part. The cut seems too precise and demands that the interior space be a more exact sphere. There is potential in the horizontal alignment, but does the object still need to be a vessel in this way? Could it be open at both ends rather than containing? This would still have the interior/exterior dialogue in a more ambiguous form.

Test number; 68

Date: various

Aim

To explore the potential and limitations of different turning tools – self adapted and custom made.

Action

I started turning a selection of knives and dentist tools. I then developed the tools shown in the left hand image. These are a wood chisel and a cold chisel ground down to a taper on the belt sander in metalwork. The right hand image shows two custom made tungsten carbide tools designed in reaction to the experience of using the adapted chisels.

Conclusion

The steel chisels blunted very rapidly in use and so required regular resharpening, which was very time consuming. I feared that getting specifically made tools would limit and determine the forms I made as I enjoyed the flexibility and adaptability of a constantly changing and evolving tool that could be subtly reshaped to suit different stages of the process. However I found huge benefit from the custom tools. (continued).

Their consistent sharpness gave speed but also gestural confidence to the process. This was also helped by switching to a Union Graduate lathe with tailstock to hold the object more securely. Because I had worked out what I needed in an improvised way I got something that served the project and did not limit the potential. Particularly I was able to start working much more finely with the 2nd custom tool (top right in bottom image).

Test number; 69

Date: 11/4/12

Aim

To discover the best body for jiggering, particularly thinking about an increase in scale, and desiring more stability combined with good colour.

Action

A number of discs were jiggered in the following bodies and fired to the relevant temperatures.

Industrial Porcelain	1220°c (left)
Porcelain White Stoneware	1260°c (centre)
Grogged Porcelain	1260°c (right)

Conclusion

All 3 showed greater stability than Special Porcelain. Industrial Porcelain is an unpleasant buff colour. Grogged porcelain has potential but I am unsure about texture and slightly drab colour. PWS is in fact the whitest although it is a bit matt and chalky in finish. This could possibly be overcome with higher firing. Decided to go with this for large scale jiggering.

Test number; 70

Date: 4/2/12

Aim

To look at other phenomena and images that relate to the ceramic objects and seem to display similar notions of boundary and form.

Action

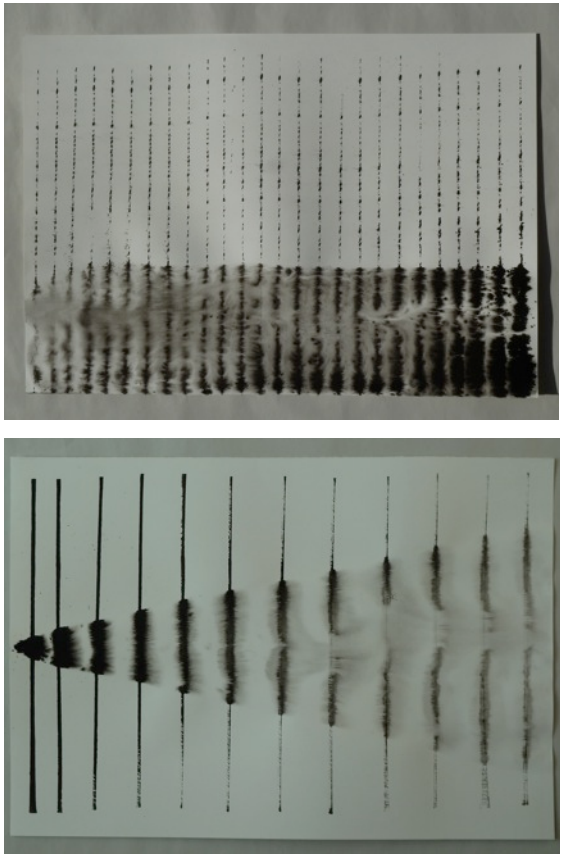
I photographed hedges that had been cut the previous winter and so displayed the record of that cut along with the intervening summer's growth.

Conclusion

These images proved informative and thought provoking, especially in inspiring a new set of drawings to try and represent them. What the image says about the negotiation between intervention and growth, and the nature of drawing in relation to form (with the tractor arm as mark making tool) is particularly interesting.

Test number; 71

Date: 23/3/12



Aim

A series of drawings to represent in the abstract the qualities of the photos of hedges from test 70.

Action

Sheets of A1 Fabriano paper were selectively wettened by brushing. Lines were then made across both the wet and dry parts of the paper using a struck string line (left hand image) or a line printed with the edge of a piece of card.

Conclusion

These successfully captured elements of the hedge images without being drawings of them. This is the point at which drawing and making became properly symbiotic creative outcomes from the same body of research.

Test number; 72

Date: 14/5/12

Aim

To improve the quality of the drawings as finished objects and overcome the problem of paper wrinkling with selective wetting.

Action

I used 400gsm paper acquired from printmaking, wetted all over by brushing and printed onto it with card edge.

Conclusion

Very good. The paper holds its shape as well as giving a finer and subtler quality of bleeding as the ink moves.

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