

A Venn diagram consisting of two overlapping circles. The left circle is light blue and contains the word "Praxis" in a stylized, blocky font. The right circle is red and contains the word "Poetics" in a simple white sans-serif font. The two circles overlap in the center, where a small plus sign (+) is located.

Praxis + Poetics

## Research Through Design 2013 Conference Proceedings

3<sup>rd</sup> – 5<sup>th</sup> September 2013  
The Baltic Centre for Contemporary Art  
Newcastle upon Tyne & Gateshead, UK

# Prax<sup>e</sup>is + Poetics

2013 Research Through Design Conference

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Praxis + Poetics

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# Data-Objects: *Databronze*

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## Abstract

The artifact *databronze* is a product of a practice-led research methodology that explores the representation of complex statistical information through the construction of physical, three-dimensional objects. The research project (data-objects) asks the following three questions, first: can the creation of physical artifacts based on data from scientific sources change the way we read, interpret and respond to complex information. Second: can data informed objects offer new insight to people outside of the scientific community who do not typically work with or read statistical lists or graphs. And third: what qualities/ traits can we capitalize when moving information between digital/ material environments.

The *databronze* object discussed in this paper is the latest artifact to be created under the data-objects project (Gwilt, 2012) with the specific intention of investigating the influence of material choices on the understanding of information represented as a physical object.

In this study we worked with packaging engineers who supplied data (based on information gathered in a series of scientific bench tests) on the ability of older people to open the lids on ordinary domestic packaging. We then worked with creative practitioners to design objects that represented this data in different ways. Craft making techniques using a range of materials and digitally based processes, such as 3D printing technologies were explored. The intended outcome of these creative activities was to make a series of object prototypes that could be tested in terms of how they communicated the embedded data. In a user-testing exercise, we

asked a variety of people to interact with the objects and discuss which objects they thought helped in the comprehension of the original information and why.

## Author Keywords

Tangible Data; Creative Practice; Information Design

## Research Imperatives

After initial project framing meetings with the engineers/researchers responsible for gathering the packaging operability data it was acknowledged that there was a difficulty in sharing the results of these experiments with parties outside of the engineering field (Yoxall, 2006). In particular the question of how to communicate these findings effectively to both the designers who are responsible for the ongoing design and development of packaging solutions, and the general public who are consumers of these products needed addressing. The importance of communicating the relationship between age and dexterity/strength and the value of understanding this relationship for different sectors of the community was identified as being of significance in terms of a research question. Further meetings with The Cambridge Engineering Design Centre, established the direction of the investigation which was to explore the development of design tools, and the use of creative media fabrication approaches to help address the problem of dissemination, cognition and uptake of these findings. In addition it was recognised that different sectors of the community; designers, care workers, the general public etc. may have specific requirements for the data and may need particular levels of insight into any given information.

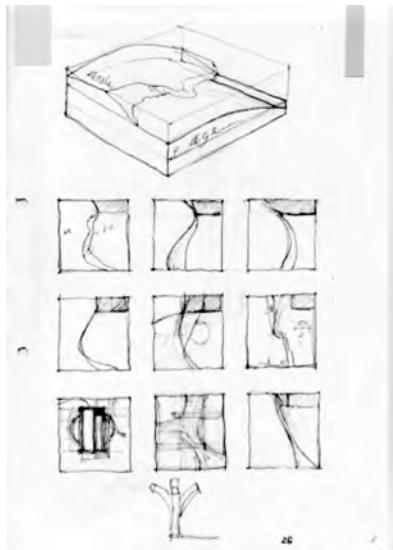


Figure 1. Initial sketch ideas.

From a theoretical perspective this idea of how we might begin to translate complex digital data into a physical artifact speaks to the current trend for strategies that bring digital computing into the everyday. For example Mitchell Whitelaw's work *Measuring Cup* (Sydney, 1859-2009) uses 150 years of weather data to drive the shape of a 3D printed cup, where the sides of the cup are built up in yearly rings of data (Whitelaw, 2010). Terms such as Ubiquitous Computing, The Internet of Things (IOT) and Smart Environments are all concepts that are growing in popularity. The data-object concept plays to the desire for the creation of hybrid digital/material constructs that are able to draw on the attributes of digital computing and the properties/value we ascribe to material form (Harrison, 2013; Munster, 2006). This notion of 'digital materiality' challenges the value systems that we typically assign (discretely) to artifacts associated to digital and material cultures, in particular we are interested in how material and operational forms, and the use of visual metaphor, play an important role in establishing expectations of use and significance. The data-object also represents a move away from the disembodied notions of computer generated Virtual Reality, towards a shared visual language and a way of interacting in an increasingly conflated digital physical space.

## Research Process

In conjunction with the other research members Dr Koutaro Sano, a Japanese ceramicist, designer, and researcher interpreted the selected statistical data as part of a practice-based methodology. A series of sketches were created that explored a number of initial concepts through the use of different visual metaphors (see Fig. 1). From these sketches a landscape metaphor was chosen as one of a series of concepts to be further developed. This landscape metaphor was used to form the basis of the *databronze* model. In this concept the data drives the topography of the object, with higher numbers corresponding to high 'ground' and lower numbers the 'low' ground. Age is represented along the sides of the model, which as you move along the edge of the form traces statistics from

young to old. In this way changes in data over time (age) were used to dictate the variations in landscape. A variety of configurations were tried that experimented with different start and end points, using separate data for male and females. These experiments were mapped out in different combinations and tests were undertaken to explore how both male and female statistics could be combined in the same object (see Fig. 2).

Although the edges of the object closely followed the original data to dictate the terrain, the surface variations in the centre of the model were a creative interpretation of the statistics.

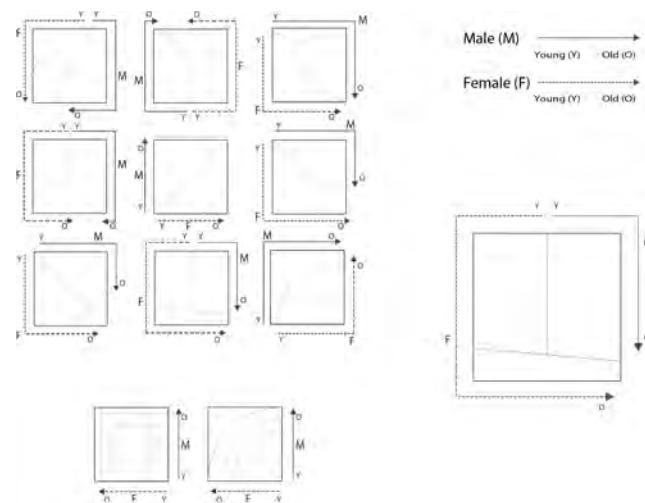


Figure 2. Experiments with different data configurations.

Initial models were made using clay, plaster, and plastic via a computer CAD model and a 3D printer (see Fig. 3). After conducting user tests with these prototypes a key topic of conversation emerged, based on how the material qualities of the different models had a strong impact on the comprehension and interpretation of the encapsulated data. Surface texture and the granularity of the surface was seen to indicate a corresponding

data density – the smooth surface of the plastic model implied a small amount of data and the rough detailed surface of the hand-crafted plaster model implied a large amount of data. Other material qualities such as the weight of the object, size and overall tactility were also commented on as factors that influenced the perception of the underlying data. With this in mind we developed the data landscape analogy further by producing a bronze version of the original plaster prototype. The thinking being that the bronze model encapsulated the quintessential qualities of crafted materiality (see Fig. 4).



*Figure 3. Plaster and plastic prototypes of data-objects.*

## Research Outcomes

The authors acknowledge how intangible ideas based around emotions, meanings, associations, and socio-cultural differences can be communicated/influenced by and through material choices (Karana et al., 2010). And how structural and physical characteristics help to communicate ideas and give character to content (in this case information). In a new study we compare two different data-objects; one made from bronze (the *databronze*), and an identical one made from Fuse Deposition Rapid Prototyping (FDRP) plastic.



*Figure 4. Databronze (2013).*

Unstructured interviews are being conducted with various stakeholders for whom the data is of relevance; this includes, designers, healthcare workers, and members of the general ‘aging’ public (40 years plus). As well as the two data-objects the data source is presented in its original form as a graph to allow for comparisons between visualization typologies. This comparison allows us to further explore what affect these material choices might have on the comprehension and cognition of the data that drives the shape of the objects. We are also interested in the making/fabrication process required to create each object and whether or not these processes (digital and analogue) have any influence on the perception of the data encapsulated within. For instance it could be argued that the use of and crafting in bronze, brings with it culturally related notions of history, power and authority, and conversely that the computer facilitated 3D printing technique is a contemporary making process that speaks to the dynamic notions of a technologised society. The premise being that the synthesised construct of the data-object can offer us a new way of looking at the digital/ material relationship and the attendant socio-cultural values we ascribe to these two paradigms.

Preliminary findings from the research indicate that these artifacts can also act as a provocation – offering a discursive space engendered through the confluence of material and digital cultures in the form of the data-object. Moreover, the type of ‘contestable

data-scape' (as used in the *databronze* artifact), where the underlying statistical information is also creatively interpreted, allows the meaning and significance of this information to be challenged and explored. In this instance the hybridity of the data artifact, with its potential to encapsulate and translate information, acts as a syncretic agent capable of appealing to a cross-section of communities. In broader terms this research sets out to explore if the concept of the data-object is useful in engendering insights into complex data systems for audiences who are not use to or comfortable with viewing data in conventional statistical and graphical forms.

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# Dear Sir/Madam: Walter Gropius Petitions the League of Design Thinkers

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## Abstract

In 1919 Walter Gropius founded the Bauhaus, a School of Art, Design & Architecture located in Weimar, Germany. The Bauhaus propagated the methodology of modernist design: rationalism and reductionism. The Bauhaus is hugely important. In Germany, its methodology influenced leading design schools such as the Hochschule für Gestaltung. Beyond this country, a modernist approach to pedagogy is argued to dominate in contemporary design education worldwide. Modernism is argued to have informed notions of "good design" and is cited as increasing the subject's standing.

Rather than emphasizing reductionism, the more recent phenomenon of "design thinking" promotes a holistic methodology. Currently, design thinking is influential in design research and practice.

As a "reductionist", Gropius is not deemed by the *fictional* League of Design Thinkers to be a design thinker. This contribution sees Gropius petition this institution. He asks why his profound contributions to design are not deemed appropriate in bestowing him the status of design thinker. He requests officials to suggest what his cognitive efforts might be termed if they are not deemed to be design thinking. Gropius moves on to rubbish the concept of design thinking. Gropius also commissions a "protest" self-portrait which aims to help narrate his frustration.

A tradition of questioning principles through the creation of fictional scenarios and crafting thought-provoking artifacts exists in design. Here, Gropius is used as a 'vehicle' to ask the community to perceive design thinking through a new lens in order to unpick the debate surrounding this influential notion.

## Author Keywords

Walter Gropius; Bauhaus; Modernism; Design Thinking; Design Fiction; Critical Design.

## Research Imperatives

The phenomenon termed "design thinking" was coined by David Kelley the founder of IDEO (Leavy, 2012). It is claimed to be a creative problem-solving process (e.g. Cross, 2011). Design thinking has become influential in design research and practice (e.g. Cross, 2011; Brown, 2008). Leading design practitioners and researchers argue the concept of holism to be central to the process of design thinking (e.g. Brown, 2008; Cooke, 2012; Stevens, 2012; Lawson, 2006).

Discussion on design processes is multifaceted. For example, reducing design practice and research to a "*formula*" driven by rational and reductive processes is argued to result in failure (Koskinen, Zimmerman, Binder, Redstrom and Wensveen, 2011, p. 42). Most commercial design practice however is claimed to proceed through rational and reductive means (Dunne, 2005). Does Dunne's (*ibid*) argument denote that most designers are not design thinkers? Or is perhaps that commercial imperatives prevent designers from functioning in a holistic manner? In noting the stifling "*paradigm of responding to a design brief*", the Design Council argues industry norms limit the capabilities of design professionals (Burns, Cottam, Vanstone and Winhall, 2006:10). The issue of modernism further complicates discussion around design thinking. One of design thinking's leading proponents Tim Brown (2008: 92) argues the process is human-centered for it can help tackle problems related to "*unaffordable or unavailable health*

*care*" and "*billions of people trying to live on just a few dollars a day.*" Similarly, modernism was claimed by its advocates to be an emancipatory movement (Leslie and Reimer, 2003), its famous edict Form Follows Function emerging as a strategy to impress supposedly positive rational forces on society (Nergin, 1999). The issue of human-centeredness provides a basis for identifying research imperatives related to design thinking and modernism.

Walter Gropius was a leading advocate of modernism. In 1919 he founded the Bauhaus, a School of Art, Design & Architecture located in Weimar, Germany. As a modernist institution, the Bauhaus endorsed a rationalistic and reductionist design approach (see Spitz, 2005). Bauhaus tutors perceived design through "*aesthetic*", "*scientific-analytical*" and "*social*" dimensions: with due attention paid to form and approach, humans could create perfect objects to improve the lives of others (Spitz, *ibid*, p. 3-4). The Bauhaus perspective can be argued to be a formula for design research and practice. The Bauhaus is hugely important. In Germany, its methodology influenced leading design schools such as the Hochschule für Gestaltung (Findeli, 2001). Beyond this country, a modernist approach to pedagogy is argued to dominate in contemporary design education worldwide (Michl, 2007). Modernism is argued to have informed notions of "*good design*" and for increasing the subject's standing (Buckley 1986, p. 21). The Bauhaus' influence appears not to resonate with Koskinen et al's (*ibid*) aforementioned argument that a formulaic design approach necessarily leads to failure.

This contribution utilizes a critical design/design fiction paradigm (e.g. Dunne, 2005). It employs a historical outlook to inform a practice-based method in order to provide a critical perspective on the notion of design thinking.

## Research Process

Individuals wishing to be admitted into the *fictional* League of Design Thinkers must utilize a holistic framework in their design practice or research. Gropius is refused membership because of

his association with reductivism and rationalism. In petitioning this institution, Gropius commissions two artifacts:

- A Letter of Petition

With characteristic fervour (Figure 1) Gropius asks why his profound contributions to design and design education are not judged appropriate in bestowing him the status of design thinker. He requests officials to suggest what his important cognitive efforts might be termed if not deemed to be design thinking. On further reflection, Gropius moves on to rubbish the notion of design thinking.

To underscore his allegiance to modernism, Gropius invites Bauhaus alumni Joost Schmidt to design the letter in the style of Schmidt's famous poster (please see, <http://goo.gl/H7uHr>).

- A New Self-Portrait

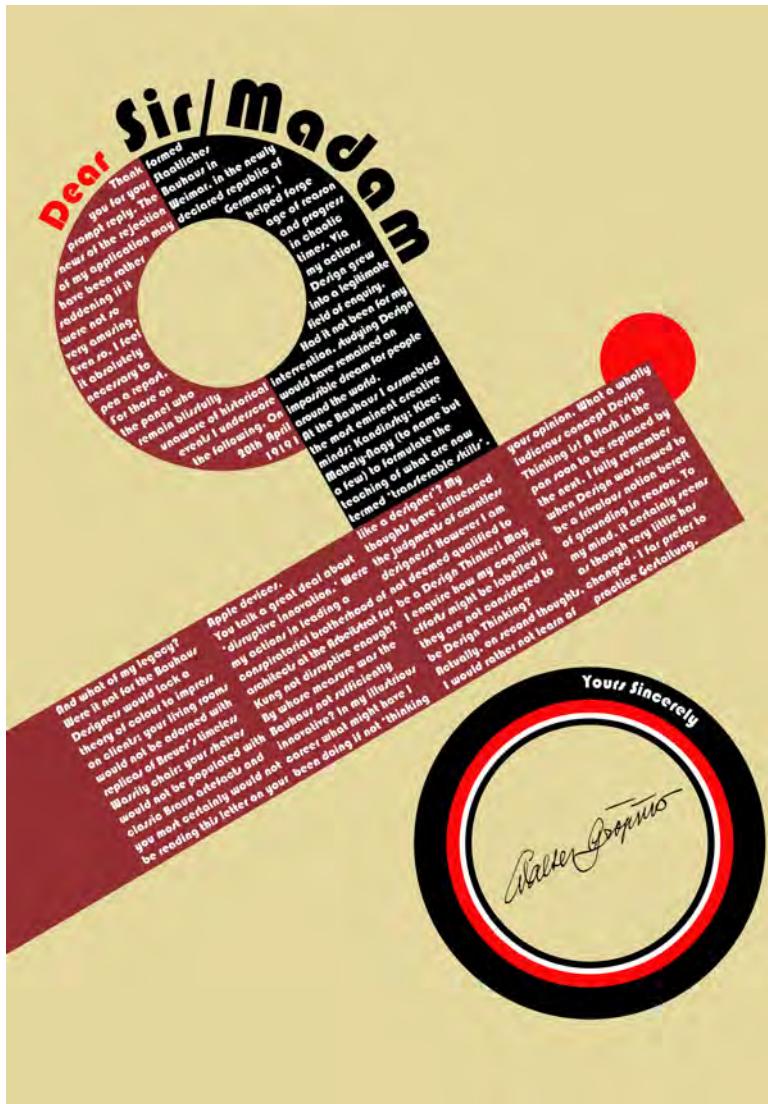
Figure 2 shows the portrait Gropius chose to adorn his Wikipedia (n.d,n.p) entry. Consequently, it is arguably an image many people will be familiar with. To accompany his letter, Gropius has a new "protest portrait" commissioned (Figure 3). Sticky notes are commonly utilized in design thinking brainstorms. Here, Gropius is pictured covered in sticky notes to reflect his indignation at being snubbed by the League of Design Thinkers. He requests that this new protest portrait accompanies his Wikipedia entry from now on.



**Figure 2.** Gropius' Wikipedia portrait.  
© Wikipedia.



**Figure 3.** Gropius' 'Protest Portrait'.  
© Aysar Ghassan.



**Figure 1.** Gropius' Letter of Petition'. © Aysar Ghassan.

## Research Outcomes

A tradition of questioning principles through the creation of artifacts exists in design (e.g. Dunne, 2005). Through utilizing fictional scenarios, designers can encourage viewers to create new perspective on subjects. For example, in a recent exhibition featuring work of the influential critical design practitioners Tony Dunne and Fiona Raby, the Design Museum (n.d., n.p) asks us to imagine the consequences of England being,

*"devolved into four self-contained counties, each free to experiment with governance, economy and lifestyle. These 'live laboratories' interrogate the cultural and ethical impact of existing and new technologies and how they alter the way we live".*

Through utilizing a design fiction/critical design paradigm, this contribution asks the community to provide opinion on (1) what constitutes design thinking and (2) what Gropius' contributions might be termed if not "design thinking". The outcome of this debate is important in helping to unpick discussion on the highly influential notion of design thinking.

## Acknowledgements

My eternal gratitude to Dr. Ben Salem Bernard for his good humor and patience in posing as Herr Gropius for the protest portrait.

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# HEIMA

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## Abstract

HEIMA<sup>1</sup> is a research project currently under development. It stems from an interest in the relationship between citizens and city space; curiosity regarding the ability of sound to suggest location in both place and time; and a fascination with unintended consequences of design.

Employing a simple comparison between the predicted aural environments – actual and imagined – within two contrasting historic dwellings, it suggests an alternative means of representing interior spaces, and additionally, begins to explore how the perception of enclosed space is affected both by aspects of materiality, and by the impact of significant external events.

The work uses sound as an ingredient within a form of composite representation of both interiors, and by doing so, aims to challenge the dominance and over reliance on visual means of expressing the nature of the built environment. *Heima* indicates alternatives to this ocular dependency, which may be employed in the archiving of vanished or significantly *reconstructed* place, as well as in the presentation of ideas about as yet *unconstructed* place.

The site of both buildings is the Woodside area of Glasgow, which was, at the mid-point of the last century, one of the world's most densely populated urban areas.

<sup>1</sup> 'Home', which connotes a physical 'place' but also has the more abstract sense of a 'state of being,' has no equivalent in the Latin or Slavic European languages. German, Danish, Swedish, Icelandic, Dutch and English all have similar sounding words for 'home' all derived from the Old Norse 'heima'. From Home, a Short History of an Idea – Witold Rybczynski.

## Research Imperatives

*Heima* is an exploration of 'Viewing' and how we perceive objects. The research aims to develop alternatives to the standard and often inadequate visual methods of spatial representation, such as analogue and digital drafting, scale model production, illustration and photo-documentation, and is in part born out of frustration at *the hegemony of sight*, (Pallasmaa, 2005).

Building on a previous site contingent work (*TreeGrid*, 2009, which harnessed live data mining to create a user-interactive virtual environment), *Heima* uses data 'reconstructed' from sets of observable historic information and in a similar way to *TreeGrid*, is intended to be experienced in a parallel way, with a dual presence, at once virtual and physical, participatory and immersive.

'A physical and purely visual curating of a space, one which clears away all detritus in an attempt to get to the kernel of a single truth, often has the effect of removing all truths and closing down the role of the senses other than that of sight' (Littlefield/Lewis, 2007).

By the late 1950's the Woodside district of Glasgow was the city's most densely populated area with 27 000 people living in its 170 acres. Over the following decade the typical traditional Victorian flatted tenements once found there were almost entirely demolished and replaced by non-traditional buildings in the form of deck-access and prefabricated concrete 'Bison' high-rise blocks. Woodside had been designated one of twenty-nine city wide Comprehensive Development Areas (CDA's) by the local authority, and as such most of its housing stock had been deemed as sub standard, overcrowded and unsanitary. It was cleared partly as a response to Glasgow's acute housing crisis and also to facilitate the construction of several major junctions of the Inner Ring Road



Figure 1. 542 St Georges Road Glasgow, circa 1967 immediately prior to demolition

*In front of us is a wide valley  
The sun is shining with glittering rays*

*The carriageway is a grey track  
White stripes, green edge  
We are switching the radio on  
From the speaker sounds:...*

*Autobahn (translation)  
Kraftwerk, 1974*



Figure 2. View from Cedar Court, Glasgow, overlooking Woodside CDA undergoing comprehensive demolition. Circa 1968

(M8), the two Woodside sections of which were completed in December 1970 and May 1971 respectively (Bruce, 1945; Abercrombie and Matthew, 1949; Cunnison and Gilfillan, 1958). The completed, and ultimately congested M8 arguably in turn neighborhood. The ‘event’ nature of the completion of the motorway which connects Edinburgh and the west of Scotland – and unusually for the UK, bisects a city centre rather than orbiting it – is a key fulcrum of the work. Something happened to the city then, it made ‘*a belated and enormously controversial stab at modernity... with hundreds of council towers and the M8 scything through it, giving the impression of a Ludwig Hilberseimer urban plan realized on a Lidl budget*’ (Hatherley, 2010).

By using a combination of the surviving archival material linked to typical tenement housing cleared from Woodside, along with the original construction drawings of the high-rise towers that were their replacement, the research will attempt to recreate and encapsulate the dramatic and rapid changes to the urban fabric and building typologies represented in the area via a series of ambient acoustic models of each space enlivened by source sounds. These will range from the hum of the city subtly and not so subtly adjusting over time, to the clatter of demolition and construction, with occasional incursions of sound made by weather. This process will test how effective digital acoustic modeling might prove in the creation of immersive environments particularly in relation to re-archiving and the representation of now vanished or significantly and detectably altered places, and by doing so, help sketch out an alternative aural landscape of domesticity, both remembered and imagined.

## Research Process

*‘The fear that can attach itself to hearing sounds whose activation is unseen; noises in the dark; a silence which is not quite silent enough, a house that won’t lie still... Lacking an object, the imagination intercedes and supplies a ghost’ (Toop, 2010).*

The process of exploring alternative, acoustic methods of spatial representation is ongoing. It began with a familiarisation with the topography of the area prior to its classification as a CDA, to date this has been primarily using historic photographic reference material as well as original street and geographical maps. This approach was combined with several visits to the sites themselves, with more thorough exploration of the area surrounding the hi-rise, and that formerly occupied by the tenement flat. This culminated in access to a ‘void’ or unoccupied duplex apartment now managed by Queens Cross Housing Association which provided a direct understanding of the materials and construction of the building, and ultimately within the flat itself ie simple timber floorboards lining a concrete shell with glazed apertures.

These ‘analogue’ site explorations were followed by ‘digital’ tasks, the first of which was an introduction to the Digital Design Studio (DDS) and Arup’s SoundLab – a twelve-channel speaker array within an acoustically treated and isolated room – Soundlab will be used to test the effectiveness of the initial acoustic models, and also be used to demonstrate proof of concept. That visit was followed by the creation of suitable 3D CAD models from a combination of original plans; archival and contemporary location photography and site surveys. Typical source models are simple planar constructions expressing the volume of each apartment, as well as relevant apertures ie doors and windows. These are then exported to an acoustic modeling package – in this case CATT Acoustics – employing acoustic prediction methods typically used to investigate how a building will perform aurally prior to its construction. The process for *Heima* deviates from this in that it employs reverse engineering by using auralisation to suggest a historic experience of sound within rooms, re-creating events from a series of fragments. These include what may have been experienced but cannot now be – in the case of the demolished building, and what may have been experienced but has now been adjusted – through the replacement buildings’ new double glazing; the absence of former industries; contemporary car engine sounds and traffic congestion.

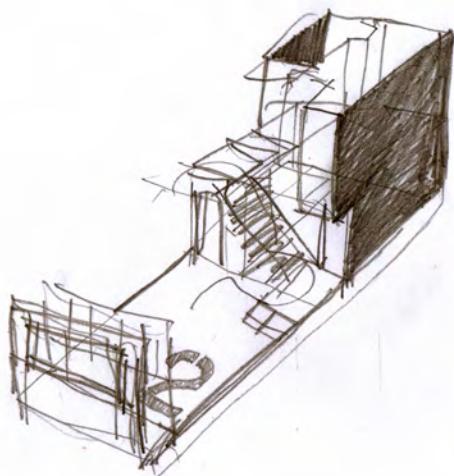


Figure 3. Exploratory sketch of Type 2 Duplex showing room layout

## Research Outcomes

As this is a work under development much has yet to emerge. The current iteration consists of two acrylic, laser-cut and etched scale models of each of the building skins, forming a diptych and acting as a housing for relayed elements of relevant audio. What is communicated here, in diagrammatic form, is physical constructed space, the sounds that it envelops, and those that it is enveloped by. What is also communicated is something that photography, orthographic and other drawings fail to capture, and that is the time contingent and experiential. It is part of a tour and not part of a map, and acknowledges the power of 'stories' to transform space to place and vice versa (de Certeau, 1984).

At the time of writing, this process is underway. The archive has been ransacked, and progress is now mired in the lengthy and laborious production and editing of digital models, however once completed the framework is there for the addition of this specific layering of memory, and grain.

*'If the city is a receptacle of the collective memory, then it will contain the memory of the events that occurred there. The conscious loss or suppression of event is an assault on the identity of the citizenry'* (Scott, 2008).

Future iterations of the project will test the feasibility of representation of environments using a sound format known as Ambisonics. This exists in part as a means of playback of 3D spatial audio via an immersive indoor multi speaker array. An adjacent website would be used to gauge the significance of interactive engagement with elements from a sound library related to the context of the work. This could be event based: the day the residents received keys; the day that former homes were razed to the ground; the day a motorway sprang to life. It might also incorporate sounds of domesticity: preparing a meal; playing cards; listening to music. Finally, the experience of sound would be influenced by data drawn from weather stations providing 'live' atmospheric information in the form of wind, thunder, rain and hail, and occasionally none of these.

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## Research Through Design 2013

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# Blue Jay Weeble: Experiential Approaches to iPad Painting

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## Abstract

Artists are increasingly adopting apps such as "Brushes", "Procreate" and "Sketchbook Pro" to create new work. The "Blue Jay Weeble" exhibit for Research Through Design explores the notion of "liveness" around live, experiential digital painting. The artist Jason Wilsher-Mills will perform iPad painting in an immersive space made up of four projection screens linked to iPads and displaying paintings made with the Brushes app. The installation will create an experience of the artist's dynamic use of the app as a tool for free drawing and collage.

The paintings will illustrate a research prototype currently being developed around the notion of a "Digital Weeble". This hand-scale object opens to display a screen interface controlled by biometric sensors which determine what content is revealed to the user-participant. The artist will illustrate this concept drawing on his repertoire of pop culture motifs. These includes Batman and the popular 1970s "Weeble" children's toy. The works additionally reference precious art objects such as the extravagantly bejeweled Fabergé egg which was produced in Imperial Russia and worn on a necklace.

## Author Keywords

Design Research, Reproduction, Liveness, Performance, Art, Digital Painting, Mobile Computing.

## Introduction: Research Imperatives

The use of digital materials in the creation and display of art is now commonplace. Digital painting apps such as Brushes, Procreate and Sketchbook Pro mean that the media to produce and distribute art are more widely available than ever before. The Brushes app (Brushes) allows users to upload images online to the Flickr Brushes Gallery, (Brushes Gallery) which at the time of writing had more than four thousand members who between them had produced in excess of forty thousand images (Blue Jay Way; Blythe et al., 2013). But it is not only amateur artists who have adopted these new media; professional artists such as David Hockney are also enthusiasts.

Hockney is a painter, and printmaker who has long produced "limited editions" of his work. In the second half of the twentieth century the artist would produce prints using traditional techniques such as etching. This process involves coating a metal plate with wax through which lines are drawn and exposed to the corrosive action of acid in an acid bath. Ink is then rubbed into the incised lines and the surface of the plate polished before a sheet of dampened paper is laid over it. The plate and paper are then run through an etching press which transfers the ink to the paper. This inking and printing process is repeated to produce print runs; in Hockney's case this involves between one hundred and one hundred and fifty copies. The etching plate is then "struck" (scratched) to prevent further copies being taken, conferring a scarcity value onto the prints. In the twenty first century, Hockney uses iPads and iPhones. He has referred to such technologies as "printing machines" (Gayford, 2011). Although he is enthusiastic about the technology Hockney notes that nobody knows how to make any money out of it (*ibid.*). When artwork is created or shared



Figure 1 . "Down the Alley (We are very pally)" ©JWM

digitally, notions of an “original work” and a “limited edition” begin to break down. As music industry representatives have long lamented, digital files can be copied at almost no cost with no diminution of quality. Increasingly, all artists are facing similar problems. Novelists and other writers’ works are now available in pirated PDF copies. Visual artists who utilize digital media are exposed to the challenges of managing their digital property. This project then, explores new digital forms of art display and dissemination.

### Research Process: The Artist

Jason Wilsher-Mills (JWM) exhibits work he produces using the Brushes iPad app under the name “Blue Jay Way” on the Brushes Gallery on Flickr. The artist is collaborating with researchers at Northumbria University and Culture Lab at Newcastle University to develop prototypes for the “digital originals” research project which explores notions around originality and reproduction (Digital Originals). Jason came to the attention of the research group following an analysis of work in the Brushes Gallery (Briggs and Blythe, 2012) where his self-portraits were highly rated by other artists in the group and struck the second author as original. Following initial telephone interviews, Jason visited the research team and participated in workshops where he discussed his technique and possibilities for new forms of reproduction and display.

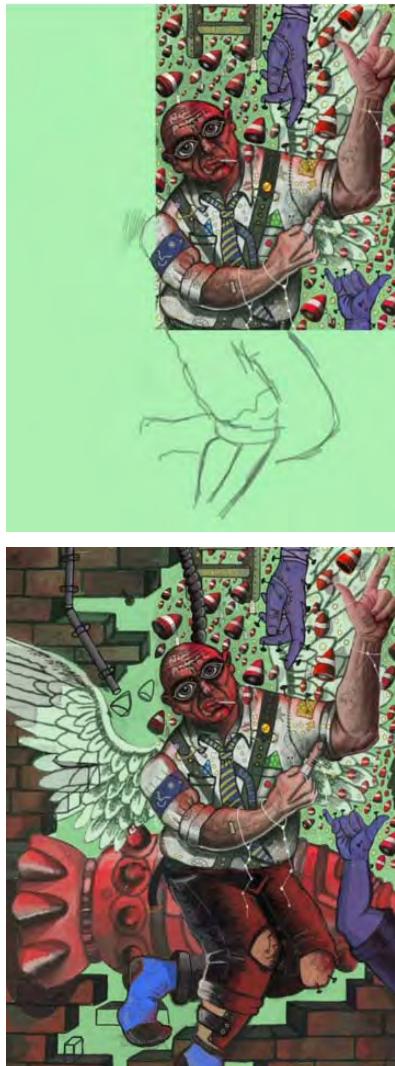
The Brushes app auto-creates an animated file of each image, produced mark by mark. Jason showed the team one such video generated as he worked over several weeks on an image, “Down the Alley (We are very pally)” (Figure 1). These videos are in some ways perhaps, even more interesting than the final images. The following section provides an overview of Jason’s creative process as documented in one such video (Figures 2–7), which he posted online (Wilsher-Mills, 2011).



Figures 2 and 3. Stills from "Down the Alley (We are very pally)" ©JWM

### Down the Alley (We are very pally)

Films of artists such as Picasso drawing on glass or Jackson Pollock dripping paint across a canvas are compelling because they provide an insight into their processes. Similarly, Brushes videos show mark by mark how a complex image takes shape over time. Jason’s video begins with a line drawing of the artist’s face. After a shirt and tie are added (Fig. 2) the image shrinks to one corner of the screen, apparently enlarging the digital canvas. A photograph of an arm appears: its white background is erased and it is resized to fit the image (Fig. 3). Further details are added and color applied in increasingly vibrant hues. Again, the image is resized and a torso added to the figure; two dark shapes are outlined to represent feathered wings. These are then deleted and another set of wings pasted from another source. The background is once again erased, and the wings are positioned and scaled to fit the figure. Gradually, other elements are added—a photograph of a hand pointing, a drawn ladder. Nails are added on to the fingers, shells or bullets appear around the figure, the words



Figures 4 and 5. Stills from "Down the Alley (We are very pally)" ©JWM

"no angel" are written over the forehead, the wings become white (Fig. 3). Abruptly, the entire image shrinks. In the now-enlarged workspace the figure's body is added, part-sitting (Fig. 4).

Further details and context are added, including bricks around the edges of the image. A rocket appears, with the artist-figure now sitting (dancing?) aside it (Fig. 5). Flying shells are added, making it appear he has broken through the wall. Further details appear, such as a Union Jack hat, and the image dramatically shrinks once again (Fig. 6). Another figure is added, leaning out of a window. Another self-portrait appears in the foreground, bandaged. A batman cowl (a regular motif of the artist) is drawn on to the figure at the window. Surrounding bricks are colored in to join seamlessly with the shattered wall. Still further detail is applied: three signs, a light bulb, a pair of Y fronts on a washing line, another self-portrait. The image is beginning to look complete, but we are still only half-way through the video. As the details accumulate the speed of transformation slows and the changes become subtler. But once again there is a dramatic change and the entire composition shrinks to the top right. Again, the figure in the forefront is given context: they are now standing in an alley; a street sign tells us this is "Sawley Close". The bandaged figure and the batman character are pointing to the original figure as he bursts through the bricks sitting atop the rocket. Again, it appears to be a finished composition, but the image shrinks one more time, though not so dramatically (Fig. 7). A boy in gas mask appears, and a fish is placed in the hand of the now-central figure.

The final image (Fig. 1) recalls British traditions of cartooning (with the figure of the knock kneed school boy in shorts), narrative painting and surrealism. Jason's visual language and subject matter are firmly situated in twentieth century art. The work evokes comparisons with the quirky personal subject matter of Stanley Spencer and the narrative figuration of the "New Glasgow Boys", including Steven Campbell and Peter Howson. The

influence of Philip Guston, Frida Kahlo and a raft of popular cultural forms are also apparent. Viewed durationaly, Jason's iPad painting recalls the way that Hogarth's eighteenth-century work narrates a complex if dreamlike set of interwoven events.

Here, the video's apparent recursive zooming-out presents an almost-hallucinogenic nesting of narrative segments. But this record of mark-by-mark composition fails to capture the dynamism of Jason's process. Observing the artist at work reveals his extensive use of the touch screen zoom facility to enable intricate rapid detailing: a mesmerizing process which Brushes automated video function entirely fails to capture.



Figures 6 and 7. Stills from "Down the Alley (We are very pally)" ©JWM



Figure 8. The artist working on an iPad with back-projected screens in Culture Lab, Newcastle, 2013.

### Research Outcomes: Blue Jay Weeble

Projection is often used to present digitised art in a gallery context. Hockney has noted that because digital work is backlit when created, something is lost when it is simply printed out on to paper (Gayford, 2011). His iPhone and iPad drawings have then been shown projected in galleries in darkened rooms. In a related project, two artists were invited to create iPad drawings in the 3sixty room at York, a four-wall projection room (Blythe et al., 2013). As the artists' fingers flicked across the devices' touch screens, the room lit up with color. This live painting revealed the artists' processes in the way that the Brushes videos do not, and presented it live in time and space, to be experienced with the artist.

At the Research Through Design conference the artist will perform iPad painting in an immersive projection space. Screens will display projected paintings in progress relating to the "Digital Weeble" prototype currently in development and which draws on a repertoire of pop culture references such as Batman, the Weeble children's toy, which was popular in the 1970s, and luxury art objects such as the Fabergé egg. The artist makes marks while rapidly zooming in and out of the picture interface, actions which are magnified when projected, creating a dynamic, engaging and theatrical display. The exhibit will demonstrate the artist's innovative use of the Brushes app and also explore the space for new interactive digital cultural objects.

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# Synthetic Biology as Material Design Practice

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## Abstract

Recent breakthroughs in the area of synthetic biology have invited a speculative design practice concerning a future reality whereby biology can be engineered to evolve material structures through morphogenesis. These potential technologies prompt a discussion on the appropriate design methods to implement a biologically oriented material practice. In this paper, we discuss two seemingly conflicting notions of morphogenesis. Within the frame of biology, morphogenesis is understood as a formal study of mechanisms that allows the formation of increasingly complex patterns in living organisms. Such mechanisms are generally based on chemical and physical interaction that allows the transformation of simple cellular units into complex arrangements. In contrast, digital morphogenesis describes a series of design practices that are largely derived from the development of generative computational tools, and are generally articulated as non-regular variations of geometric abstractions.

The artefacts presented in this paper embody material proxies, a craft-based design strategy which provides a method to bridge the gap between the design discourse on morphogenesis and the actual mechanisms of form generation in biology. Material proxies are assemblages which partly substitute complex biological and chemical mechanisms, managing complexity in order to understand and experiment with basic parameters of biological morphogenesis. We describe the design context and motivations for the artefacts, located in biomimicry, and provide further examples of the implementation of material proxies as design methodology.

## Author Keywords

Synthetic Biology; Morphogenesis; Morphogenetic effectors; Material Ecologies; Self Assembly; Emergence

## Research Imperatives

Recent breakthroughs in the area of synthetic biology, the branch of biology whose ambition is to design, manipulate and engineer new biological systems, have invited a discussion within design and architecture about the possibilities of a future whereby technology can be intertwined with biological life to evolve shape. Cruz and Pike define these design-biological composites as Neoplasmatic, a new stage of materiality that suppose a partly designed living material (Cruz & Pike 2008). This concept extends the notion of a designed artefact to include living organisms whose form is a constant process of adaptation and negotiation with the environment (Spiller & Armstrong 2011; Michael Hensel 2006). Such a discourse suggests a fundamentally different material ecology for design, one in which design is not the process of geometrical abstractions realised through material technologies, but one where design is partly embedded in the process of fabrication and assembly.

The prospect of realising material form through living mechanisms brings renewed attention to the concept of morphogenesis, which attempts to identify the mechanisms involved in patterning cells within multi cellular organisms. However, the term morphogenesis has been also used in design to encapsulate practices and concepts metaphorically related to biology (M Hensel et al. 2010). Such design practices are largely derived from the development of computational tools in design starting on the 1980s (Roudavski n.d.) and can be described as a strategy to create generative non-

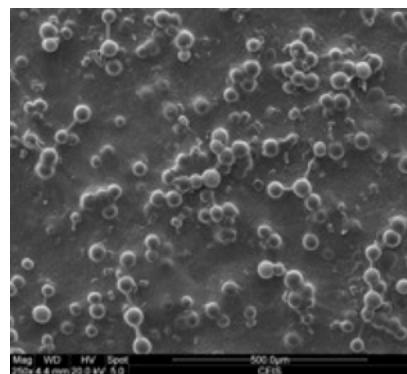


Figure 1. Electron microscopy image showing cell distribution in bacterially induced mineralisation

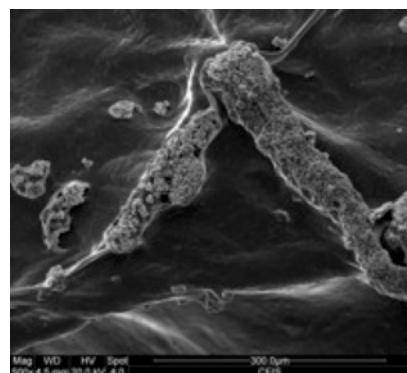


Figure 2. Cell distribution pattern on a modified bioreactor. In this image, crystal formation on threads

standard variations of geometrical abstractions. Steadman (2008) regards digital morphogenesis as a natural evolution of biomimicry, a phrase coined to signal the use of living systems as source of inspiration for design. Fundamentally, the biomimicry approach sets out to create structures and design schemes which visually resemble natural shape.

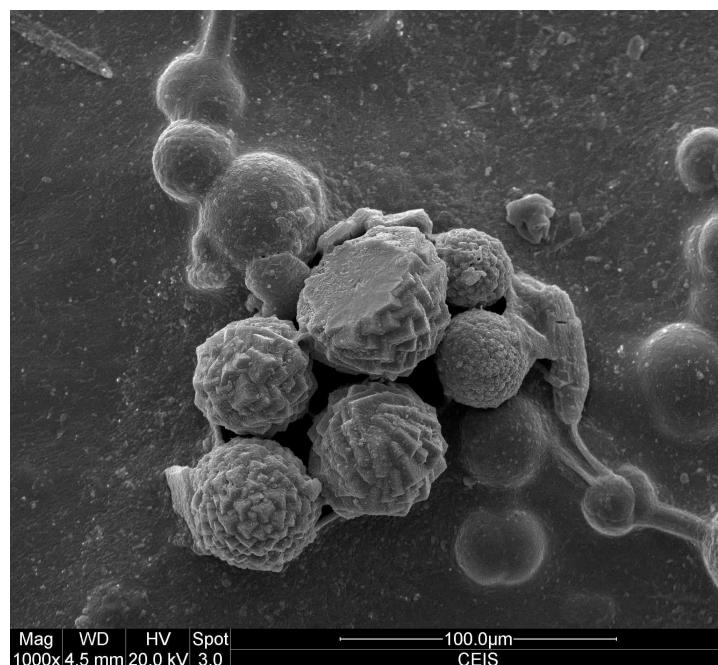


Figure 3. Electron microscopy image showing calcium carbonate crystals clustering around a bacterial locus. A graphic scale shows the dimension of 100μm

In contrast, morphogenesis is generally understood within biology as a formal study of mechanisms that allows the formation of increasingly complex patterns in living organisms. The mechanisms that allow shape to be developed start with DNA expression within individual cells, acting collectively and in relation to their

environment. In *The chemical basis of morphogenesis* (Turing 1952), considered a foundational text for the current understanding of shape development in organisms, Alan Turing states that the emergence of complexity in biological systems is the result of chemical and physical interactions within tissues. Such processes are commonly initiated by random disturbances in the system.

The work presented in this paper sets out to evolve material articulation from the understanding of the fundamental mechanisms at work in morphogenesis, rather than following the biomimicry schema of purely visually resembling natural shape. Based on this principle, we propose a craft-based method as means to gain a more direct engagement with the generative potential arising from cellular, living matter interacting with their physical and chemical environment. Furthermore we propose a design strategy based on such interactions rather than on geometric abstraction. We believe that material engagement, combined with computational tools and rapid prototyping technology, affords designers with an unparalleled understanding of the chemical properties which give rise to complexity and variation in biological form.

## Research Process

As biological systems pose a significant amount of complexity, we developed a strategy to handle complexity in biologically-oriented design applications which we coined as material proxies. Material proxies are assemblages which simplify certain mechanisms in order to isolate, study and experiment with specific traits of biological shape processes. The series of artefacts presented in this paper are the first design exercise in which craft has been incorporated to develop a material proxy.

We initially conducted a research on biomimetication (Dade-Robertson et al. 2013) in which we investigated how the macro-geometry of material condensed through biomimetication, which refers to the process through which organisms produce hard tissue such as minerals through cellular metabolic activity, can be



Figure 4. Artefact B2. CGI of material deposition on a three-attractor system.



Figure 5. Artefact B3. Three-attractor system, iteration 150

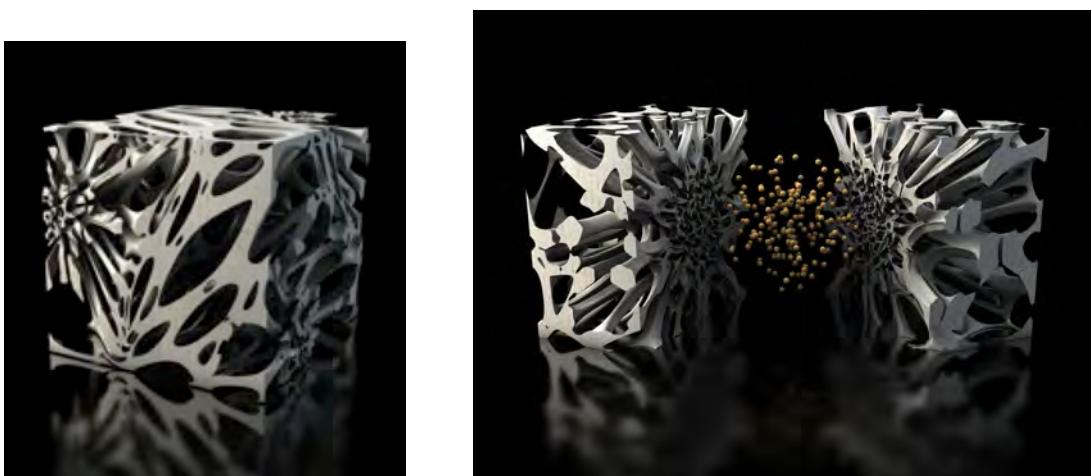


Figure 6. Artefact A. Design strategy for graded substance composite material. Cells shown in yellow, illustrating the interaction between cell placement and material formation.

influenced by modifying the physical environment at the molecular scale (Dade-Robertson et al. 2013). In that study, we began to explore the basic physicochemical interactions to which cell distribution is indexed. We observed that crystal formation was tightly linked to the metabolic activity of bacterial organisms. Such organisms form communities, and determine their placement based on the chemical distribution of their immediate environment. In order to explore these dynamics we developed SynthMorph, a form-finding computational tool based on basic morphogenetic principles derived from the theory of Professor Jamie Davies. Davies sustains that all biological structures are articulated by precise morphological permutations (Davies 2008, p.710). SynthMorph was prepared to work around two classes of object: cells and attractors. Cells behave as a system of particles governed by Boid rules, whose spatial distribution is determined by disturbances brought about by attractors, which can be understood as centres of physicochemical perturbation.

Using SynthMorph, we conducted a series of experiments that rendered cell distribution as point clouds. Using such point clouds, we implemented an algorithm based on Voronoi Tessellation to partition space around cell clusters, thereby simulating material deposition in the fringes of chemical perturbation loci caused by metabolic cellular activity. Results were prototyped using a Selective Laser Sintering machine.

## Research Outcomes

The artefacts exhibited show two different experiments of cell distribution. Artefact A shows the effect of one attractor in terms of disturbances and cell distribution. Artefact B1, B2 and B3 result from the evolution of a three-attractor system at three sequential stages.

Conceptually, these artefacts provided us with a proxy to understand the interaction of molecular and macro-scale material formation through biological means. The study of biomineralisation suggested that the interactions at the molecular level have an effect on the macro-scale properties of materials. Using this principle as design concept, we worked around the possibility of a material with differentiated graded microstructure, which would render different effects and properties depending on the specific cross section through which we observe it. A useful model to imagine this is to observe the constitution of seashells. Even when the substance of shells is constant throughout their cross section, being constituted of calcium carbonate crystals, their texture and mechanic properties vary in each layer. Whilst the interior is soft and highly reflective thus conducive to the development of the mollusc, the exterior is hard and provides protection.

Artefact A embodies what we believe is the simplest instance of a design strategy for a graded microstructure. Placing an attractor in the centre of the structure creates a very dense core that gradually becomes more porous towards the edges. We may imagine a number of design possibilities around this physical property, such

as that of creating a material that allows foreign substances to fluid throughout predefined channels. In the case of Artefact A, the flow would be controlled to be especially higher on the periphery. This principle is further elaborated on artefacts labelled as series B, whereby three attractors create a material with three very defined dense cores, and a porous, lighter periphery.



Figure 7. Photograph showing, from left to right, Artefact B1, B2, B3 and A. Artefacts shown in this page measure 120mm in each side.



Figure 8. Photograph showing rapid prototyped version of Artefact B1



Figure 9. Artefact A showing cell distribution

The artefacts produced in this research assume a number of mechanisms through which a microscale event, such as cell distribution, affects macroscale properties. The electron microscopy images shown constitute a magnification that we may understand 1000:1 scale. The artefacts on the other hand operate at a design possibility of potentially 1:1000 scale. Results presented in this paper must therefore be understood in the context of material proxies for a biologically-oriented material articulation of design, allowing us to develop design methods around cross-scale interactions and seamlessly integrated within assembly.

The potential outcomes of this research may contribute to the wider discipline of design, affording design materials and artefacts which is shaped to environmental conditions such as mechanical stress or chemical composition in the air.

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# Words, Code, Dots, and Lines: Language and Sketching in Formulating a Cross-Disciplinary Project

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## Abstract

These pictures of a whiteboard, sketchbook and screenshots show different approaches to a collaborative project, through which we investigated everyday web use and extrapolated findings into a possible future search tool. The whiteboard shows part of a thematic analysis. Users were interviewed and kept diaries, and the resulting data was analysed iteratively, resulting in a novel framework. The sketchbook shows how an idea for a technology gradually took shape, revealing a design approach to tackling the aesthetic, functional, and theoretical quandaries that emerged. The texture of the design exploration is very different to the texture of the social science analysis. Both deal with the experience of users but they do so in very different ways. Finally the screenshots show how these ideas were further explored and rendered in code. We return to language but a language neutered of all ambiguity, to become puzzle pieces in a logical game. Again there are aesthetic and practical judgments, but they feel different. In this paper, we explore these approaches to consider how these ways of thinking come together; how they thrive on their differences and where potential problems lie.

## Author Keywords

Interdisciplinarity; Design; Social Science; Software Engineering; Craft

## Thinking about Interdisciplinary Research

In this paper we reflect upon a successful interdisciplinary research project, entitled 'Beyond Search'. We will not reflect upon the research imperatives, processes, and results of the project itself but instead focus attention on the way in which each of the disciplines involved in the



**Artifact 1: Thematic Analysis**

project team—social science, design, and software engineering—approached the prototyping phase of the project. We do this to better understand the role of design within multidisciplinary research and to contrast the ideas generating phase of a research project across different disciplines.

This paper and the artefacts associated with it represent a first stage in our stepping back from *doing* interdisciplinary research to examining such interdisciplinary research. In what follows, we discuss three artefacts, and consider the similarities and differences that they bring to the fore.

### Artifact 1: Thematic Analysis

The first artefact comes from a thematic analysis of interview and diary data, derived from a study of the everyday web use of 24 individuals (Lindley et al, 2012). It shows a whiteboard detailing notes and findings from interviews, organized as a way of drawing together data across participants.

What can this artefact tell us about the practice of qualitative analysis, informed by social science, in this early stage of the project?

Firstly we see an authentic attachment to the participants' own language and thinking. The approach does not seek to provide a tractable model that abbreviates the participants' own understandings, but instead to thicken their description and coalesce it into something useful. Language is key to this analysis as is a principled philosophy of social science.

From the artefact though we also see that spatial placement is being used as an analytical tool. The relative placement is used to experiment with different categorical groupings and

*public double  
private float  
protected internal void  
(Code fragments)*

```
Conditional probability tables 09/08/13
--- John would like to see NULL -> Mode transitions too, can we do that with FULL OUTER JOINs?

SELECT
    SecondEvent.logname AS Logname,
    FirstEvent.IntervalNode AS FirstNode,
    SecondEvent.IntervalNode AS SecondNode,
    COUNT(*) AS Count
FROM VibefilterAfterStudyStartWithMode AS FirstEvent
RIGHT OUTER JOIN VibefilterAfterStudyStartWithMode AS SecondEvent
ON FirstEvent.ID = SecondEvent.LogID AND
FirstEvent.ID IN
(SELECT MAX(id) FROM VibefilterAfterStudyStartWithMode
 WHERE (LogID = SecondEvent.LogID)
 AND (id + SecondEvent.ID) = 0)
GROUP BY SecondEvent.logname, FirstEvent.IntervalNode, SecondEvent.IntervalNode
ORDER BY SecondEvent.logname, FirstEvent.IntervalNode, SecondEvent.IntervalNode
```

### Fragment of Artifact 2: SQL Code Listing

to spot outliers etc. It is not part of an aesthetic exploration but is definitely a non-language based tool for thought.

Finally we see that the concern is not just to find a model for the data that honours the participants' own 'theories' but to provide such a model that is useful as a starting point for other disciplines to design and build from.

### Artifact 2: Software Code

The artefact chosen from software engineering is a screenshot of two sets of code. The first was written for a project to build experience prototype visualizations of the use of repeated searches over a long period of time; the second was used to explore logs of web use captured as part of the study described above.

Code is inherently language based and it is reductive. Language is used precisely, often with definitions that differ from their everyday meaning. The code fragment in the sidebar may read as disheartening and abstract, but a programmer will read it as the access modifiers and type declarations for three instance variables. But there is also a sense in which the code is a medium in the sense that a craftsman would think of a medium.

The code listings from our artefacts cover two programming languages, SQL and C#. SQL is a structured query language designed for managing and interrogating data held in a relational database while C# is an object oriented general purpose programming language. From the artefact we can see that they are used by the software engineer on the team in very different ways. The SQL is written in a journal style, time passing as we move through the code listing. Each new group of SQL statements tries to probe another aspect of the data, seeking insights into what the



Pages from Artefact 3: Sketchbook Pages

data reveals about our participants' web use. But we see the results often instead reveal data quality or data understanding issues which are then used to write further code to cleanse the data. We see here that the code is used as a journal of ideas tried, problems unearthed, and insights gained. In those respects it bears similarities to the design sketchbook in the next section. The C# code listing is very different. The code does not unfold through time but instead follows the structural architecture of each aspect of the intended functionality. And yet this is still very much a sketch. In much the same way as a painter might sketch out a composition in charcoal on canvas before proceeding to oils, programmers often sketch out the structure of code before filling in the detail and refactoring the design where the simple structure of the initial sketch proves inadequate.

In fact there are many different styles of coding present in the artefact, showing the subtle ways in which software can be used. Sometimes it is sparse and focused on an architectural goal. Sometimes it is bloated with 'boilerplate' code added by tools to make the programmer's life easier. Sometimes it is half finished when an idea peters out. Sometimes there is a clear established pattern behind the code, sometimes not.

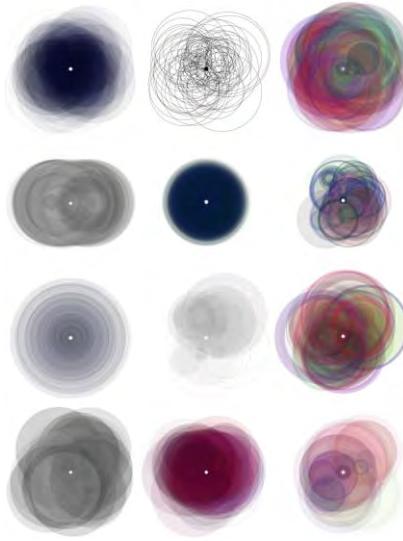
Through all these differences there is one that is particularly striking when compared with the use of language in Artefact 1. The software is often focused on an application or tool that will then further our knowledge of the problem area. There is often a layer of indirection between the code and the participant in our study. The software engineer may be working on tools and applications that help us understand the complexities of daily life but they are not grappling with those complexities directly.

### Artefact 3: Sketchbook Pages

In addition to producing software code, the development of experience prototype visualizations of repeated searches also drew upon design. Some of this design process is shown in our third artefact, sketchbook pages.

Like social science, design has an intimate relationship to the users of a project's output. Many designers use the output of careful usage analysis (typically performed by social scientists) as the fodder for their design, while others design probes and prototypes to facilitate the gathering of experience data. Even where designers eschew the typical focus group process it is clear that they still draw on and hone knowledge of how people experience designs.

Our chosen artefact shows some of this. Within the sketchbook, some sketches reveal the designer grappling with both intricate and broad-stroke problems of usage. But more striking are the aesthetic explorations. Within this strand of the project we were interested in how people make the same search repeatedly over a long period, in the context of researching a project, or nurturing a long-term interest. Early on in the project we decided on a tree-like metaphor to visualize the changing search result-set over time. The sketchbook shows our designer trying various ways of representing this tree. Page after page is dedicated to sketches of the overlapping circles he was trying out for leaves. Some of these sketches are quick. They are simple ways to see how something will look and to uncover any practical and aesthetic problems with the representation. Others are painstaking and beautiful. Here the realisation is richer. This partly helps see more accurately what the final result will look like but also gives our designer time to think patiently. The detailed and accomplished nature of the



Pages from Artefact 3: Sketchbook Pages

practice provides the space necessary for design ideas to percolate up from problem explorations.

## Discussion and Conclusions

The Human Computer Interaction (HCI) community, though born in computer science, has from its inception looked to other disciplines for inspiration, answers, knowledge, and methods. These couplings started with psychology and include disciplines as diverse as sociology, various branches of philosophy, anthropology, biology, etc. But when it comes to design based disciplines like interaction design, communication design, experience design, etc., disciplines that one would expect to be very natural partners to HCI, there is a tendency to queer design, to treat it as something interesting, something to dissect and to examine rather than something to assimilate. There are practitioners actively publishing practice based research within the CHI community (for example Gaver et al (2010) and Wallace et al (2013)), and we hope that explorations like the one reported on in this paper, and indeed the Research Through Design conference, will help progress work that melds design into academic research.

These artefacts were intended to illustrate (literally) our move from doing interdisciplinary research to thinking about interdisciplinary research and especially the role of design. Each artefact epitomizes this initial exploration of the 'sketching' stage of an interdisciplinary project (though each discipline may not use the term sketching). From social science we found spatial placement being used as an analytical tool to find a model for the data that honours the participants' own 'theories'. From software engineering we found code used as a journal of ideas tried, and also to sketch out architectural structures. From design our artefact

shows the design sketches exploring the aesthetic, functional, and theoretical quandaries raised in the project.

The exploration of these artefacts shows some of the similarities and the differences between the different disciplines engaged in our multi-disciplinary research. Some differences are striking and obvious, for example the reliance on language in both our thematic and software exploration, while other similarities lie beneath the surface, for example the continuous concern for user experience in both social science and design. But there are no easy conclusions to draw from our artefacts. The practices they embody are both rich and varied and we hope that exhibiting and discussing these artefacts will help us delve into that complexity further.

## Acknowledgements

Thanks to Stuart Taylor for his work inspiring and kicking off this project.

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## Inventing the Future by Examining the Past

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### Abstract

This practice-based research questions how archaic techniques may add value when combined with new materials, to the design of multi-functional 'soft' products or apparel. At the forefront of possible applications for these 'soft products' are the needs of future space apparel, where the possibility of interplanetary travel and space tourism are becoming feasible once again through technology and private rather than state funding. The aim was not to compete with NASA, but to use the 'space problem' as an approach to innovation. New materials and in particular textiles, have become the focus for technological advancement driven by scientific investment in automotive, medical, aeronautical and protective fields. Advances in interactive textiles, polymers, composites, thermal, chemical, shape memory, phase-change, chromatics, and bio-sensor materials have developed exponentially creating a sea change in material possibility. (Singh, A, 2012) By exploring traditional craftsmanship, new technology, and experimenting with archaic techniques, I aim to investigate the relationship between function, aesthetics, and purpose where it may be possible to develop new approaches to multi-functional product capability. What is apparent is that although the future is already upon us in terms of technological advances in materials, we are creatures of habit and prefer what we know and trust, skins, cotton, wool and linen are some of the oldest materials known to man and the familiar form of a shirt for example is still with us from antiquity. It is our intellectual need for technological development coupled with our emotional need for trust in materials, familiarity, heritage and authenticity that provides the design brief for future apparel.

**Keywords:** future; past; craftsmanship; space; multi-functional; soft-product;

### Research Imperatives

Creatively approaching the issues of interplanetary travel will allow me to explore the possibilities of advanced materials challenging us to re-think how they may be able to be transformed, rejoined and re-cycled in innovative ways considering integrated clothing items as parts of a multi-role system. This approach is pertinent to furthering designs role in enhancing the human centred needs of health, wellbeing, safety and sustainability through experimentation in the renewal and re-cycling of materials and by developing products able to have many or continued uses.

### Research Process

The artefact created is intended to be a prototype for future experimental purposes. It was important to find a mechanism for prototyping, to explore the inherent qualities of materials, and test performance on the body. The glove became the obvious choice as a perfect example of a highly crafted item whose design must consider the complex movements of the hand, mobility, dexterity, and enhanced function in its use of materials and construction. The hand and glove acts as microcosm of the human body where problems of design and fit are mirrored at a smaller scale, while the complexity of the hands movements and its literal 'reach' add enhanced levels of enquiry. I intend to make many gloves in order to explore possibilities.



Figure 4. Cosmonaut glove 1960's

I began by researching extravehicular portable life support systems - space suits, which are naturally subject to stringent specification from their internal systems and external dust control (Gaier, J, 2010), to bioenergetics - measuring the loading restrictions of clothing (Norcross, J, 2010) However the outer shell is still closely connected to our understanding of apparel design and it is evident from vintage collections of astronaut and cosmonaut wear that both fashion and aesthetics still play an interesting part in their conception (fig 4) (De Monchaux, N. 2011). Gloves are extensively tested for their performance in zero gravity via mobility and dexterity (Thompson, S 2011) in addition to their role in extending astronauts reach and performance from a stationary position (Stack, D, 2010) Materials are tested for dust abrasion, mobility, and sensitivity. More recently the 'bio-skin' (Newman, Webb 2011) explores a radically different approach to space suits by placing the vital services inside the fabrication of a close fitting skin rather than inside the suit, benefitting mobility.

It became evident that in considering the future it was essential to examine the past. An investigation of historical techniques became necessary to become fully conversant with pattern cutting and construction techniques enabling me to produce a glove to fit a specific hand (fig 1). A prototype was created using a pattern based on early techniques and observations of historical pieces from the V&A and the Kyoto Costume Museum, (fig 2), by observing and re-creating these artefacts I aim to gain a greater understanding of materials and construction techniques and how they work in conjunction with the hand. Whilst the glove became an interesting object with which to view and test ideas, inevitably the process drew into focus the purpose of design beyond the purely functional thereby questioning the relationship of function to aesthetics, and emotion, the relationship of the maker to the product and how the designed object has enriched and amplified the wearers' experience over and above its function.

### Research Outcomes

This limited investigation has proved that the project has further potential and I intend to propose this as subject for postgraduate research. The future directions that the inquiry could take are three-fold: first, to research and experiment with new materials and construction techniques, secondly, to note how the design and construction enhance the function of the hand and its intended purpose; and thirdly how the notions of aesthetics and emotion in design are interpreted and how this narrative informs the future.

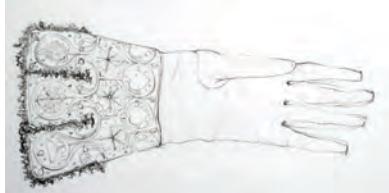


Figure 2. Glove 1540's V&A costume



Figure 1. Open glove showing trank and fourchettes

Initially I believed that the glove would be straightforward to research however information has proved to be more elusive, perhaps because it falls into the category of what (Miller 2010) using the phrase 'blindingly obvious' refers to when he considers the problems posed by objects that have become ubiquitous. His studies in Material Culture have considered the problems posed by objects that we have quite literally become blind to, he argues that the study of artifacts has been neglected, and suggests that the very physicality of the object which makes it seem so immediate, sensual and assimilable, belies its actual nature.

By prototyping a test glove for future experimentation I have expanded my focus from the purely functional and gained an understanding of how the creative process connects the maker and wearer to each other and their place of origin and questioned the overlooked emotional aspects of design. This balance of function and emotion resonates with current debates in design - our lack of practical skill and inability to interact with or repair modern

products, which are increasingly inaccessible to the consumer. (Crawford 2010) argues that a decline in tool use would seem to betoken a shift in our relationship to our own stuff; more passive and more dependant; 'What ordinary people once made they now buy; and what they once fixed for themselves, they replace entirely or hire an expert to repair, whose expert fix often involves replacing an entire system because some minute component failed.' This process has led me to consider the wider implications of designing multi-functional integrated clothing items as parts of a multi-role system particularly in respect of the speculative restrictions of interplanetary travel.

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# The Invite: Adding Value to Paper with Paper Electronics

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## Abstract

If the paper we are surrounded by were to suddenly become interactive, how would our relationship with it change?

The way we currently access digital technology is predominantly through screens and speakers. There is a shift from these intrusive technologies towards more physical and quietly ubiquitous technologies. Paper Electronics is the combining of paper, components and conductive inks to create paper interfaces and devices, and has the potential to be an important part of this development.

Historically, craft practice has produced socially relevant technological breakthroughs, from goldsmiths democratising print (Gutenberg), to artists democratising Printed Electronics. Craft approach is open minded and open sourced, setting it apart from the more rigid restrictions of an HCI approach. Paper is, at its most fundamental, a craft product and tool.

This paper aims to explore the question of Paper Electronics adding value to paper through one specific prototype: The Invite.

The Invite's intention was to shift the user's perception of what paper can do. The Invite was created using a blend of traditional and modern craft approaches: screen-printing and open source electronics. Reflective practice was used during the making process to investigate how a craft approach can be applied when designing for an emerging technology.

The Invite was an event ticket screen-printed with conductive ink. It looked just like a normal piece of paper, however, when plugged

into the speaker system at the event, The Invite became a musical instrument. Its interface allowed the user to control audio output in two ways: pitch and frequency. A large printed circle used capacitance to create what acted like a distance sensor. The base unit The Invite plugged into contained all the hardware.

This research crosses boundaries between craft and technology and invites these disciplines to explore a playful and innovative use of an everyday tool.

## Author Keywords

Design; Paper; Electronics; Prototyping

## Research Imperatives

Due to the nascent nature of the Paper Electronics field there are many exciting questions to be addressed. Below are the aims of this particular research project.

- To determine whether value can be added to paper with Paper Electronics
- To reflect on the potential shift of peoples' perception of the capabilities of paper
- To explore the use of reflective craft processes when designing for an emerging technology

Addressing these areas will undoubtedly generate new knowledge around prototyping with Paper Electronics.

## ELECTRONICS

**What** - Standard components soldered onto rigid printed circuit board.

**Examples** - Computers, phones, radios, TVs

**Status** - Most electronic products today use this technology.



## PLASTIC ELECTRONICS

**What** - Flexible components and circuits created using organic semi-conducting materials.

**Examples** - Electroluminescent lighting, OLED displays.

**Status** - Available in a few consumer products, but still in developmental stage.



## PAPER ELECTRONICS

**What** - Electronics created by printing conductive inks onto paper, with components being either printed on or attached using conductive glues.

**Examples** - Early stage prototypes

**Status** - Emerging. The field is being explored by companies such as Novalia (developing the mass-production of paper Electronics, and Bare Conductive (developing the craft/maker market for Paper Electronics).



Figure 1. The Invite plugged into the base unit.

## Research Process

The research process for The Invite has been broken down into three sections to help compartmentalise the process: Find, Play and Make. Throughout this particular creative process reflective practice was used to gain a deeper understanding for prototyping with an emerging technology.

Figure 2. Diagram illustrating Paper Electronics' position in the world of electronics.

*A practitioner's reflection can serve as a corrective to over-learning. Through reflection, he can surface and criticize the tacit understandings that have grown up around the repetitive experiences of a specialized practice, and can make new sense of the situations of uncertainty or uniqueness which he may allow himself to experience. (Schön, 2003, p.61)*

The design process is inherently rife with subconscious influence and the effects of personal intuition. Decisions are often made subconsciously, or with little reflection. Schön agrees, observing that in tacit professions (such as design) we often know what to do, but not why. Reflection-in-action and reflection-on-action are tools to help develop and enrich the design process and, crucially, address that underlying 'why', 'why' being a fundamental consideration when designing for an emerging technology such as Paper Electronics.

Fusing craft methodology with the design process of Find, Play and Make helped to not only deepen the understanding of each stage of the design process, but also delivered considered and meaningful results.

### Find

The Find section of the process focussed on generating ideas and investigating materials. Around 100 ideas were generated by constantly reflecting on previous thinking. Using previous ideas as a foundation for the new allowed for a comprehensive and vast range. Further reflection polished the results: the ideas were then grouped together and put through various filtration methods.

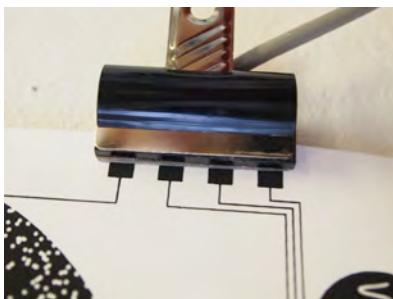


Figure 3. This bulldog clip was custom made to connect paper to other devices combining the visual language of paper with electronics.



Figure 4. Using a traditional screen printing technique to experiment with the emerging technology of conductive inks.

### Play

Playing is a naturally reflective activity. If a project, action or idea doesn't work, our automatic response is to tinker. We reflect on why, and then play with other solutions. Playing is crucial for understanding the materiality of an emerging technology. Reflection, especially reflection through playing, served to not only strengthen and inform activities undertaken in the midst of the design process but also the user testing stage. The predominant mode for reflection in the Play stage was through photos, including reflection after the practice occurred. The Play section also saw an investigation into the construction of Paper Electronics. This exploration of fundamentals resulted in a stronger and more precise definition, dividing Paper Electronics into two categories, Active Paper and Passive Paper<sup>11</sup>. This part of the process saw experiments at the point where traditional printing techniques, open source electronics and emerging technology meet. The relaxed craft approach lends itself well to the exploration of Paper Electronics and tends to lead to varied, interesting and organic ideas and results. Experiments were also carried out to explore the visual language of Paper Electronics, investigating how to join Paper Electronics to other hardware as well as studying the graphic design of Paper Electronic buttons and sensors. Different ink mixes were also explored, mixing conductive ink with different levels of acrylic medium and water.

### Make

The Make section sees objects come to life, go out into the real world and receive user testing and reflection. The Invite was screen printed with Bare Conductive ink (see Fig. 4). The box was made from acrylic, cherry wood, an Arduino ("Arduino," 2012) and an MP3 Trigger. The bulldog clip cable has a separated copper board insert inside the clamp which connects to the cable running out of the back of the clip (see Fig. 3).

<sup>11</sup> Active Paper contains active components such as microcontrollers, which are glued onto the paper. Passive Paper only contains passive components such as resistors, which can all be printed with conductive ink.

Reflection of this stage in the design took part during user testing. Observations were made, reflected upon and then rationalised.

### Research Outcomes

The research outcomes surrounding The Invite vary from negative to positive and conceptual to obvious. Using reflective practice, the research outcomes from The Invite have been addressed in a matured version of The Invite called Playing Paper (see Fig. 5), which has recently been displayed at The Lighthouse's AS02 Paper exhibition in Glasgow and subsequent Pecha Kucha ("The Lighthouse," 2013).

Concerning instinctive use, the learning curve for research surrounding The Invite was steep and clear. Interestingly, users ranging from tech-savvy designers to more traditional bibliophiles all encountered similar issues with The Invite; these issues clarified that the design needed changing in order to accommodate a more instinctive visual language. As a specific example, the graphics for the distance sensor were flawed; users' instincts told them to treat the sensor like an iPod wheel. Changes were needed at a technical level as well. The conductive ink lines on The Invite were too thin to consistently sense capacitance.

Both issues were resolved in the matured or 2.0 version, Playing Paper. The visual language problem was addressed by acknowledging people's diverse relationships with technology and offering options. Instead of one image with an ambiguous meaning, the user was presented with three. One depicted a simple rectangle, similar to The Invite's level of communication, the next was a sketch of a distance sensor component, and the final image was of a theremin, a distance sensing musical instrument.

Surprisingly, emotional and engagement reactions to interacting with both The Invite and its improved version, Playing Paper, were similar. Despite 'improper' or 'incomplete' use due to the flawed



Figure 5. Playing Paper at the Lighthouse.

nature and ambiguity of The Invite, users still exhibited genuine enjoyment, surprise and enthusiasm for the technology. In both projects users hunted for hidden physical components and appeared in awe of the technology. Regardless of the user's background, Paper Electronics in The Invite and Playing Paper left the impression of being magical.

This research shows that value can be added to paper using paper electronics. This value is not only functional but more importantly in elements of joy, surprise and magic. These playful paper interfaces allowed the users to see entirely new possibilities of what paper can do, shifting boring perceptions of paper's functions. Through the exploration of prototyping for an emerging technology using reflective craft processes it is clear that fun, engaging and surprising products can be created.

The Invite and its matured version, Playing Paper excited me as an innovative new application of Paper Electronics. That they can be implemented at low cost, played with on a physical level and appeal to users of varying backgrounds and levels of technological savvy only cements paper's consistently ubiquitous position as a design material not only for today, but for the future.

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# The Book Spotter's Guide to Avian Titled Literature

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### Abstract

In order to remain relevant in the digital age, physical libraries have to strengthen their position as social and cultural spaces. They need to find ways to challenge existing users perceptions of the collections and how they are accessed and presented.

In an attempt to engage with these challenges, the University of Technology Sydney Library redesigned its visual identity and interior spaces, and commissioned us to create an installation in the central stairwell. From our initial research we formed the following question: how can we design a creative work (installation) that suggests the library is a space for play and discovery?

This paper reports a practice-based research project with two intrinsically linked outcomes:

1. An installation: 'Avian Titled Literature' – 30 altered books hung as a 'flock' in the central stairwell at the University of Technology, Sydney Library, with a set of ten accompanying A2 posters. The installation aims to visually communicate that the Library is a space for play and discovery.
2. A hybrid exegesis: 'Field Guide to Avian Titled Literature' is a document that tells the story of the installation, reporting the tacit knowledge embedded in the design process. It is 'hybrid' in that the document communicates through word, image and materiality.

The project is the first iteration of a larger, ongoing research project investigating ways visual communication design could encourage serendipitous discovery, browsing and more playful engagement within libraries.

### Author Keywords

Practitioner-research; reflective practice; visual metaphor;  
installation; hybrid exegesis.

### Research Imperatives

This project stems from a problem in the world – the relevance of a physical library in a digital age. Libraries need to strengthen their position as social and cultural spaces – finding ways to communicate this strategic aim is rich territory for design research. *Avian Titled Literature* is the first iteration of an ongoing research project in which we collaborate with libraries to help make their collections accessible, relevant and captivating to a broad audience.

The University of Technology Sydney Library positions itself as the social and cultural hub of an inner-city university campus. Recently, the Library overhauled its visual identity and redesigned interior spaces in response to changing user needs. This visual and spatial redesign aims to shift the perception of a university library from a staid and conservative institutional space, to a more active and engaging space for learning and socialising. As part of the redesign, the Library commissioned us to create an original work to enliven the three-story void in the central stairwell.

### Research Process

From personal conversations with librarians, and the paper *From Search to Discovery in our Future Library*, (Booth, Tiffen and Vawdrey 2012) we formed the briefing question: how could we



Research Through Design 2013

design a creative work (installation) that suggests the library is a space for play and discovery?

## An Installation

The result is an installation of 30 altered books suspended as a flock in the stairwell. Each book represents a novel from the Library collection that has a bird in the title – *One Flew Over the Cuckoo's Nest*, *To Kill a Mockingbird*, *Flaubert's Parrot*, etc. A set of ten posters is mounted on the stairwell wall, prompting different interpretations of the bird-books (Fig. 1).

The installation acts as a metaphor that can be understood in several ways. First, as a visual simile: if you hang a book by the spine it looks like a bird. Second, as visual metaphor: the books refer to knowledge, flocking and rising in the university library. Third, by folding the books (something you are not supposed to do in libraries) and ordering them in an idiosyncratic way (birds in the title of novels, not by author or content) the installation disrupts the natural order of things, challenging the perception of the library as a conservative institution. We aimed to create a work with layers of possible readings in order to encourage “reading, curiosity, exploration, and wonder about the Library and its collection” (UTS Librarian Mal Booth, pers. Com.).

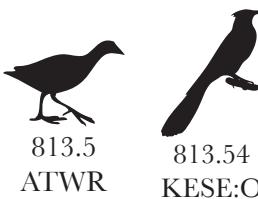
We searched the catalogue to find novels held in the UTS Library; it was important to connect the installation explicitly to the collection. This search produced more books than we could possibly suspend, so we edited the list to reveal a range of bird species in the title (twenty-one unique species).

A key consideration was for the book titles to be legible, so an understanding of the installation unfolds as patrons walk up the stairs. To draw attention the bird-titles (and not distract the viewer with cover images), we designed simple dust jackets for the books. Each cover features a silhouette of the titular bird on the spine, and the 'call number' to locate the book in the library (Fig. 2).

These silhouettes and call numbers are also listed on an A2 poster – ‘Book Spotter’s Guide to Avian Titled Literature’ – (Fig. 3) that is displayed on the stairwell wall, inviting library patrons to spot the



*Figure 1. 'Avian Titled Literature', 2012  
Central stairwell, UTSLibrary, Sydney.*



*Figure 2. Bird silhouettes and call numbers for book spines. 'Oryx and Crake' (Margaret Atwood), left, and 'One Flew Over the Cuckoo's Nest' (Ken Kesey) right.*

different books, and hopefully prompt them to find them on the shelves.

*THE BOOK SPOTTER'S GUIDE TO  
AVIAN TITLED LITERATURE*

This installation is the work of Zoë Sadokierski and Kate Sweeapple, academics from the School of Design at UTS. There are thirty books in the flock, each with a type of bird in the title. Use this guide to spot the book-birds, and refer to the localities listed to find copies of the books in the UTS Library. Read more about the installation and our other research projects at: <http://cargocollective.com/PageScreen/Unlikely-Avian-Taxonomies-3>

1. *One Flew Over the Cuckoo's Nest*  
 Ken Kesey  
 London: Calder and Boyars, 1972, 1982.  
 25142279 The Cooper-00-00-0000-0  
*Bring the Singing Back Home*.

2. *Oryx and Crake*  
 Mervyn Peake  
 London: Virago, 2006  
 25142279 The Cooper-00-00-0000-0

3. *To Kill a Mockingbird*  
 Harper Lee  
 New York: Harper, 1960  
 25142279 The Cooper-00-00-0000-0  
*Bring the Singing Back Home*.

4. *Jonathan Livingston Seagull*  
 Richard Bach  
 London: Element, 1995, 1999  
 25142279 The Cooper-00-00-0000-0  
*Bring the Singing Back - October - Oct 1997 A*.

5. *Parrer and Oliver in America*  
 Peter Carey  
 Cambridge, MA: Peagin Books, 1991, 1999  
 London: Hatchette, 2000  
 25142279 The Cooper-00-00-0000-0

6. *Fleabear's Pigeon*  
 Julian Barnes  
 London: Faber, 1985  
 25142279 The Cooper-00-00-0000-0

7. *Pigeons from Hell*  
 Robert Ervin Howard  
 Project Gutenberg, 2006  
 25142279 The Cooper-00-00-0000-0

8. *The Wind-up Bird Chronicle*  
 Haruki Murakami  
 London: Vintage, 2005  
 25142279 The Cooper-00-00-0000-0  
*Bring the Singing Back*.

9. *Love Among the Chickens*  
 P.G. Wodehouse  
 Project Gutenberg, 2003  
 25142279 The Cooper-00-00-0000-0

10. *The Wings of the Dove*  
 Henry James  
 New York: Modern Library, 1945.  
 25142279 The Cooper-00-00-0000-0

11. *The Maltese Falcon*  
 John Huston/Dashiell Hammett  
 United States: Times Entertainment, 1991/1946.  
 25142279 The Cooper-00-00-0000-0  
*Bring the Singing Back - October - Oct 1997 A*.

12. *Swallows and Amazons*  
 Arthur Ransome  
 London: Cape, 1965  
 25142279 The Cooper-00-00-0000-0

13. *Still Life with Woodpecker / Still Life with Typewriter*  
 Tom Robbins / Zora Sadeckalski  
 Papp Books Press 2001  
 25142279 The Cooper-00-00-0000-0

14. *Seven Songs*  
 Azumy Padovich Chavdar  
 Project Gutenberg, 1999  
 25142279 The Cooper-00-00-0000-0

15. *The Cat and the Raven*  
 Kerty Greenwood  
 Melbourne: Vix Lalitha Books, 2005.  
 25142279 The Cooper-00-00-0000-0

16. *The Eagle and the Raven*  
 Pauline Edge  
 New York: Dial Press, 1976.  
 25142279 The Cooper-00-00-0000-0

17. *The Raven*  
 Edgar Allan Poe  
 Project Gutenberg, 1995  
 25142279 The Cooper-00-00-0000-0

18. *Poor Miss Finch*  
 Wilkie Collins  
 Project Gutenberg, 2013.  
 25142279 The Cooper-00-00-0000-0

19. *Cat Among the Pigeons*  
 Agatha Christie  
 Sydney: Loudermilk Press, 1982.  
 25142279 The Cooper-00-00-0000-0

20. *Bos Wham If These Are Not Pigeons?*  
 David Horne  
 Sydney: Angus and Robertson, 1971.  
 25142279 The Cooper-00-00-0000-0  
*Bring the Singing Back*.

21. *Shadow of the Outlaw*  
 Peter Watt  
 Sydney: Pic Macleod, 2008.  
 25142279 The Cooper-00-00-0000-0

22. *Cry of the Curlew*  
 Peter Watt  
 Sydney: Pic Macleod, 2000.  
 25142279 The Cooper-00-00-0000-0

23. *Flight of the Eagle*  
 Peter Watt  
 Sydney: Pic Macleod, 2001.  
 25142279 The Cooper-00-00-0000-0

24. *Pigeon English*  
 Stephen Kelman  
 London: Bloomsbury, 2001.  
 25142279 The Cooper-00-00-0000-0

25. *The Pigeon Fix*  
 Charles Mary Young  
 Project Gutenberg, 1992.  
 25142279 The Cooper-00-00-0000-0

26. *The Owl and the Possum*  
 Edward Lear  
 Sydney: ABC Books  
 25142279 The Cooper-00-00-0000-0  
*Bring the Singing Back - Oct 1 - Nov 1st Show*

27. *When Blackbirds Sing*  
 Marvin Boyd  
 Doe Why West Landmarks, 1992.  
 25142279 The Cooper-00-00-0000-0  
*Bring the Singing Back - October - Oct 1997 A*.

28. *The Crows Fly High*  
 Florence Page Jaques  
 Minneapolis: The University of Minnesota Press, 1995, 2009  
 25142279 The Cooper-00-00-0000-0

29. *Wild Swans*  
 Jung Chang  
 London: Phoenix, 1991, 2001.  
 25142279 The Cooper-00-00-0000-0

30. *The Eagle Has Landed*  
 Jack Higgins  
 London: Phoenix, 2003, 2005.  
 25142279 The Cooper-00-00-0000-0

Figure 3: A2 poster 'The Book Spotter's Guide to Avian Titled Literature'

In addition, a series of A2 posters present quotations from the books in which the birds 'appear'. Traditionally, users locate books

## Research Through Design 2013

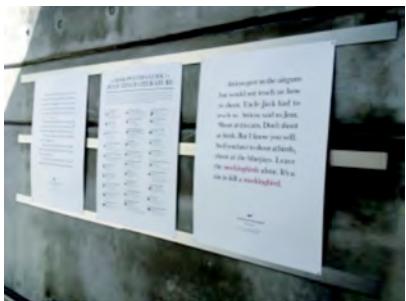


Figure 4. A2 posters mounted on the stairwell wall.

through the library catalogue searching by author, title or subject. These posters encourage discovery by giving a taste of the writing style: the posters transform the moment of wonder into a possibility of engagement with individual texts.

In order to find these quotes we used a 'focused data-mining' approach, 'mining' a written text for specific information<sup>1</sup> (Sadokierski and Sweetapple, 2012). We were looking for passages where the bird name appeared, to reinforce the idea of the project. By isolating these passages, we could choose a passage that worked as a kind of 'pull quote' for the book; a paragraph of text that gives a taste for the writing style – rather than a plot summary (Fig. 4 and Fig. 5).



<sup>1</sup> We used SCRIBD.COM to search the books for specific words or phrases.

Figure 5: Detail of A2 poster with a quote from one novel

### A Hybrid Exegesis

Additionally, we produced a 'field guide' (hybrid exegesis) that reports tacit knowledge embedded in the design process, in a sharable way. Accompanying the Avian Titled Literature installation, we produced a 'hybrid exegesis' called 'Field Guide to Avian Titled Literature'. To clarify what 'hybrid exegesis' means, it is necessary to pick it apart.

**Hybrid:** The term '*hybrid book*' describes novels in which graphic elements (photographs, drawings, diagrams) are integrated within the written text, as literary devices. (Sadokierski 2010) These graphic devices are more than illustrations of the written text, they are an integral part of the text. You cannot remove them without significantly altering the primary text. 'Hybrid' gives a sense that word and image are grafted together to form an argument, rather than the image illustrating the text.

**Exegesis:** In universities and art schools, an exegesis is a written text in which the creative practitioner critically examines their work in light of contemporary theory and practice. This written exegesis often includes images that function as illustrations of the written argument. Although some exegesis may include images that form part of the argument, it is not an expectation of the genre of exegesis writing that this is the case.

By combining the terms, we are emphasising that our research report is made through a combination of word and image. The images in the hybrid exegesis do more than offer illustrations of the written text; they form part of the argument.

In this paper, we describe the research and design process that led to the installation. In addition we argue for the significance of a hybrid exegesis as a way to disseminate findings from a practice-based research project.



Figure 6, 7, 8. Spreads from our hybrid exegesis.

## Research outcomes

There is research embedded in the design and creation of the Avian Titled Literature installation, however this is primarily the kind of research that practitioners regularly undertake in commercial or artistic practice.

The scholarly research contribution comes through the articulation of our research methods and the insights drawn from our design process in a sharable way – ‘reflective practice’ (Schön, 1983). Importantly, for the discipline of design, we communicate this knowledge as a hybrid exegesis – a document that makes an argument through the interplay of word, image and materiality (Sadokierski 2010), (Figs. 6, 7 and 8).

It is difficult to position design practice as research without explaining the context in which it came to be. Just as a researcher begins a scholarly article by positioning it in a particular field and referencing theory or texts she has drawn from, practitioner researchers must frame their creative practice for it to be understood as a research outcome. Where the writer takes a new idea and frames it in a theoretical context, a practitioner-researcher creates a new work, and tells the story of that work: what led to its creation, the process of creation and where it points the maker to next. It is this deliberate process of articulating the context, process and findings of a design project that constitutes a contribution to a field. Traditional scholarly journals are not always an appropriate forum to report practitioner research for several reasons. First, due to restricted space on the page and budget considerations, many journals do not accommodate large quantities of images that are necessary to explain a design process. Scholarly journals tend to prioritise written arguments over visual or verbal-visual arguments.

Second, practitioner-researchers often do not produce creative work that is based on or framed by traditional scholarly theoretical frameworks, therefore finding reviewers for these submissions is difficult. Therefore, practitioner-researchers need to find alternative ways to disseminate their research that accommodate verbal and visual arguments.

This model of disseminating design research is gaining momentum as an alternative to the traditional research paper. Aside from our own Page Screen research studio (Australia) are: The Hybrid Publishing Lab (Germany), and The Publishing Lab (UK/Spain).<sup>2</sup> The production of this book adds to the growing body of knowledge disseminated in this way.

By recording our research process and findings in this way, particularly of site specific or durational works, we can show an arc over time of where these projects lead to, and where future projects have stemmed from. We hope this project marks the beginning of a deeper engagement with cultural institutions. It is perhaps only then that the research outcomes from this project will be fully accounted for.

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<sup>2</sup> [hybridpublishing.org](http://hybridpublishing.org); [the-publishing-lab.com](http://the-publishing-lab.com); [pagescreenstudio.com](http://pagescreenstudio.com)

## 'IT Fauna' and 'Crime Pays': Using Critical Design to Envision Cyber Security Futures

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### Abstract

The research presented is a collaboration between social scientists, designers and technologists that explored whether critical design could be used to envision cyber security futures. The research imperative was to examine the use of critical design as a way of imagining future or alternative scenarios of cyber security. We evaluated research methods that would encourage cyber security practitioners and policy makers to discuss and re-consider cyber security risk.

The research used critical design to produce speculative scenarios that would encourage a new way of thinking about cyber security risk. 'Specimens of IT Fauna' is a visualisation and celebration of our imaginary bestiary of software. 'Crime Pays' is a video installation that envisions a future where there is effectively a tax on online privacy.

The artefacts were used in two workshops to encourage cyber security practitioners and policy makers to envision future risk scenarios. The research demonstrated that while there is potential for using critical design in this way there is a need to develop a bridge between the artefacts produced through critical design and the epistemological position traditionally taken towards risk by

cyber security practitioners and policy makers. We conclude that future research should link critical design with systems thinking as the next step in developing tools for envisioning future cyber security risk. This will offer a structured way for moving to a more productive level of engagement with the artefacts while giving participants a license to be creative and a way of incorporating the human experience.

### Author Keywords

Critical design; speculative design; cyber security; envisioning

### Research Imperatives

The research outlined in this paper was part of a larger project called Visualisation and Other Methods of Expression (VOME). The VOME research was located in the relatively young research discipline of cyber security and focused on issues of privacy, identity and consent in online environments and engaging primarily with end user communities. The research explored the use of novel methods of engagement and an early outcome was the recognition of a need to 'design culturally sympathetic research approaches' (Coles-Kemp and Ashenden, 2012, p.2) to understand how end users perceive cyber security risks.



Figure 1. *Specimens of IT Fauna*  
Low Orbit Ion Cannon (1 of 3 models)  
Laser etched crystal - other models in the  
series are 'Blaster Worm' and 'Web  
Crawler'.



Figure 2. *Crime Pays*: Some grease to seal the deal (1 of 3 photos). Video and three photographs depicting social change as a result of the new payment system.

During the course of the research, however, the importance of engaging with cyber security practitioners and policy makers instead of just end users became clear. As a result the VOME researchers came together with designers to explore the use of critical design to engage with cyber security practitioners and policy makers. Accordingly, the research presented here examines the use of critical design as tool for imagining future cyber security risks.

The analytical approach for the research is critical design which creates 'provocative artefacts' (Dunne and Raby, 2001, p.63) by using critical theory with design to make us think about things we believe we know in new and different ways. Such artefacts are often more effective than direct questioning techniques in enabling user communities to engage with future possibilities (Bowen, 2007). Critical design offers a participatory practice approach and so continues the VOME research theme of exploring novel methods of engagement. As such, critical design was thought to be an appropriate tool for developing ways to envision cyber security risk.

### Research Process

We started with an initial consultation workshop where cyber security academics explored what the impact of new, online security technologies might be on our society and culture. Following on from this there were informal discussions to share the existing research output from the VOME project with the designers. The aim of these initial discussions and workshops was to find a common ground for exchange between designers and experts. Narrative was used as a tool through exercises such as improvisation from random prompts and the creation of fictional tabloid articles. Both parties were able to collaborate on stories, then examine and discuss them.

Designers then used these exercises as a starting point to

formulate more specific and nuanced stories. In the case of *Crime Pays*, this led to the imagination of a future scenario and payment system, while *Specimens of IT Fauna* focuses on existing but overlooked narratives and metaphors used to describe the internet. Artefacts were then designed within these narratives premises, giving the stories and ideas a tangible physical presence and enabling further dissemination and discussion.

*Specimens of IT Fauna* (Fig. 1) was designed with educational props in mind, referencing the science classroom. The small scale of the objects and the explanatory labeling encourages manipulation and discussion while the use of laser etching and lighting provides an aesthetic 'hook' and a sense of technological wonder.

The *Crime Pays* (Fig. 2) video mimics the aesthetic qualities of a corporate presentation and only the filmic letterbox format hints that this is fiction. The video brings 'The Yes Men' activist approach into a consenting corporate conference and invites the expert audience to play along. Within a workshop setting the video is displayed alongside photographs depicting three imagined social scenes. The minimalist style of these photos is intended to push the characters human interaction to the foreground, thereby directing discussions from the abstract system to the possible impact on people's lives.

We subsequently ran two workshops to showcase the artefacts and to explore their use as ways of envisioning cyber security future risk. The workshops were held at the British Computer Society in London – a venue where it was believed that participants (working in the field of cyber security) would feel comfortable. Participants were self-selecting as the workshops were publicized through existing networks for cyber security practitioners and policy makers. There were twelve attendees at each workshop and each workshop was three hours in length. The workshops started with a short presentation to set the context of cyber security risk and critical design and this was followed by the designers introducing the artefacts. Participants were then encouraged to ask questions,

discuss with each other and reflect on the artefacts. Their outputs were captured on 'post-it' notes as well as rich-pictures drawings.

## Research Outcomes

Please describe the resulting knowledge that arose from the practice-based research. This should be placed in the context of an existing disciplinary body of knowledge through the use of references.

Cyber security risk has traditionally been encapsulated by the engineering and physical sciences where risk is seen as knowable and measurable. The potential value, however, of cyber security risk artefacts for 'interpretively expressing professional knowledge' (Baskerville, 1991, p.749) has been suggested and the Blackett Review on 'High Impact Low Probability Risks' (Government Office for Science, 2011,) concluded that there is a need for tools that will allow experts to imagine risks in a way that will 'expand the boundaries of their mental models' (p.11).

Accordingly the aim of this research was to evaluate the use of critical design as a research technique for imagining future cyber security risk. We wanted to move beyond the approaches used in VOME and towards a future-looking, creative approach with a practitioner and policy maker user community. We learned three lessons through the workshops.

Firstly, it takes effort for participants to become engaged and conversant with critical design artefacts and there was initial confusion over the purpose and use of the artefacts presented. In time, however, participants commented that the artefacts made them realise how they had become 'dependent on a common language' within their field of expertise and that 'it's hard to move past that'. They did feel that the pieces gave a 'different perspective', that made them 'think differently' and realize, 'how we have normalized images'. While they were beginning to engage in

self-reflection it was difficult to move them beyond this to a more future-thinking level of engagement.

Secondly, participants needed to be given a license to be creative. They had a tendency to retreat to what they have already experienced or believed to be true. This was demonstrated in references to practical questions about cyber security "where are the boundaries to defend – in the cloud, at the end of a network, in a device, or in the user's heads?" and citing of specific implementations of technology such as, 'Mondex, c1993, Natwest' (the unsuccessful invention of an electronic cash system by the National Westminster bank).

Thirdly, participants needed to understand how the artefacts could be experienced. They felt that the artefacts would be 'comprehensible by mums (and dads)' but that, 'they [IT Fauna] need a narrative'. They needed to see how others experienced these artefacts and asked, 'where is the human element?' commenting that the artefacts needed to be 'user activity based'. One participant pointed out that 'the internet is entirely experiential – this is where the art should focus'.

## Conclusion

Critical design for research is often used in the development of new technologies or products. In this research, however, we were exploring its use as part of the risk assessment process for cyber security. The lessons we learned demonstrate that while there is potential for using critical design in this way we need to develop a bridge between the artefacts and the epistemological position traditionally taken towards risk by cyber security practitioners and policy makers. In the next phase of the research we will aim to link critical design with systems thinking as a further development of tools for imaging future cyber security risk. This may well offer a structured way for moving to a more productive level of engagement with the artefacts while giving participants a license to be creative and a way of incorporating the human experience.

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## The Evolution of Silence

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### Abstract

An exploration of memory and destruction, 'The Evolution of Silence' is a multi-dimensional project that involves field research, archival and library research, writing, drawing, imaging, mapping, printmaking, sound recording, video editing, and coding. It is a creative investigation into the visual representation of conflict and focused on the Nevada Test Site – the site of experimental, post-World War II nuclear detonations in the United States.

Part one of the project, a web-based archive, presents an exploration of a restricted landscape, and a visual mapping and interpretation of its destruction. It allows one to bypass government boundaries and control of the area, making it possible for any individual to experience a cold war's aftermath and silence. The project gives form and expression to various forms of data, and is unique to other existing documentation of the Nevada Test Site in that it preserves an individual view of every nuclear detonation that occurred in Yucca Flat valley. Eight hundred and twenty-eight (828) nuclear explosions occurred in Yucca Flat alone and, as a result of many of these, the valley is pockmarked with sink-hole craters. It is my goal to bring attention to this neglected area as an important symbol of the impact of war.

The project also reveals and memorializes the role that display mannequins played in the Federal Civil Defense program. Representing human subjects, they experienced the force of nuclear explosions in the 1950s. By integrating documentation and creative interpretations of these figures, I address disappearance, damage, and irradiation. Their story offers compelling historical perspective on the cultural view of the atomic bomb and on the human toll of war.

Methodical and expressive, the archive synthesizes objective information, integrates visual, textual and audio interpretations, and presents a dynamic structure and interactive framework in which viewers engage and explore transformation and conflict.

### Author Keywords

War; conflict; representation; mapping; archive; visual design

### Research Imperatives

My research is motivated by a concern for how violence is represented, aestheticized, and reconciled within culture. In particular I ask, how does the information of war and the ways in which it is made visible and understandable shape our perspective of conflict? What role does the media play in defining our experience and how should this be critiqued? What is the relationship of the archive and memorial to an evolving field of data visualization?

These questions inform my creative investigation and critical perspective. My approach involves examining the impact of events and their dynamics, exploring multi-media language (image, sound, text, motion, code), pursuing archival and investigative research, and creating critical interactive experiences whereby the viewer actively dismantles the aggregate image of war, and confronts the scale of violence that has taken place. My research aims to reveal and subvert reductive tendencies in data visualization, in favor of processes that convey multiple points of view, detail, and emotion.



Figure 2. Yucca Flat: Google Earth Map. I mapped the locations of detonations and then took a screen shot of the site of each individual detonation.

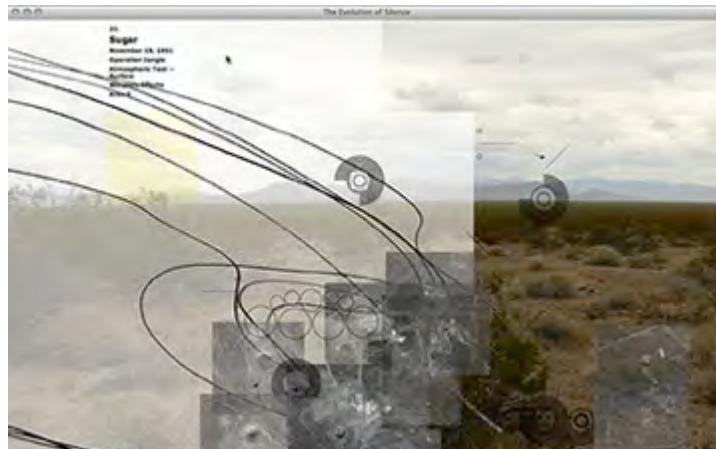


Figure 1. Screen shot of 'The Evolution of Silence' web-based archive.



White duck pants and shirt and nylon jacket with fleece lining, leather shoes.  
Jacket had a large burn in the back about the size of a Cadillac hub cap. This jacket was lined with all nylon fleece but the fleece allowed no signs of burn.

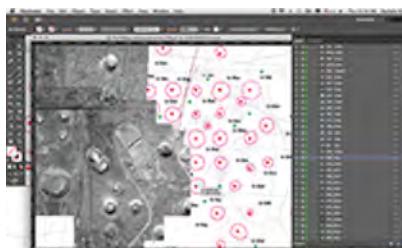
Figure 3. 1953 J.C. Penney advertisement showcasing 'before' and 'after' states of the L.A. Darling Co. Mannequins used in the March 17, 1953 Annie Test. (detail)  
Image courtesy of Nevada Test Site Historical Foundation.

## Research Process

My research process involves collecting, understanding, presenting and interpreting historical data through the use of various media formats and the layering of perspectives from different sources (Fig. 1). I have consulted published books, newspaper articles, oral history accounts (some housed at the Library of Congress in Washington, D.C., the Cahlan Research Library at the Nevada State Museum, and the University of Nevada Las Vegas (UNLV) Special Collections). I have collected, interpreted, and scanned: maps, data, photos, films, and text documents (published by the U.S. Department of Energy (or the former Atomic Energy Commission), the National Nuclear Security Administration, and the United States Geological Survey, and archived at the Nuclear Testing Archive, the National Archives, the UNLV Special Collections, the Cahlan Research Library). I came to know the Nevada Test Site (NTS) visually and understand its landmarks, initially through the Web via Google Earth and later via high-resolution satellite images granted from the GeoEye Foundation. I also know the place from my notes, sketches, conversations, and

the memory of the two field visits I have made, and by hiking the nearby National Desert Wildlife Refuge, whose landscape closely resembles Yucca Flat. From this variety of material and experience, I create visual/typographic/time-based/interactive explorations that interpret the dynamics of the place through combinations of video, drawing, scanning, sound design, writing, photography, mapping, and interactive forms. I have conducted a few rounds of iterations on the web-based archive alone, seeking a balance between optimization, accessibility, and complexity.

I was initially inspired to take on the subject of nuclear testing after reading, 'Savage Dreams' by Rebecca Solnit, in which the politics and history of two contested landscapes in the U.S. (one was the Nevada Test Site) are discussed. Further inquiry via the Web revealed a graphically striking landscape of hundreds of craters and I was intrigued to investigate the ways Yucca Flat valley symbolized the activity and impact of war. I began the project in 2008 with library research to learn more about nuclear testing. In May 2008, supported by a Faculty Research Grant from the University of North Carolina Charlotte, I made my first field visit to the Nevada Test Site. The Nevada Test Site is located approximately 65 miles north of the city of Las Vegas. Day-long bus tours are conducted monthly and are led by former Department of Energy employees, individuals who had worked on the site and had been involved in the testing program. We were driven through various areas within the Test Site (Mercury, Frenchmen Flat and Yucca Flat) and among the ruins and debris of nuclear testing: driving inside the low and wide Bilby Crater, and around parts of bridges, concrete structures, and a solitary brick house (from the 1955 Apple Test in Area 4). The tour culminates with a stop at Sedan Crater (at the northeastern part of Yucca Flat valley). At this point we were allowed to step off the bus and stand at the crater's edge. Created July 6, 1962, it is the largest crater of the nuclear testing program with a depth of 320 feet (100 meters) and a diameter of 1,280 feet (390 meters).



*Figure 4. Tiling/Mapping every nuclear detonation in Yucca Flat. Using a United States Geological Survey map to identify nuclear tests, I determine the 'x, y' coordinates for my geographic map view for the web.*



*Figure 5. Tiling/Mapping in process.*



*Figure 6. Tiling/Mapping in process, overview of entire image.*

No photography, video, or sound recording is allowed within the Nevada Test Site. Over the course of three days, I traveled along the roads and to the towns that surround the restricted areas of the Nevada Test Site and the Nellis Air Force Testing Range. On that same trip I began my archival research at the UNLV Special Collections Library, the Atomic Testing Museum, Nuclear Testing Archive, and the Cahalan Research Library at the Nevada State Museum.

I continued my research at the Library of Congress in Washington, D.C. in the summer of 2009. After consolidating data from government and archival sources to create one list of every detonation that occurred in the Yucca Flat area, I began sketching, concept mapping, and making visual explorations of the valley. In Fall/Winter of 2009, I mapped each explosion by name, date, and created in Google Earth. In 'satellite view,' I systematically took a screen shot of each location, creating an image that represented the site of every nuclear detonation (Fig. 2).

In 2010, I organized my imagery and content, and developed concepts for designing interaction. After researching and testing experiments in JQuery, HTML, CSS, I designed and developed my first web-based prototype. In spring 2011, I received a Faculty Research Enrichment Grant from The University of the Arts to work with a technical consultant to optimize the site and to code a version that dynamically pulls from my master list of data (an Excel sheet). I worked independently to refine the code and develop more layers; created videos, sounds, and writing to include in the archive.

Initially, the website presented a chronological view of all detonations that occurred in the valley (Fig. 7). I spent several weeks in Fall 2012, while on a Semester Course Release from The University of the Arts, tiling the individual images of each detonation in a map in Illustrator to determine their 'x, y' coordinates in relationship to one another (Figs. 4, 5, 6). Now online, the web browser dynamically interprets and generates a

geographic view of the valley from these coordinate values (Figs. 8, 9, 10). In this version, the detonation sites (and craters) are presented by location. In Fall 2012, I received a Research Imagery Grant of six high-resolution images of Yucca Flat for use in my project from the GeoEye Foundation. I conducted further archival research at the National Archives in College Park, MD in the photography, film, and military documents collections. I made a second field visit to the Nevada Test Site and the National Desert Wildlife Refuge, conducted further archival research at the UNLV Special Collections and the Cahalan Research Library, and consulted with Las Vegas historians and curators on questions surrounding the use of mannequins in nuclear testing (Fig. 3) and of their supposed tour of the U.S. after having been removed from the Test Site. I was able to find evidence of their public display in downtown Los Angeles, CA in 1953. The whereabouts of the mannequins remain unknown.

In 2012, after having filed a Freedom of Information Act Request with the U.S. Government in 2011, I received access to 'before and after' photographs taken by the USGS for their mapping projects. Currently, I am planning ways to incorporate this recently uncovered archival material into the web-based archive, as well as my images, sounds, writing, videos and animations. A research and design process Blog, started September 2012, is online at: <http://blog.racheleriley.com>.

## Research Outcomes

'The Evolution of Silence' encompasses research into a visually arresting and symbolic landscape. After initial explorations in video and drawing, I began planning and experimenting with mapping the valley, and eventually created a web-based exploratory format. The interactive experience reveals multiple dimensions, one of which presents official information about nuclear tests from government records, while other dimensions, anecdotal and expressive, include visuals and references from research, newspaper accounts, advertisements, and interpretations in writing, sound, and



Figure 7. An earlier iteration of the web-based archive in which detonations are arranged by time.



Figure 8. 'The Evolution of Silence' web-based archive, geographic view.

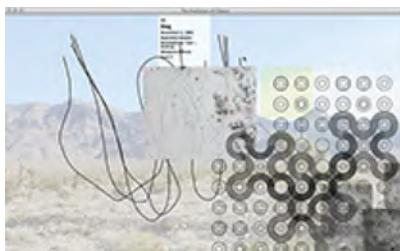


Figure 9. 'The Evolution of Silence' web-based archive, geographic view with layers visible.

animation. Together these multiple dimensions represent the traces, instants, memories, and fragments of what happened, and contribute to the experiential and open-ended nature of the project. 'All archives are realized in destruction, preserved by traces of destruction' (Lippit, 2005, p.9).

My research emphasizes the eight hundred and twenty-eight (828) individual nuclear detonations that occurred in Yucca Flat, in ways that other documentation of the Nevada Test Site either does not do at all or does not do visually (Fig. 10). In addition, I focus on the 'before and after' of transformation. For the landscape, employees, and residents of the area an accumulative impact of explosive instants brought about dramatic change. I investigate the damage to the valley itself—made visual by the presence of hundreds of sink-hole craters, and to people and culture—partially explored through the stories of the L.A. Darling Co. display mannequins which, representing human subjects, experienced the force of nuclear explosions in the 1950's. For each of these areas of focus, I reveal previously unpublished documentation, and create prints and animations that explore the disappearance and destruction. The macabre presence of the mannequins, used in post-nuclear-test marketing materials to promote Civil Defense strategies in the U.S. in the 1950s, points to the human cost of war, to those affected by nuclear fallout. I have created a sub-site under the March 17, 1953 Annie Test which presents their story and interpretations of their damage.

The archive is political—it documents a contested landscape that was appropriated by the U.S. government in 1951 as a 'more convenient' place to test nuclear weapons. It provides a reflective experience whereby the area is conceptually reclaimed. Calling attention to the activity of this remote area raises awareness about nuclear weapons, and contributes to the discussion of government activity, control, and ethics. The archive is aesthetic and a resource for further research on the topic, embodying and sharing previously unreleased archival photos, government documents, official reports on the impact of testing on the ecology of the Nevada Test Site,

maps, and anecdotal documentations. The project aims to make this off-limits, remote, and historically significant place more knowable. There is always more to discover and to include: 'the more knowledge (grows) the greater the unknown (grows)...The more information flashes by, the more we are aware of its incomplete, fragmentary nature' (Virilio, 1991, p. 45). The project embraces what is fragmentary about memory and ruin. 'To make peace (with acts of violence) is to forget. To reconcile, it is necessary that memory be faulty and limited' (Sontag, 2004, p.115).



Figure 10. Screen shot of 'The Evolution of Silence' web-based archive.

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# Exploring 3D-Printed Structures Through Textile Design

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## Abstract

This paper discusses novel, 3D-printed structures that are the result of an exploration through geometries and textiles to create auxetic structures. Auxetic materials are those that expand, when stretched, in a direction transverse to the stretch. 3D-printing is the most recent exploration in a research project into weft-knitted auxetic textiles that aims to populate development in this area, previously dominated by engineering disciplines, with a clear design-led presence.

The physical work consists of knitted fabrics with designs inspired and informed by auxetic geometries; these are then translated into rubber and plastic 3D-printed structures. The production of these geometries is a distinct development from those usually created via a process of mathematical and computer modelling. The geometry is based solely on the product outcome of modelling through knitting. This acknowledges the discrepancy between the programmed, theoretical pattern and the knitted object. This shape is then translated into a form that can be produced as a 3D-print in a material with different properties from those of any textile fibre. By this method, exploration through knitting can demonstrate an original way of designing geometries through design, experimentation and physical means.

Although the knitted fabrics and the 3D-prints display very different aesthetics and handle, the auxetic effect has been transposed by applying the geometric concept of the fabric. This shows promise for textile making to act as a template for modelling complex structures, which can be translated into different media, thereby widening potential applications exponentially.

## Author Keywords

Textile design; knitted structures; auxetic structures; structure modelling; 3D-printing; making.

## Research Imperatives

This research came about through a dis-satisfaction with the under-representation of design methodologies in work considered under the wide umbrella of *technical textiles*.

The wide contribution of both design and craft practices to the development of textile research and commerciality is often overlooked in favour of a scientific method (El-Moghaazy, 2009). Through a carefully positioned project, which champions the use of a creative practice as a methodology for conceiving, developing and making, the inherent values of this subject are tested for their validity.

It is important to the project that an experimental and relaxed methodology that allows for experiential knowledge is allowed to occur naturally. The approach is one of a designer and has many commonalities with craft practice.

## Context

Auxetic materials are those, which have a negative Poisson's ratio - an expansion in a direction transverse to that of an applied stretch (fig. 1). These materials were first discussed in materials research by Rod Lakes (1987). Auxetic structures span a wide range of materials. Significant research has been conducted on theoretical geometries, which are tested via mathematical modelling (Liu and Hu, 2010). The modelling of these structures involves a need for an

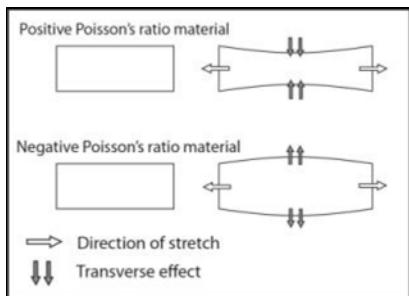


Figure 1. Auxetic effect.

Described in engineering terms as a negative Poisson's ratio.

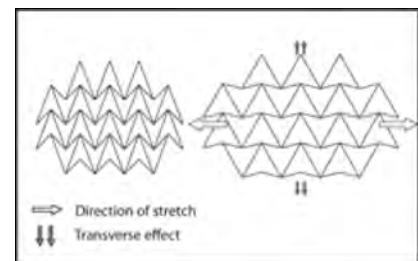


Figure 2. 'Double arrowhead' structure.

Shows a re-entrant structure, which served as inspiration for the chevron forms in the knitted fabrics and subsequent prints.



Figure 3. Weft-knitted auxetic structure shown in placement on plain knitted fabric.

The knitted textile development took place at Nottingham Trent University on electronic Stoll knitting machines. This took

acute understanding of the structure before the physical making of an object. This methodology is likened to a scientific method (Farrell and Hooker, 2012), and is in contrast to the method used in this research to develop auxetic geometries.

### Methods and methodologies

The methods used in developing the outlined research adopt a design approach adapted from textile and apparel design. Here, the most important stage is the physical production of materials. Through repeated sampling and adaptation stages, the desired effects (in this case of auxetic behaviour) are refined.

### Research Process

inspiration from established auxetic geometries (Fig. 2) and applied experiential knowledge to establish the geometries into functioning auxetic fabrics (Glazzard and Breedon, 2011). This practice used free and subjective methods alongside measures of behaviour (using both qualitative and quantitative methods) to alter the aesthetics, quality, yarn choice, and stitch structure of the samples (Figs.3 and 5). In a desire to quantify the effect of the auxetic structure of the knitted fabrics, the final appearance of the most successful fabrics was replicated in diagrammatic form (Fig. 4).

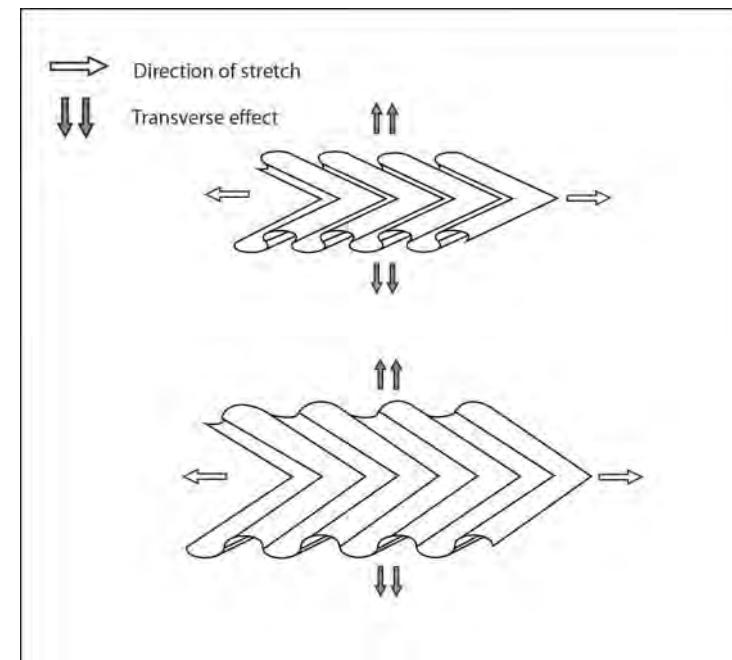


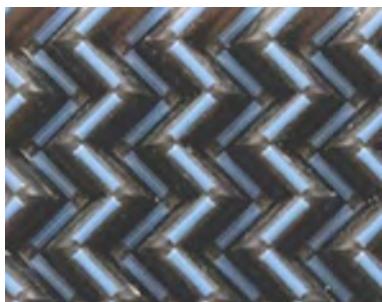
Figure 4. Diagram showing the effect of stretching the fabric (in figure 3), as based on the final physical form.

The decision was made to choose the final form of the sample to better match the final geometry of the fabric, rather than the conceptual model of the structure, both of which are often



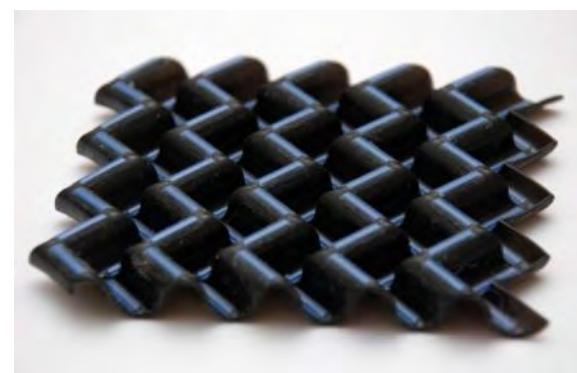
*Figure 5. Close-up of knitted auxetic fabric.*

*Shown here in covered elastic yarn, knitted on 14 gauge electronic Stoll knitting machine.*



*Figure 7. Close-up of 3D-printed structure in two materials.*

*Printed using black rubber main with supporting ligaments in white plastic.*



*Figure 6. The first replication of the geometric model. A rubber 3D-print with plastic ligaments.*

significantly different. Here, printed forms were made that copied the physical profiles of the most successfully auxetic of the knitted fabrics, chosen from results of testing at an earlier stage in the research. The printed structure in two variations (one with a rubber-like material with added hard, plastic struts on some of the ligaments (Figs. 6 and 7) and one with only the rubber (Fig. 8), showed similar auxetic behaviour to the knitted fabric.

The originality of this method is that the 3D-printed material could not be produced in any other way. Much like a craft methodology, the development relies on tacit and experiential knowledge at each stage (Harrod, 2007). The geometry developed is different from other auxetic geometric models and uses knowledge of different materials and handle (see fig. 9) in a way well known and integral to textile design, but unusual in the auxetic field.

## Research outcomes



*Figure 8. Second replication of the geometric model using rubber only and increased condensing of the form.*

The use of a knitted geometry as a process to create an auxetic shape was tested, and proven to be successful. Also, the method of working from a physical outcome, to develop a model through a design process was proven to be successful (as seen in Fig. 10).

The implications for this material are that, where a knitted fabric can be seen to be unsuitable (for example, due to porosity, scale limitations or uneven stretch), the production of a plastic, rubber or different solid could greatly expand the application potentials. Furthermore, it would be easier to produce shaped or tubular versions that may be limited in the original knitted geometry. This complements feedback from focus groups, who, when discussing the knitted fabrics, often envisaged applications for auxetic structures, which would not be suited to knitted fabrics, such as sails, a skate park landscape, building materials, medical items such as stents.



Figure 9. Close-up of knitted auxetic fabrics showing alternative effects available using a knitted textile craft methodology.



Figure 10. Details showing the transverse expansion of 3D-print showing expansion when stretched in the length.

## Conclusions

Final material products have been developed through a process of making that is only replicable through the experiential and tacit knowledge of the designer in the role of the manufacturer.

The experiential knowledge involved in the process of designing the fabric and then choosing the most relevant aspects of a sample to its behaviour (rather than its most logical aspects) is unique to each designer in the manner of a craft process.

Knitted fabrics are regular and highly structured, but the results of combining yarns, stitch structures, tensions and gauges are often unpredictable. The theoretical structure and the actual form are often significantly different and it takes time and practice for a practitioner to be able to draw out the differences between desired effect, inherent fabric properties and unexpected side effects of the decisions made in the design process.

## Acknowledgements

3D-prints made at Aalto University, Helsinki. Programmed and printed in collaboration with Vanja Valencak and Jussi Mikkonen.

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# Collaboration across design disciplines to create a new designer maker's tool

## Abstract



Figure 1. Final Design.

This cross-discipline collaboration was initiated to create a design tool that enhances creative use and accuracy in fashion pattern construction, a tracing wheel. A tracing wheel aids the pattern designer to translate a 3D Moulage design developed on a mannequin into a flat paper pattern. This pattern can then be used to create a final garment with accuracy in the desired cloth. The Moulage process is used by couturier houses to obtain complex shapes that are difficult to achieve through flat pattern cutting.

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The manufactured tracing wheels available in the market are generally made from plastic and a cheap metal wheel. They look like toy cowboy spurs. The spur wheel is the pricking implement that rolls through the calico prototype to obtain a 'traced' pattern. The differing tracing wheels available lack tactile ergonomic use and/or do not leave a defined 'prick' in the paper required to obtain an accurate pattern.

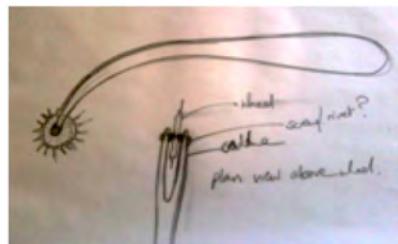
The case to hold this tool will be of equal importance to the tool itself, a protective barrier that holds the respected tool as a jewel. A maker and their tools have a synergy. As in Sweeny Todd talking about his razors as an extension of his arm; "these are my friends, see how they glisten, see this one shine, how he smiles in the light, my friend, my faithful friend" (Sondheim, 2010). The product designer in conversation with the fashion designer have worked through the problems of use in current and vintage tools. Both designers have contributed to the process in exploring flatware designs (cutlery) for weight and hand feel, making sketches, CAD representations and modelling in OBO Model Board. Through several iterations the finalised design has been executed in brass. The weight of the Brass in the product is hoped to give a better hand feel and a positive user experience. It is intended to translate a cheap plastic tool to one that has greater worth, feel and responsiveness to inspire further creativity in pattern translation. A tool that may engender continued pleasurable use in creative pattern cutting.

## Author Keywords

Moulage; Pattern Wheel; Tool; Ergonomics; Materials Exploration; Dialogue.



*Figure 2. Existing Plastic handle Tracing Wheels. The tool on the left has burs left by the plastic molding processes that are sharp in the palm of the hand. The tool on the right has a pressed metal wheel with blunt serrated points.*



*Figure 3. Pre sketch that initiated the collaborative conversation.*

## Research Imperatives

This practice based research was a response to the inadequacies of a pattern cutting tool, the tracing wheel. A tracing wheel aids fashion design pattern cutters to translate pattern pieces accurately onto paper. Designers will often moulage an idea on a mannequin, molding, draping, easing, shaping and forming fabric around a substitute human form. This 3D construction is dismantled from the mannequin with all the annotations and traced through the fabric with the pin pricks from the tracing wheel in order to obtain a flat pattern that when cut in the desired cloth will form the final garment. The current tracing wheel tools vary from those with cheap plastic handles with sharp burs left from the molding process to those with wooden handles on a metal shank with thin pressed serrated wheels that leave a blunt impression on the pattern paper (Fig. 2).

Danny Duquemin-Sheil from Northumbria Designers in Residence has been building a body of work that explores tools for everyday living. The Designers in Residence latest inquiry is to form a partnership for a collaborative project. Danny and Fashion Design Academic Sarah Morehead discussed tools in fashion design and the increasingly disposable nature of tools that did not enhance the user's performance but possibly hindered the processes through discomfort in use.

This new tracing wheel tool was to sit comfortably in the hand, feel smooth to touch, keep the wrist at a consistent angle and have greater aesthetic appeal than those already available for purchase. The cost of the tool would be considerably more expensive than current disposable models and possibly equal in value to a good knife. Like any artist, having the right tools to craft your work is vitally important. Having a connection to those tools that they become an extension of your physique adds to this interplay of body and tool.

## Research Process

Initial conversations between the two designers were about the tool, its function, existing products and their strengths and weaknesses. The cheap, disposable products available on the market were neither visually appealing nor ergonomic in handle design (Fig. 4).



*Figure 4. Examples of existing products, their handles and wheel structures.*

Danny became aware through demonstration from Sarah of what the tool should be able to do and the short comings of existing tools. This led to a series of rough sketches to explain in more detail the tool's function and aesthetics (Fig. 3). Each designer discussed 3 D forms that could be relevant to the design and making of a more elegant tracing wheel tool. Danny bought different sculptural Japanese bamboo knives, spoons and strainers whilst Sarah shared an understanding of how historic cutlery might



*Figure 5. CAD illustration of wheel area.*



*Figure 6. Japanese Bamboo Tools.*



*Figure 7. Contemporary Pistol Flatware*

inform the process (Brown, 2001). The simple forms of the molded and cut bamboo were very elegant (Fig. 6). The Pistol and Rattail designs of 18<sup>th</sup> century cutlery offered a tactile shape that could sit across the palm of the hand with comfort (Fig. 7). Through conversation and overt and discreet demonstration each practitioner gained knowledge and understanding of the materials and processes required to create the tool. Discreet demonstration as in the hand movements and body gestures that accompanied the conversations which gave a richer understanding of the joint process we were undertaking.

Through exploring, handling and feeling the shapes of modern bamboo and traditional cutlery the first developments, sketches and model in OBO modeling foam were produced. The tool was to fit an average size 7 hand. In the first model the handle fell into the cup of the hand, from user experience this can cause pressure when pushing the wheel into the small bones in this area resulting in pain. The second iteration was elongated to sit on the mound of flesh, the Hypothenar muscle group opposite the thumb group of muscles called the Thenar (Fig. 8). the length of the tool was now established along with the upper girth and comfort in the palm. Focus was now placed on how the fingers curved around the tool to grip the handle. The underside area of the tool where the fingers curl back to grip was skived and pared to enable an internal precision grip. The forefinger should direct and control the wheel as a drawing implement. The area above the wheel needed to be of sufficient width to comfortably rest the pad of the finger at a relaxed angle. The shape of the tool was to enable good grip and minimal effort in wrist movement allowing an imaginary straight line through the pad of the forefinger through the hand and up the wrist to the forearm (Fig. 1). All of these parameters had informed the subsequent models. At each stage we discussed the evolving aesthetic. To Sarah, the now functional tool needed to have a more jewel like aesthetic and to encompass the elegance of fine dining. For Danny the tool had become an elegant bird like form.

Danny designed the steel spiked brass wheel through CAD and provided the details to enable a local engineer company to provide a costing (Fig. 5). Dialogue with Tom Jones from M Machine, the specialist in this area of manufacture, offered two ways of executing this component. Handmade would cost £300 and to have a production tool made for batch work would be similar. At this point we discussed refining the spiked wheel from an older tool for inclusion and attachment to our newly formed handle. This wheel was ground and polished to give a more considered aesthetic appeal to the pinched brass structure that holds in the conical steel points. Danny made a special wooden clamp to hold the wheel whilst grinding and polishing the faces of each side of the hub. He developed a tool to create another tool. The sex bolt that holds the spiked wheel in place was purloined from an old Anglepoise light. This dictated the size of the central hub hole and is aesthetically larger than desired.

The box is of wooden construction with the inner area routed and lined to hold the instrument in place. The lining will be in crushed velvet or similar to reflect the inside of a snooker case, jewel box or cutlery canteen, (see link to Maria Theresia Vienna). The new tracing wheel is considered as an item to be cared for much in the same way as a snooker player carries their own identifiable cue in its bespoke case. This tracing wheel should also have its own ceremonial space.



*Figure 8. Hypotenar and Thenar.*



Figure 10. Finished design.



Figure 11. Wheel Section, Sex Bolt is too  
rge.



Figure 9. Filing and refining final tool.

## Research Outcomes

The journey and understanding between each different design discipline, 3D product and fashion, has led to a wider knowledge in hard and soft materials and the performance qualities of hand tools. The process has brought a mutual acknowledgement in how we explain and communicate ideas through pre sketch, actions, conversations, metaphors and the different vocabularies of each discipline. Performance of the user is inextricably linked to the performance of the tool and has impact on the creative flow and intentions of the creator. Disposable tools impinge on how we feel about our craft processes whilst using them. We are more conscious of the negative sensations of the tool in use. A tool that becomes a seamless extension of our selves and where we become less conscious of its presence enables an interrupted creative flow. When we put the tool away, look after it, we take ownership of its function and ability to perform for us in a pleasing manner. This in turn builds pleasurable memories of positive use, creating a virtuous circle of care, use and performance.

It is understandable that sons wish to care for their fathers tools which although grey and worn through time have a stronger construction, feel and lasting performance. Good tools have emotional resonance. This tool in solid brass has elicited

conversations about similarity to flatware. Flatware, cutlery, also has to feel comfortable in the hand as a discreet but pleasurable tool to aid dining. Affluent travelers' during the 18<sup>th</sup> century carried their own flatware housed in elegant boxes, (see Britannica reference). This tracing wheel has been created with the same consideration. The tool is expensive in comparison to its disposable counterparts. It was not necessarily intended for mass manufacture and would be comparable in price to a good pair of drop forged English bespoke shears. However, it could be cast in brass to make the tool more economically viable as a product. As many musicians are aware, practicing with a beautifully made instrument aids positive feedback through both sounds and touch. The tracing wheel tool was intended to aid the connectivity of man to craft and the welding of materials in creative flow. Just like the musician, the greater connectivity to the tool, the greater the reward in learning, performance and tacit understanding (Figs. 10,11,12).

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Figure 12. Finished design.

# Technological Microcosms – Considering Materiality and Collaborative Practice in the Creation of Wearable Futures

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### Abstract

With the increased prevalence of digital technologies in our everyday lives, the questions posed to the contemporary craft practitioner regarding creation of an emotionally resonant interaction between the digitally enhanced object and its wearer have become progressively more prominent in the applied arts. Through examining the notion that human biology is a part of material culture, my research explores how recent developments in material science and wearable technologies can be viewed as contiguous rather than oppositional to the organic processes of the human body and how to bridge the gap between the craft practitioner and scientific discovery. More immediately, this research challenges the perception of smart materials and their application within the field of contemporary jewellery in both an artistic and scientific context through proposing the development of symbiotic stimulus-reactive jewellery organisms. Bringing together digital methods of fabrication with craft methodologies, I use materials such as silicone in conjunction with thermochromic pigments to create objects that respond intimately to changes in the body of the wearer and the environment. Potential practical applications for these jewellery objects exist in the areas of human-computer interaction, transplant technology, identity management and artificial body modification, where such symbiotic jewellery organisms could be used to develop visually engaging, multifunctional enhancements of the body.

### Author Keywords

Smart Materials; Wearable Futures; Contemporary Jewellery; Rapid Prototyping; Thermochromics; Collaborative Practice

### Research Imperatives

The idea of creating a jewellery organism that comes alive on the body has fascinated and inspired my research ever since learning about the potential inherent in smart materials almost ten years ago. While smart materials have been known to scientists for far longer (Huang et al., 2010) and have been used to great effect in engineering and aeronautic applications as actuators, their use in contemporary art and craft has been sporadic, most likely because of the challenges posed in accessing, processing and shaping them. Many smart materials with the most fascinating characteristics are not yet commercially available to the contemporary craft practitioner, and can only be accessed through a process of seeking out collaborative relationships with the scientific community or industrial producers. How the gap between the practitioner and cutting-edge scientific discovery can be bridged to facilitate such collaborative efforts and benefit all parties involved is a key question of this research. Developing a holistic approach whereby material experimentation and digital production processes are used to facilitate the development of a coherent aesthetic language that supersedes ideas of mere gadgetry and enables wearable technologies to be imbued with life is at the centre of my research. I challenge the perception of smart materials and their application within the field of contemporary jewellery in both an artistic and scientific context by exploring the use of thermochromic pigments and microelectronic components to develop symbiotic stimulus-reactive jewellery organisms that are visually engaging yet multifunctional enhancements of the human body (Figs. 1 and 2). The permeation of digital technologies into even the most personal realms of our day-to-day lives has facilitated the acceptance of the concept of cybernetically modified bodies through advances in medical technologies and procedures (Bland, 2010, Clark, 2003). Craft Practitioners who define themselves as *technical creatives*,



*Figure 1. The Geotronic Brooch contains a programmable colour LED which is set to beat like a human heart.*



*Figure 2: Kathy Vones, Geotronic Brooch in darkness, Silicone, Copper, Vitreous Enamel, Sandstone, Electronic Components, 18ct Gold (2013)*

well versed in both scientific and artistic methodologies and working on the development of wearable futures (Miodownik, 2003), are moving towards a present in which technology could become permanently integrated into the complex systems of the human body. The possibilities and challenges facing the contemporary jeweller in particular, to advance the debate surrounding the modified body and interactive adornment while engaging in successful collaborative projects with partners from the scientific community, will constitute the focus of this research.

## Research Process

My research process focuses on the concept of playful practice and its emphasis on material experimentation. The process of prototyping is one of the methodological cornerstones of playful practice and is often regarded as being one of the final steps within

*“Craft has been described as being “without design” [...] It is continuous, rather than discreet in nature, and it is suggested that this is the root of the ‘holistic’ perception of craft.” (Kettley, 2005, p.10)*

the linear process of problem/need identification – visualisation – prototyping – testing applied in product design and its related disciplines. However, it is less well recognised as being an integral part of contemporary craft, and within the context of disciplines such as fashion, ceramics and jewellery design, prototyping is often referred to as making ‘test-pieces’ or ‘mock-ups’ – a description that belies the huge potential inherent in this creative process. In her investigation of design principles used with contemporary craft, Sarah Kettley successfully identifies the internalisation of a particular material or process achieved through visceral immersion through manipulation, handling, repeated exposure and drawing as one of the key factors in imbuing crafted objects with emotionally resonant qualities that transcend mere artistic and personal expression (Kettley, 2005). As soon as playfulness is combined with prototyping, a creative process of trial and error emerges that can yield innovative and sometimes unexpected results (Lieberman, 1977). Using design methods such as drawing, photo studies, collage, image boards, experiments, personal inventories, generative design and prototyping (Martin and Hanington, 2012), my research process consists of developing a series of material experiments as well as finished jewellery pieces and objects based aesthetically on microscopic structures found in the natural world. Over the last twelve months, particular emphasis was placed on developing complex silicone shapes with the help of three-dimensional printing technologies that integrate thermochromic Leuco dye pigments to achieve temperature induced colour change cycles. During a series of controlled experiments, ratios of liquid Leuco dyes increasing in increments of 0.1ml were mixed with silicone compounds and carefully controlled amounts of powdered artist pigments to achieve varying degrees of colouration and transparency in the finished silicone shapes. It was discovered that upon reaching the activation temperature of approximately 31°C the Leuco dyes reach transparency and reveal the underlying pigmentation stemming from the addition of artist pigments (Figs. 3 and 4). Upon cooling, the thermochromic pigments are restored to their original opaque state, thus reversing the colour change. This cycle is repeatable infinitely, although further long-term testing is



Figure 3. A temperature induced colour change cycle (low to high) from magenta to blue in thermochromic silicone samples for the Cocoon Earring series.

Figure 4. Below is an example of the colour range achievable in combining thermochromic Leuco Dyes with Silicone



necessary to check for material fatigue and discolouration. It is hoped that through future collaboration the potential of thermochromic liquid crystals and their spectral colour change cycles can be investigated in this context.

## Research Outcomes

The *Cocoon Earring* (Figs. 5 and 6) exhibited at the *Praxis and Poetics* Conference represents the first of my research outcomes to combine thermochromic silicone shapes and a three-dimensionally printed structure with microelectronic components while achieving stimulus reactivity. Unlike its predecessors the *Geotronic Brooch* (Figs. 1&2) and the *Mycelia Brooch* (Fig. 7), which relied either on pre-programmed cyclical responses or external light stimuli to create interactivity while being worn, the *Cocoon Earring* reacts intimately to the biological impulses created by the human body. Through the incorporation of a pulse sensor in the clip-on earring finding, the wearer's heartbeat is measured continuously when the *Cocoon Earring* is fitted onto the earlobe. As soon as the wearer's heart rate rises from its established base levels, a signal is sent to a small microcontroller. This signal is in turn translated into heat impulses and sent into thin wires embedded in the thermochromic silicone shapes. The heat from the embedded wires gradually starts to activate the thermochromic pigments and the silicone shapes start to change colour as the heat is distributed throughout. If the wearer's heart rate falls back to its established base rate, the wires start to cool and the thermochromic pigment slowly returns to its initial inactive state, thus reversing the colour change in the silicone shapes.



Figure 5. Kathy Vones, *Cocoon Earring* - first production sample incorporating thermochromic silicone shapes and a sandstone structure (2013).

While relatively large in scale, the *Cocoon Earring* is designed to almost fully envelop the ear conch to create the impression of a calcified growth that emerges from the ear. This further emphasises the concept of a jewellery organism that is intimately connected to the wearer, thus creating an original visual language that transcends functional considerations and focuses on harmoniously integrating microelectronic components and smart materials into an object that is both aesthetically as well as functionally resolved.

Through engaging in a holistic process of material immersion and experimentation I am developing a body of work that is emotionally resonant while leaving space for serendipitous discovery. The rise of *technical creatives* represents a new breed of studio artist, equipped to contribute to the debate surrounding the role of the practitioner in an age defined by digital revolution and material discovery. Against a background of growing fascination with and reliance upon technologies and devices that contain some form of interactivity, my research provides an essential part of developing a discourse on the place symbiotic jewellery and the contemporary craft practitioner occupy within this setting. The challenge to

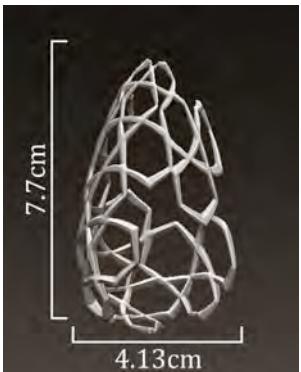


Figure 6. Three Dimensional Design Drawing of the Cocoon Earring

*"The real value of a model or simulation may stem less from its ability to test a hypothesis than from its power to generate useful surprise. [...] It holds equally true that chance favours the prepared prototype: models and simulations can and should be media to create and capture surprise and serendipity."* (Schrage, 2000, p.117)

reconfigure craft-based techniques and aesthetic considerations within a methodological framework focused on the user experience of wearing and interacting with stimulus-reactive jewellery objects will provide the basis for the further development of these ideas in a variety of practical applications.

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Figure 7. Kathy Vones, Mycelia Brooch, Sterling Silver, 18ct Gold, Silicone, Mineral (2012).

*This piece was inspired by growth patterns of microscopic fungi and the silicone shapes contain UV reactive pigment.*

# FutureFactories: Practice-Based Research in the Creative Use of Digital Design and Manufacturing Technologies

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## Abstract

FutureFactories is a research program exploring the creative potential of emerging digital design and manufacturing technologies specifically Additive Manufacture (AM) or 3D printing. The project developed from the author's practice-based PhD study in 2003. A central aim has been mass-individualisation, defined as the industrial scale production of one-off artefacts. Whilst mass manufacturing has made quality products affordable, their ubiquity and omnipresence brings an associated sense of devaluation and disposability. Functional, durable products are often replaced as a result of emotional responses such as identity, convenience and status rather than actual need (Chapman, 2005). Making each and every artefact unique in some way might encourage a consumer-product emotional attachment; sentiment often associated with bespoke, pre-industrial, handmade artefacts. This project explores how individualised production might be achieved without losing the economic efficiency (and associated market supported product development opportunities) of mass-manufacture. The study combines parametric Computer Aided Design (CAD) and computer programming in a computational design approach that facilitates the automated generation of variants. Coupled with the flexibility of additive manufacture this allows tangible personalised products to be 'printed' direct from on-screen meta-designs (Atkinson and Dean, 2003). These virtual templates remain in a constant state of flux, generating alternate design variants as and when required.

Early in the project a distinction was drawn between mass-individualisation, with changes in form outside of the customer's

control, and mass customisation, where the product is configured to a specific consumer need or desire (Davies, 1987).

Through a series of case studies, this paper will describe attempts to personalise industrially manufactured artefacts and to engage consumers in the creative process. The research questions explored include the potential to 'add value' through customised production; the design of a solution space rather than a singular optimal solution and the retention of a coherent and functional design solution in spite of automatically generated variance.

## Author Keywords

3D Printing; Additive Manufacturing; Digital Manufacturing; Individualisation; Customisation; Computational Design.

## Research Imperatives

- Creative possibilities
- Emotional attachment
- Customisation/ individualisation



Figure 1. Tuber iterations 1 - 5

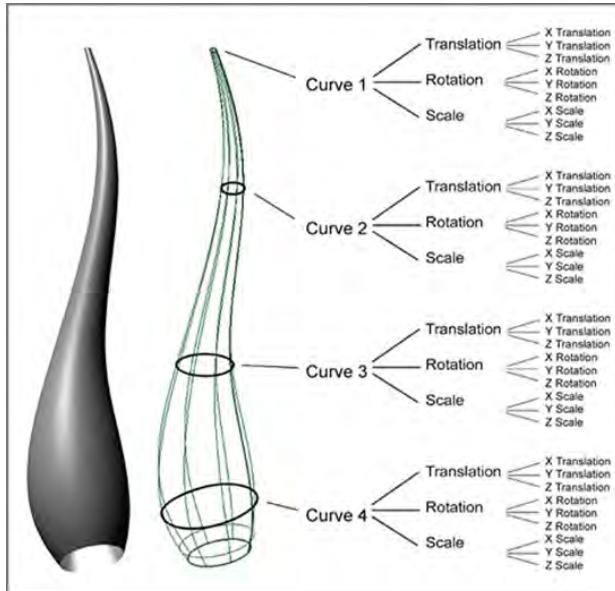


Figure 2. Phenotype CAD model and genotype parameter code

## Research Process

The work began with envisaging how a design might change over time as opposed to the creation of a singular 'optimal' solution, and by considering how this might be presented to the consumer. A virtual on-line viewing experience seemed appropriate. Parametric CAD models are defined by the relationships between parameters rather than the absolute values to the variables themselves. Modifying these parameters according to pre-defined rules and relationships can therefore be used to generate geometric variants (Fig. 1). Each discrete phenotype variant will have its own genotype code of parameter values (Fig. 2). In early FutureFactories work morphing designs were created using the

key-frame animation of CAD models. In key-frame animation an entity is created along with a series of developmental stages for that entity over time. Software then extrapolates between these key-frame states creating a seamless animation and, at the same time, a discreet 3D model configuration for each frame of this animation. A vast number of models can be created from even a short movie sequence (30 frames per second was used in this work). The idea was that the consumer would view 'living' designs morphing on screen (Fig. 3) in real time via an on-line shopping experience. There would be the option of freezing the development at a moment of choice thereby creating a unique variant and placing an order if desired (Atkinson and Dean, 2003). Once an order is placed the digital file would be forwarded automatically to an appropriate production bureau and the printed part delivered to the customer's door.

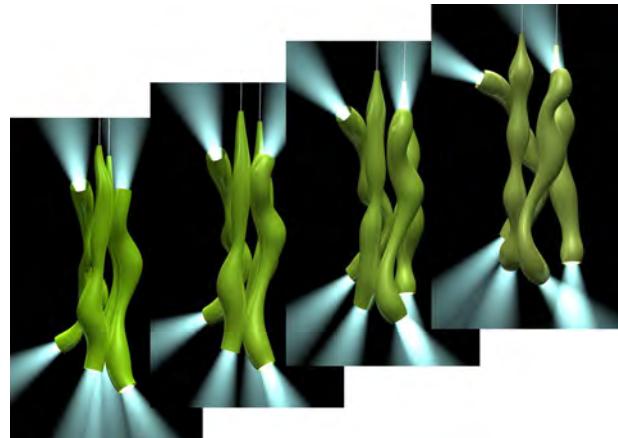


Figure 3. The Tuber lamp animation

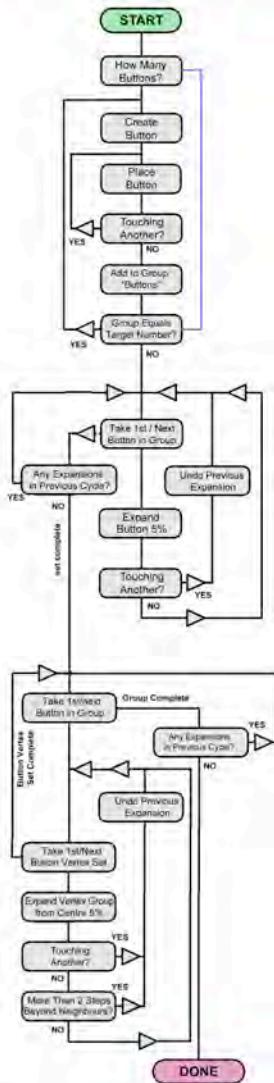


Figure 4. A schematic of the script

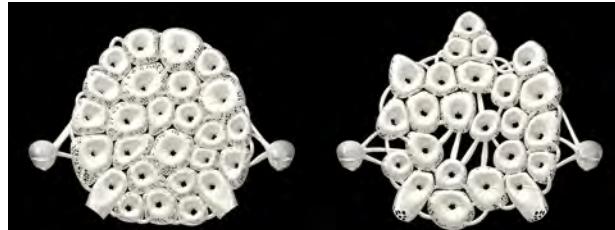


Figure 5. Holy Ghost iterations 1 and 2

A program of exhibitions at the end of the initial one-year residency period yielded valuable feedback on the concept. Would-be consumers, in this case exhibition attendees, expressed a desire for more dramatic and fundamental changes in form than the gently writhing morphing of Tuber allowed. This would be hard to accommodate as the techniques thus far involved the manipulation of existing parametric CAD models rather than the creation of new geometry. Also, whilst the key-frame animations provided proof of concept, they were of fixed length and offered only a finite number of solutions: the intention had always been to create scalable, script driven solutions generating potentially infinite variety. The solution was to combine the existing parametric morphing strategy with a building block Constructive Solid Geometry (CSG) approach. In CSG complex three-dimensional models are created from the combination of simpler solid elements using Boolean operations. Using this technique features could be added or subtracted using a library of pre-defined geometric entities. Once placed in the model these library elements could be subject to the same parametric manipulation employed in the Tuber design.

In the Holy Ghost chair the process begins with a standard build unit termed a button (deliberately reminiscent of traditional button leather furniture). In the first phase of program (Fig. 4), the number of buttons that will make up the back is determined (between 22 and 28). A three-dimensional surface pre-determined by ergonomics is then populated with this number of buttons positioned at random. In the third phase of development the

buttons expand in a uniform axisymmetric manner until they almost touch; this is then followed by a non-uniform expansion to fill in the gaps. In a final manual operation the buttons are connected by a matrix of curved links that act as live springs allowing the whole back to flex like a sprung mattress. This manual addition is termed a manual mapping process (Dean et al., 2004). The modeling of the links could have been automated in the software with sufficient programming investment. Holy Ghost variants are shown in Figures 5 and 6.



Figure 6. Holy Ghost iterations 3 and 4

## Research Outcomes

Mugge (2009) shows that effort invested in personalising a product has a direct effect (as a result of the extended period of time spent with the product) and an indirect effect (via the personalised product's self-expressive value) on the strength of the emotional bond with the product. This research attempts to show that similar benefits can be achieved through more passive involvement in the creative process. Whilst the generative processes in general have had significant popular appeal it has proved difficult to access the desirability of individual iterations where an actual purchase is not being made. At exhibitions 2D prints of individualised products have been offered to visitors to demonstrate the principles; these however do not appear to stimulate greater interest in one outcome over another. Nonetheless the added dimension of a pre-purchase virtual experience centered on the creation of the product appears attractive. This virtual 'performance' may be to some extent lost in the physical object that is ultimately 'taken home'.



Figure 8. The set of 5 ring iterations



Figure 7. Phenotype CAD model and genotype parameter code

The proliferation of web-enabled devices, in particular smart phones, potentially offers a ready link between virtual design concept and physical artefact through an augmented reality experience. T-Rex Versus Gorilla is inspired by 60's Japanese science fiction cinema. The design centres on a fight sequence between monster characters. These figures wrap around opposing sides of the finger to form a ring with the gorilla gripping the T-Rex's tail on the underside (Fig. 7). The fight sequence exists as a virtual animation with the protagonists exchanging blows and with a precious stone employed as a weapon in the confrontation. Five key frame poses from the animation have been materialised into a set of ring designs (Fig. 8). These pieces are cast in silver from printed waxes with the gorilla distinguished from the dinosaur using oxidation. The animation is a

fundamental part of the concept and its potential allure to the buying public. In order that the consumer gets full value from the design it is important that this video clip can be seen alongside the isolated pose that each physical ring represents. A Quick Response (QR) code is laser etched on the underside of each ring. Viewing this code through the camera of an appropriate mobile device allows the user to see the virtual animation superimposed on the ring itself via links to the digital file posted on the internet.

The flexibility of AM offers far more than free form geometry. The absence of production tooling and its associated investment can change relationships between designer, manufacturer and consumer. AM however will remain a premium process for the foreseeable future and it is only through added design value that its use can be justified. New marketing models are sure to emerge but these are as yet difficult to imagine in an industry shaped by the industrial age. Linking research and practice has allowed the exploration of novel concepts and offers some insight into consumer reaction. Tuber luminaires have been acquired by the Museum of Modern Art in New York (MoMA), (2005), and DHUB, the Design Museum of Barcelona (2010) for their respective permanent collections. Holy Ghost with feature in Out of Hand: Materialising the Virtual at the Museum of Art and Design New York from September 2013.

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# Seeing Me? : Returning the Poetics of the Body to the Medical Consultation

## Abstract

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The role of the somatic body as a physical and visceral object is waning within the history of the medical consultation. For while the corporeal body once held centre-stage in the communication between doctor and patient, today the somatic body has been transformed into disembodied artefacts, such as X-rays and magnetic resonance imaging (MRI). This transformation and transparency of the physical body aims to increase an understanding of 'what is happening' within the dynamic and complex object that transports us through our everyday lives. However the interpretation of images, such as MRI, is restricted to the trained eye of the medical practitioner. As a result, these images often remain inaccessible to the patient who is being asked by the health professional to understand (potential) changes in 'their body' and make treatment decisions.

This paper outlines the exploratory research of a 3D CGI artist during a two-year residency in a radiology department; in response to an invitation to 'improve the realism' of existing MRI images and develop a communication tool with patients. Initially responding to the brief, the artist reframed the question and explored an alternative approach that aimed to return the poetics to the human anatomy.

## Author Keywords

3D Visualisation, Medical Imaging, Patient Communication, 3D CGI, sociology of diagnosis, embodied geographies

## Research Imperatives

Historically, a patient's body 'belonged' to the doctor and the medical consultation was a one-way communication; where the patient offered up information on the 'body' only on request from the doctor. Today, in a shift towards patient-centred care, individuals are increasingly involved in their healthcare, which relies on an understanding of what is happening to their physical body, in order to make informed decisions with their health professional to develop care plans (Houts et al., 2006). Visual images, such as Magnetic Resonance Images (MRI), are proposed to be a useful communication tool in bridging the gap in knowledge between patient and health professionals (Mishler, 1984), although their purpose has always been diagnostic since the early 1980s.

## Diagnostic Gaze and the human body

3D visualisations in medicine use technologies that offer the clinician a window into the inner body of the patient, through images such as MRI. This 'view' captures complex clinical datasets that display, in detail, the internal organs and tissues of the human body, in a way not previously possible. Both clinical (2D) and subsequent 3D visualisation of medical scan data are designed to render the body transparent, thereby allowing science to 'see' and 'map' the inner body (Dijck, 2005). The 'mechanical-medical eye' (Dalton, 1989) allows the body to be exposed in ever-increasing transparency, although this ability to see more detail does not automatically equate with increased knowledge. These representations of the body are based on protocols that describe the patient's disease in the language of medical science. A language, which is abstract, highly specialist and is distinctly separate from the 'body' as experienced by patients within their

everyday lives. As a result, while these images have been designed to be interpreted by, and are useful to, radiologists (Hartswood *et al*, 2001), they remain inaccessible to the untrained eye of most patients. Consequently, developing visual diagnostic tools, such as MRI, into a communication tool within the consultation raises the question: how do we develop images that are accessible to patients whilst also maintaining a representation of the medical body to aid decisions around treatment plans?



**Figure 1.** This 3D CGI rendering is a visualization of the human left kidney, aorta and right renal artery, entitled 'Stenosis'. The animated image is derived from clinical renal angiogram MRI data visualising renal artery stenosis. (Created by J McGhee.)

## Research Process

The development process was non-linear, highly exploratory and cyclical though there were three main reference points:

**Establishing a Pipeline:** MRI clinical data had never been imported into the artist choice of software (MAYA) and considerable time was spent working out a pathway.

**Tumbling:** once the pipeline was established, the artist extracted a 3D model of anatomy (a wireframe), from the MRI data that had no light or colour; usually present in photographs though notably absent within the darkness of the inner body. The artist then 'tumbled'<sup>1</sup> through, around and inside the 3D mesh exploring the complexity of the anatomical form and developing ideas for different visualisation techniques. Examples include:

- CGI lighting to develop a visual quality that renders the inner body glass-like rather than soft organic tissue (fig 2);
- Placing the image against a dark background, with exaggerated angles of perspective, evokes a feeling of space exploration or suggests the inner body as a deep and dark oceanic place (figs 1-2)

**Dynamic & hybrid approach:** once the light, colour and structure were established, the focus was on representing blood flow through the arterial structures and, for example, slowing down 'the flow' to offer patients time to reflect. The artist increasingly drew on different sources of knowledge. For example, 'Stenosis' (fig 1), drew on four sources to create the final image:

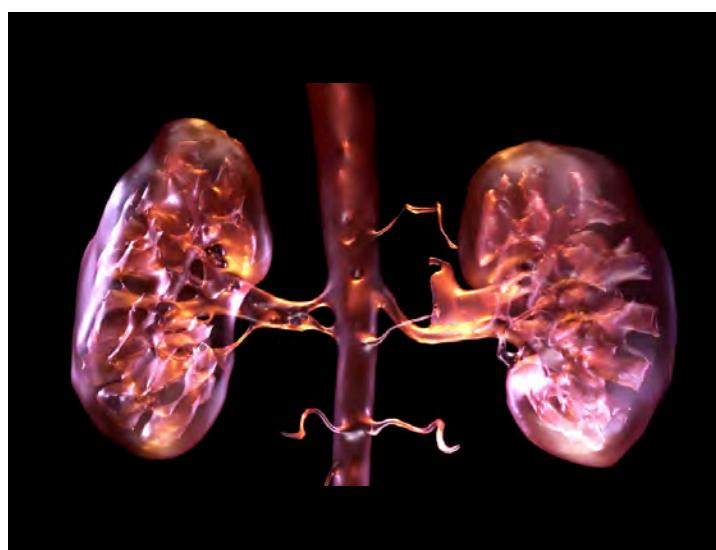
- *MRI*: the scan of an aorta was used to generate a digital wire-frame of the aorta.
- *MRI video footage*: data from several seconds of a beating heart from a test subject
- *Drawings/verbal*: the radiologist generated, and discussed, a series of drawings of a heart to communicate the rhythm/parameters of blood flow.
- Artist's Interpretation: personal vision of the inner body based on cinematic reference material.

<sup>1</sup> A term used in 3D software packages to describe how an artist moves around a 3D object.

**"Observing the world with rigour and curiosity is an act of both art and science. Artists scrutinise the world around them for its beauty, its contradictions and its signs of human experience"**

(Thomas et al, 1997:76)

The primary intention in all these images (see figs 1-2) is the development of a language that describes the body more holistically and focuses on the visual aesthetic of the image as a whole, rather than highlighting the aspect of the human anatomy that is diseased. The aim was to create an image with a degree of sensibility in an attempt to bring the viewer closer to the nature and beauty of inner kidney structure, and also as a means to penetrate the complexity of arterial disease.



**Figure 2.** 'Medulla' – visualisation 2. Final stage image: a 3D CGI rendering of human kidneys from clinical renal angiogram MRI data. Represented as glass-like structure rather than soft organic tissue. (Created by J. McGhee.)

### Research outcomes

Tackling the challenge of exporting the MRI data into the existing artisan software (MAYA) led to extensive technical experimentation prior to creating any final visual images. A new design method evolved which renders 2D MRI data into 3D visual moving images. This drew on multiple reference sources, most notably the artist's

own interpretation of 'how the image should look'. *'it doesn't look like that': an artist interpretation*

In Stenosis (fig 1 & 3), the moving particles inside the vessel were not intended to 'accurately' replicate the way in which blood moves through the arterial system. The movement of blood in the human body follows a cycle, one that bursts, twists and pumps through the arterial system of the vessels, providing an aesthetic of movement that is absent from static MRI. Influence came directly from the cinematic, drawing from the popular inner body aesthetics seen in feature films such as *Innerspace* (Dante, 1987) and *Fantastic Voyage* (Fleischer, 1966).



**Figure 3.** 'Flow' – visualisation 2. Final stage image: a 3D CGI rendering of aorta from clinical renal angiogram MRI data. A still image taken from an animated movie sequence. (Created by J. McGhee.)

Radiologists responded differently to the perceived 'accuracy' of the final image. One radiologist approved of the moving image while another stated that it didn't represent how blood flowed. The artist offered one explanation behind the non-realistic

representation: "it would look like a butcher's shop if I represented it faithfully".

### Concluding remarks and Caveat

With the rise in the role of the patient in the healthcare, there is an increasing need to describe the inner body in a more accessible and holistic way for patients. Here we present only one potential design solution to this complex social challenge: a visual communication tool that can be used by both clinicians and patients within a medical consultation. The intention of these images is not to offer a 'realistic' view of the mechanical processes of the body but to begin developing a joint communication tool, and language, for patient and health professionals during the consultation (McGhee, 2010, Thomson, 2012).

We propose that 3D CGI artists have an important role in the interpretation process in their ability to tell stories through their chosen medium (in an attempt to increase access to anatomical clinical imagery for patients). Inevitably, this proposed role raises a number of ethical questions on the integrity of the image:

- How far does/should/can the artist interpret the data?
- Is an abstracted visual narrative appropriate as a communication tool for patients?

However, while the role of the 3D CGI artist is to work with clinical colleagues it is not as a conduit for, or servant to, medical knowledge. Instead we propose the role of a critical friend: one who challenges existing visual representations of the patient's body, that currently appear to offer only the health professional a transparent view of the patient's body.

### Next Research Steps

Constructing an image that provides both medical clarity and alternative ways of viewing disease and anatomy for patients proved challenging. As such our next steps are to invite patients to explore and redesign these images in a hospital setting.

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# Praxis and Poetics: Can design methods facilitate the personalisation of healthcare for individuals with Type 1 diabetes within a National Health Service context?

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## Abstract

This study employs a research through design approach. It reflects upon the design, making and application of a probe-based design method within a National Health Service (NHS) context. Creative Prompts take the form of physical artefacts and act as vehicles for exploration by supporting patients to self-reflect, articulate and express their thoughts, emotions and experiences of Type 1 diabetes mellitus (T1DM). Each of the seven Prompts frames an area for exploration and pose 'questions' to patients through the completion of different activities. Patients use the Prompts independently within their own home and then share their outcomes in an interview with the researcher. This research method elicits a different type and quality of information from the patient than orthodox methods and enables a richer expression of an individual's personal perspectives and experiences. It engages patients in an interesting and creative way as opposed to box ticking, generic forms and questionnaires. This creative form of engagement facilitates the starting of 'new conversations' and in turn enriches patient-healthcare professional (HCP) interaction. The outcomes of the pilot study to date are very positive. There is evidence of positive behavioural change amongst patients. Patients have demonstrated a growing sense of empowerment and have become more pro-active and engaged in their care. The quality of interaction between patient and HCP has improved as patients feel more organised and confident in articulating their experiences, thoughts and needs in a more concise way. Medical consultations have become more problem-solving orientated, and patients now set their own agendas. In completing the Prompts patients feel they

have learnt more about themselves and their preferences and have also gained more knowledge about their condition. The Prompts have facilitated the exploration of two very distinct disciplines and their practices.

## Keywords

Creative prompts; Long term conditions; Probes; Reflection; Patient-healthcare professional interaction; Patient empowerment

## Research Imperatives

This study explores the potential of design methods to facilitate the personalisation of healthcare for individuals with Type 1 diabetes mellitus (T1DM). It also investigates the ways in which design methods can enrich patient-healthcare professional (HCP) interaction. T1DM is a Long Term Condition (LTC), which cannot be cured but can be managed with medication or other treatments. Being diagnosed with a LTC can have a negative impact upon an individual's sense of wellbeing and quality of life. A diagnosis of T1DM is a life-changing event, which necessitates an immediate change in an individual's behaviour and lifestyle. It places high behavioural demands upon an individual on a daily basis such as monitoring blood glucose levels and self-injecting insulin. This level of management can be emotionally and mentally exhausting. People with diabetes are twice as likely to develop depression than the rest of the general population (6) but in 30-50% of cases depression remains undetected (1). The need for 'parity of esteem' for mental health in T1DM care is recognised by Governmental

*"It is estimated that 41% of people with diabetes suffer poor psychological wellbeing"*

(Mind the Gap, 2008)

*"Only a third of people had an individual care plan to meet their needs, and where it was offered, it was not given the time it needed or felt like a form filling in exercise".*

(Diabetes E PCT survey, State of the Nation, 2012)

bodies and independent organisations but service provision remains poor and variable. Poor psychological wellbeing can affect an individual's ability to self-care and lead to poorer healthcare outcomes, increased risk of developing complications and a reduced quality of life (3).

Recent Government health and care reforms (2) promote a patient-centred NHS, that will focus on "personalised care that reflects individuals health and care needs" (2) and makes shared decision-making the "norm" (2). This is a transformational change for the NHS, which has provided many challenges, one of which is the implementation of policy into practice. It is at this juncture that design can provide a means of translating policy into something tangible that can be used by HCPs and patients. Personalised Care Planning is a method used to in the NHS to empower patients with LTCs and encourage them to take greater ownership and responsibility for their care. It is a generic ten page paper document with a question box format. A patient and HCP complete the form together, the patient answers the spoken questions and the HCP writes them down. This method affords very little time for reflection and consideration. The mode of patient involvement and expression is limited to verbally answering the questions, which can prove a difficult task for some to articulate and communicate their personal emotions, experiences and needs. Fundamentally Care Plans are clinical artefacts not patient artefacts. The Plans ask patients to 'report' and 'add', they are more 'about' the patient and not 'for' the patient. Opportunities are being missed to engage patients on a different level and as a result many individuals suffer from a silent misdiagnosis (Mulley et al, 2012) as a consequence of poor articulation and communication of personal preferences.

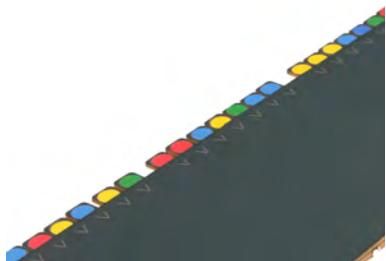
### Research Process

This study uses a practice-based approach to design research. It employs a probe-based method derived from Cultural Probes (Gaver et al, 1999). The designed artefacts are called Creative Prompts (CPs) and their purpose is to support patients to self-

reflect, articulate and communicate their thoughts, emotions and experiences relating to T1DM. They are also a method for engaging and empowering patients in their own health and care. The study employs a qualitative approach and uses a multiple-case study design. It is to be hosted by Newcastle Diabetes Centre (NHS) for a duration of twelve weeks. The sample group consists of six patients. The group will be made up of both male and female patients between the ages of eighteen to fifty years. Patients must have been diagnosed for a minimum of six months to a maximum of six years. The sample groups inclusion/exclusion criteria will ensure a diverse range of individuals with varying experiences of T1DM. A pack containing seven CPs is given to patients at the beginning of the study to use independently at home. The researcher interviews each patient individually after the completion of a CP, during which the researcher uses the 'outcomes' of the Prompt to gently guide the conversation. The 'outcomes' of a Prompt helps to establish the structure and pattern of the conversation. The Prompts start conversations at the right point for the patient and on a topic that is meaningful and important to them. Patients have control over what is discussed and when which creates a more equitable and potentially more productive form of clinical engagement in practice.

Operating within the NHS presented opportunities and challenges. It has also provided insights into the complexities of applying design thinking across disciplines. Designing for an NHS context influenced the design of the CPs, design decision-making and the design process itself. Each Prompt is designed to explore specific aspects/ issues/themes relating to T1DM. Design decision-making was influenced by the constraints of working within the NHS for example minimizing costs, meeting ethical requirements and accounting for a HCPs time. The researcher consulted HCPs as to the feasibility of some CPs for everyday practice. A wide range of design ideas were collated and mocked-up. A means of evaluating their potential was devised. A set of primary and secondary evaluation criteria was established and applied to introduce greater rigour and validity to the selection process. Each Prompt was then

Figure 2. 'Mood calendar' Prompt



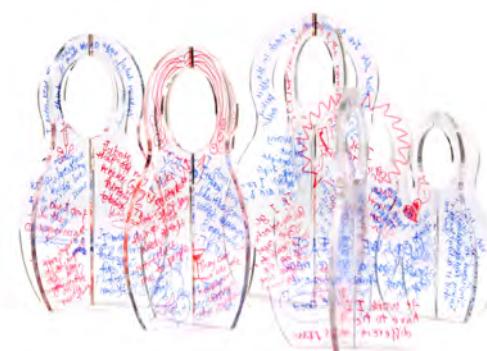
The coloured tip on the end of each stick creates a visual, which maps out a patients emotional wellbeing.

Figure 3. "Bottled up emotions"



This Prompt plays on the metaphor 'bottled up emotions', which is frequently used in a health context. Patients write/draw on leaves of paper, place each into a cork and then drop them into the bottle for safekeeping.

Figure 1. The 'Peeps' Prompt.



plotted on a radar diagram against both sets of criteria. This process enabled a full and fair comparison to be made. In addition, the researcher's personal intuition was used to select the CPs. This intuitiveness developed naturally as insights were gained and empathy for patients grew.

The researcher also conducted an experiment to see if the same type and quality of data could be elicited from a patient without the aid of CPs. This experience proved difficult and further evidenced the value of foreknowledge and the importance of providing a structure for a conversation of this nature. It also highlighted the need for a 'tool' to identify a patient's personal boundaries and the subjects that they feel comfortable discussing and in what depth.

The design of the Prompts centred on the process of reflection. Individual prompts use specific actions and visual cues to guide and support patients into a state of reflection. The 'Peeps' Prompt (Figure 1) uses human-like forms to explore relationship dynamics. The physicality of the 'dolls' encourages patients to pick them up and move them around as if they were in conversation with each other.

## Research Through Design 2013

The 'Mood calendar' Prompt (Figure 2) last for twenty-eight days and uses colour to increase a patients emotional awareness and to help to identify causal links between behaviour, emotions and external influences.



Figure 2. The 'Mood calendar' Prompt.

A Prompt aesthetic adopted was appropriate for both a clinical and non-clinical setting. The CPs had to blend into the home and feel as though they were the property of the patients (Figure 3). 'Space' for patients to personalise and express themselves was designed into each Prompt and for this study a greater amount of space was allocated due to the design of the study. Patients use the Prompts in whichever order that suits and are able to reflect and consider privately before sharing their needs, emotions and experiences with HCPs. The Prompts engage patients in a creative way that introduces an element of fun and learning into healthcare. The Prompts become unique to that patient.

The natural flow of the design process, with its iterative cycles was interrupted by the need to gain NHS ethical approval at a 'Research' classification. A small pilot study was conducted prior to this process as design changes could not be made following ethical approval.

## Research Outcomes

This practice-based approach to design research resulted in knowledge and insights being gained in both design and medicine. Creative Prompts have shown to be a very simple but effective mechanism for engaging participants in their own care by supporting self-reflection and the articulation of personal emotions, thoughts and experiences.

Using the Prompts increased patients' emotional and psychological awareness in relation to self, diabetes and others. Positive behavioural change did occur as patients became more involved in their care. A growing awareness amongst the patients developed regarding the control they have to shape their interaction with HCPs and therefore treatment direction. Patient A found the Prompts gave her the "*ability to talk more openly about how you feel about your diabetes without it being depression*" rather than simply answering yes or no to a depression screening question. After using two of the seven Prompts Patient B explained "*your more defined in what you want to talk about rather than it just being 'Hi, how are you doing?' or I haven't thought about it until I've walked through the clinic door*". Patients began to set their own agendas for medical consultations and started to view them more as a problem-solving opportunity. Patients were more motivated to get the most out of their HCP. There was a shift in mind set from feeling as though they had to justify their HbA1c levels to their HCP to what can they as patients get out of the consultation. Patient A changed their healthcare provider after reflecting on the outcomes of a Prompt designed to engage patients in healthcare service evaluation. The type and volume of responses to this Prompt highlighted the degree of dissatisfaction she had with her current care which led her to take action. The Prompts operated on both a practical and emotional level with some using them as a cathartic outlet "*it was an interesting piece of work because I've never really [long pause] I've carried that in my head you know and to get it out of your head and into to somewhere is actually very...I enjoyed doing it to be honest*" (Patient B) (Figure 3) and others as aide-

memories/reflexive tools. Patients enjoyed engaging in the different activities offered by each of the Prompts. Patients developed a strong sense of ownership over the Prompts with one patient taking a Prompt (Figure 3) on holiday with them.

HCPs responded positively to the CP's and appreciated the need for such a method. Several HCPs regarded the Prompts as "giving permission to the patient to change the conversation" and were excited by the potential of the Prompts to readjust the power balance between patient and HCP. One HCP recognised the added value they could bring to patient experience as patients "*go away believing that they're more important than their blood sugars*". A HCP described the Prompts as "*giving them [patients] the how*". The Prompts provide patients with the 'how' to identify and communicate their needs, personal preferences and perspectives.

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# Interactive Teaware: Sharing Experiences in Old Age

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## Abstract

*Interactive Teaware* was designed to support conversation and socialisation while having tea and coffee. We discuss themes emerging from the design of *Interactive Teaware* in order to propose characteristics that we believe constitute appropriate, meaningful and useable interaction design for older people living in care homes. These include the integration of digital artefacts into a resident's daily life, as opposed to scheduled activities. Given that life in the care home is often associated with disempowerment, we propose augmenting residents' existing abilities. We also assert that digital artefacts need to avoid negative stigmas through medical styling and instead enforce a positive and familiar identity through the use of associated materials, such as porcelain. Implications for design stem from insights gained through time spent in the care home.

## Author Keywords

Elderly, Care Home, Conversation, Ceramic, Digital Artefacts, Design, Dignity, Communication

## Introduction

*Interactive Teaware* (Figure 1) was designed to encourage conversation while care home residents are having tea and coffee at the dining table. The set consists of a table, tablecloth, cups and saucers. The cups and saucers are made of porcelain and have aluminium radial patterns on their surfaces. Upon the underside of the cup is a small copper protrusion (Figure 6). On the table is a cotton cloth that's eggshell in colour and sewn onto this are three black felt pads with two grey semi-circular patches on top of each (Figure 8). When the saucer is sat on the felt pad, the cup placed

on the saucer, and your tea cup gently moved, emotive combinations of words subtly appear as projections at random locations on the tablecloth (Figures 2 & 4). The greater the duration of movement the more words appear. These words fade in to white and then fade out. They vary in size and orientation and appear as part of the fabric surface (Figure 4).



Figure 1. *Interactive Teaware*

Designing to support the social lives of older people has become a pertinent issue in HCI and design. However, other than Blythe et al. (2010), Gaver et al., (2011) and Wallace et al. (2012), few digital design studies focus specifically on care home residents. This is despite writers such as Wilson et al. (2012) emphasising the prominence of loneliness and isolation, and a lack of support



Figure 2. Example words.

**"oh... is anything happening today, no it just really doesn't work, the weather and that sort of thing, aren't the trees blowing"**

Figure 3. Maureen discussing the lack of stimulating conversation



Figure 4. Words appear on the table cloth surface. We selected thick cotton from a series of materials as this made the projection textured and appear more like it was printed on the surface.

around sociability. Moving to the care home is a significant life transition that impacts upon long term relationships and often involves residents striving to form new friendships with other residents and staff. This endeavour can be hampered by sensory, cognitive and communication problems and the prevalence of over-worked staff who in turn neglect meaningful social contact (Wilson, et al. 2012). Difficulties in forming relationships, resulting in isolation, may contribute to research demonstrating that up to 40% of people living in care homes suffer from depression (Llewellyn-Jones et al. 1999).

Consequently we were motivated to explore and expand on the roles and forms that digital design to support sociability might assume within care homes. In order to do this we spent time in Pebble Glen House getting to know a small number of residents, staff and the care home environment. Our experiences in Pebble Glen House then informed a design and making process. This paper discusses aspects of our design rationale in order to contribute characteristics we believe are appropriate to designing digital artefacts for the care home. These put the humanity of the residents in the foreground and offer new ways for sociability and relationships to develop and be supported.

### Design Rationale

Our design rationale was informed by a series of semi-structured interviews with a small number of residents, opportune engagements with staff members and observations while in Pebble Glen House. The interviews were on occasions supported by visual and audio prompts, which included old photos of areas that residents had spoken of and historical radio broadcasts. The most insightful engagements took place while drinking tea in the communal area as our discussions were often more relaxed, and because we were able to observe in a natural manner the workings of the care home. One resident (Maureen) is referred to on a number of occasions as she became a key informant and inspiration in the design of *Interactive Teaware*.

The principal motivation for *Interactive Teaware* was that conversations were often restricted to the weather or the meal itself. This was highlighted when one staff member suggested that a poster stating today's weather was visible in the care home since residents were always asking about the weather during breakfast. While discussing the poster we felt this staff member had shown some animosity towards the repetitiveness of this question and in turn misinterpreted a classic opening to conversation. Maureen also directly pointed out a lack of conversation while dining and expressed a desire to learn more about those she shared the care home with (Figure 3).

A series of considerations informed our decision to have words gently appear on the table cloth (Figures 2 & 4). While talking with two other residents, Maureen gained our attention and abruptly got involved in the discussion by announcing her love of words, thus changing the topic of conversation. In turn we proceeded to talk about words and Maureen's love of words, which included fascinating words, long words and crosswords. We reflected that perhaps Maureen had wanted to share this with us, yet had not found an appropriate opportunity to introduce the topic.

When starting a conversation with someone we are not well acquainted with, we commonly find a 'ticket to talk' (Svensson & Sokoler, 2008). A 'ticket to talk' involves using something in our environment to begin a conversation, from which other themes can be introduced. Even while dining with friends, we may refer to the menu, the décor or a picture on the wall. Our environment naturally helps us find or introduce topics of discussion. As the care home communal area was unchanging, repetitive and impersonal we wanted to introduce opportunities to engage in novel and varying conversations while having tea and coffee.

The notion of a 'ticket to talk' and Maureen's love of words led us to consider the use of diverse and emotive combinations of words that would gently fade onto the tablecloth. These words are taken from poems and people's reminiscences (Figures 2 & 4). As with other



*Figure 5. The radial pattern on the saucer is designed to reflect a modern ceramic and yet is able to detect the movement of the cup on its surface. Each alternate line is a switch contact, when two neighbouring lines are contacted with a protrusion under the cup (Figure 4) we are able to calculate the rate at which the switches are contacted using a microcontroller (a basic rotary encoder). This equates to the speed at which the cup is turned on the saucer.*



*Figure 6. The protrusion on the cup is made of copper which is able to connect the switches on the saucer surface. This is shaped to sit on the inside rim of the saucer surface.*

'tickets to talk' the words can be referred to in an open-ended way. For example, they might offer ways into new conversations (other than the weather), be formed as questions by staff members or inspire the topics of stories amongst residents.

Informing our design was awareness that gadgets or screens are often understood as inappropriate at the dining table. Consequently we focused on augmenting existing aspects of the table setting, ensuring we did not create a distracting focal point. For example, the table cloth is used as a surface onto which words appear, thus they are not directly in one's line of sight. Additionally, as we never wanted to impose sociability and since 'quiet time' can also be desirable whilst having tea and coffee, the words are not always shown. Instead by gently moving the cup on the saucer residents are able to conjure, or stir up conversation when it's desirable to do so. The greater the duration of movement the more words appear.

In designing this interaction we observed people drinking tea and found that it is common to fiddle with the cup. The tactile qualities of ceramic, its clinking sound and other feedback can encourage us to play with them. While experiencing prototyping kinds of interactions, we found that the cup affords spinning on the saucer, while holding its handle. We therefore reasoned that fiddling could offer a means of integrating technology without understanding how something works. Instead one can learn by play, feedback from the table surface and the affordances already presented by the cup on the saucer. Fiddling is also a behaviour that happens when we are restless and bored, perhaps when there is little conversation.

In designing the cups and saucers we wanted to create a sensor, whilst also achieving a unique and striking lustre design. In order that the cup and saucer can be drunk from, washed and dried as normal, we could not use existing electronic components. Rather we explored the use of conductive lustre, which could be used to create a simple sensor (Figure 5) that would be manufactured using processes already prevalent in the ceramics industry. In

designing our sensor we referenced existing ceramics, whilst also considering how these designs might equate to a sensor that is able to detect movement.

## Discussion

Through *Interactive Teaware* we have expanded on the roles and forms that digital technology to support sociability might assume within the care home.

The true reason for the poster stating the current weather, as mentioned previously, may have been a form of psychological treatment for confusion known as reality orientation (RO). RO involves continually reminding residents of basic information, such as the weather, current date, who they are etc. Patton (2006) draws attention to a lack of contemporary research around the benefits of RO and therefore doubts its effectiveness alongside contemporary approaches to care. Being continually reminded of basic information could contribute to a stigmatising environment that stifles normal conversation. In fact, MacDonald & Settin (1978) found that their research participants became dissatisfied and bored during RO. In contrast to RO, this work advocates support for genuine conversation through the introduction of diverse and changing stimulation in care home communal areas.

In the care home we encountered 'reminiscence' sessions. These are able to support conversation and storytelling (Astell et al. 2010). In contrast to these scheduled activities we propose that digital design supports socialisation in daily life, by subtly integrating technology. Rather than attending activities, residents could be encouraged to lead their own social lives, which may be less stigmatising and appropriate for some care home residents. This can be achieved by further investigating existing social etiquettes and situations which residents encounter on a daily basis.

*Interactive Teaware* avoids traditional notions of technology and manufacture and instead looks towards augmenting artefacts that



Figure 7. The underside of the saucer has two semi-circular contacts on its central rim that lead to either of the two sets of radial switch contacts on its surface.



Figure 8. A conductive fabric pad on the table cloth connects the saucer to a microcontroller on the table. The semi-circular grey sections match with the underside of the saucer. Using soft conductive fabric allows the rigid ceramic to make good electrical contact.

are familiar. The care home environment tends to disempower residents. The room temperature, times of dining and visiting hours may all be dictated by staff. Many residents are still able to drink tea and handle the cup, however. By augmenting this ability we are building on existing capacities and enabling individuals to affect their social interaction with other residents and staff.

Through the use of porcelain and our lustre design, we are conveying to residents that they are valued. As discussed, there is a dynamic in care homes generally where residents are largely disempowered and unable to alter the environment in which they live. Given that our homes tell us about who we are through the messages they afford (Rubinstein, 1989), we believe that attention should be paid to not inflicting negative identities on residents (i.e. patient). Rather by creating captivating artefacts for the care home it may be possible to enhance an individual's sense of pride in the space.

An elder in his or her own room has prompts to introduce topics of conversations that are meaningful to him/her. We experienced this first hand during our visits when Maureen became fluent, engaged and enthusiastic while surrounded by her belongings. The familiarity of her objects enabled her to easily direct the conversation. As visitors we were also supported in getting to know Maureen as we could ask about objects in the environment. While we used words, other table cloth designs might include personal content (i.e. photos, maps) by using cups that can be uniquely identified. As such residents could extend the familiarity of their personal space to their interactions with others in communal areas. In essence the communal areas could become transient to the needs of individual residents. Currently we are working with individuals in dementia care to expand on both the content and the ways in which we might integrate and individualise 'tickets to talk' in the communal areas.

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# Poetics of Play: Touch and Movement in Garment Design with Sheepskin, Silk and Lace

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Figure 1. Initial sketch.

## Abstract

This is a start to an area of research into both the somaesthetic responses and dialogue the fashion designer has with materials, in particular sheepskin, silk and lace but also the envisioned somaesthetic response the designer aims to elicit from the user in the wearing of a styled artefact in these fabrications. Richard Shusterman's philosophical concept of the importance of the soma, the body as an object of 'knowing' through sensory aesthetic understanding informs this work. This research will explore how a garment feels to the body and our relationship with materials. A key interest is how the somaesthetic qualities personal to us might contribute to the psychological attachment to an item and how this in turn may correlate to how we then treasure and keep these items of clothing. The intention to create new processes and practice in structuring sheepskin, silk and lace will start with a representative human frame in the form of a mannequin. Sculptural structures that emulate the frozen physicality of human action will be added to the mannequin and the designs will be based around this new silhouette from which a pattern will be taken and a garment constructed. Once completed the added structure will be withdrawn and allow the new garment silhouette to hold itself or fall to the body frame. The garment will be a result from a physical dialogue by the designer with the differing breeds and varieties of sheepskin that explore constraint, flow, drape, volume, loft, tactility, and the somatic presence of how the user will both feel the differing surfaces in some element but also potentially be made more aware of the negative or 'silent' areas where material does not touch the body but rather frames or 'captures' air.

## Author Keywords

Somaesthetics; Touch; Interaction Aesthetics; Materials Exploration; Physical Dialogue



**Figure 2.**  
Exploratory sketch to inform construction.



**Figures 3&4.**  
Plaster cast of shoulder area

## Research Imperatives

This research was motivated to explore the material qualities of sheepskin, silk chiffon and guipure lace in the context of Somaesthetics. 'Somaesthetics is a form of reflective bodily awareness intended to show the importance of paying serious attention to the body's role in enhancing knowledge, improving performance, and increasing the pleasures of living. It considers the body as our primary means of engaging with the world, including structuring of our mental life, and is intended to fill a gap in the philosophical and practical understanding of the body's role in experience, including the making and experiencing of the arts' (Carter, 2008).

This is an inquiry into sheepskin, silk and lace and their handle and capacity to be manipulated and crafted into a fashionable garment that would feel good to wear as a multimodal sensory experience. 'Fabric hand, or handle as it is often called, is defined as the human tactile sensory response towards fabric, which involves not only physical but also physiological, perceptual and social factors; this very fact complicates the process of fabric hand evaluation tremendously' (Pan, 2007).

The research details how I, as the crafts person, 'Think through the Body' (Shusterman, 2012) and, use my own somatic experiences in the making of the garment. The thread of both user and maker are intertwined through difference and commonality in bodily experience that could be said to be an aspect of empathy in design.

Much has been documented on 'Tacit' Skills in the design process. Polanyi 'Personal Knowledge' (1998) gives credence to the personal involvement of the knower in their understanding of the world. He considers that we are able to recognise that we believe in more than we can prove to be true and at the same level know more than we can say. This design practice is an exploration of bodily knowledge and thinking through the body. The body that informs the mind and can enables a greater capacity for unspoken

learning in how we use materials. Somaesthetics gives a philosophical understanding as to how tacit skills are imbibed into our physique, our soma.



**Figure 5.** Torso Development from plaster shoulder cast.

## Research Process

As a kinaesthetic learner, I use my body to learn and absorb new knowledge and to understand the world more fully, a process of constant movement to cause triggers in my thinking, my prioperceptive self. Prioperception meaning the 'sense of orientation and awareness of one's surroundings; innate sense of the relationship of body parts with one another via sensory input from prioperceptive nerve endings in muscles, tendons and joint capsules' (Shusterman 2012). It is for me and many designers the



Figure 6. Sleeve cuff in stretch chiffon with welded sheepskin cuff structure.

Figure 7. Development of the silhouette.

actions that inform my knowledge that then through reflection and new synthesis inform my doing and creation in the use of new materials to create new products. The tactile processes of feeling through my body and fingers inform my sensations on what the fabrics can do, in other words their potential to bend, yield, explode, crack, flex, drape, and mould to my expectations to create something new. It is this thinking through feeling, thinking through my body that has informed this garment and how it will encourage awareness of the user's own body through restriction and play.

### Design and making process

Physiotherapists encourage clients to undertake specific exercises to maintain an S bend in their spine that supports the body's core muscular structure. Standing with your arms by your side and palms of your hand facing forward forces your shoulders back and places your spine into a gentle healthy 'S' shape. I have used this posture to make a plaster cast of the shoulders and take a pattern to from the upper torso of the dress (Figs. 3, 4 and 5). It is hoped that the user will be conscious of allowing the fabric to lie flat across the front area of the garment. Slouching forward would give stress to the back bodice and cause a wrinkled affect on the front area. The neck line has Toscana sheepskin inside the neck and a trim meeting the inside facing. This has been placed to inform the wearer of the tactile soft hair and air as they move their neck. The main body of the dress has layers of lace and chiffon. The chiffon allows air to permeate around the body. The layering affords both privacy and a building of subtle colour changes. Both the hems of the dress and sleeve are constructed with fluted cut chiffon sections welded to sheepskin. The chiffon intersections allow the cuff and hem greater articulation to swing around the arms and legs. Texel, Mongolian and Truscana sheepskin have been used between each section of chiffon. The differing sheep breeds have specific qualities of touch and handle in both the skin support and wool fleece.

The initial sketches (Figs. 1 and 2) were diverse and explored the different properties of each material. The stretch silk chiffon was

chosen to enable a flow and lightness over the skin, its ability to flutter in air currents that form eddies around the body and its strength as a platform to mount other fabrics upon. I use a heavy Guipure Lace for its decorative quality embroidered with cornelli cord over the top of more complex woven micro structure with different densities of designed hole structures. It has a sturdy construction that allows appliquéd cutting raw edges and defining areas of garment.



Figure 8. Frayed chiffon braid and Toscana sheepskin.

### Research Outcomes

This garment results from an approach that foregrounds an attention to somaesthetics in the making process. The subsequent mental and physical knowledge from the creative process informs the next phase of making and creating a product. Perception informs movement and movement informs knowledge. The knowledge impacts on perception and thus new creative actions, thoughts and understanding ensue. This forms a spiral of creative physical and mental action. The sensory feedback from realising different iterations in prototyping informs our thinking in re-



Figure 9. Final Garment Simulation.  
Montage of images using Photoshop  
from each of the developed samples to  
simulate aspects of final garment.

examining and re-creating new iterations. Thinking through our bodies is an important part in how we recognise multimodal aspects of the creative process. Our understanding of our own soma has the potential to make an important contribution to feelings of empathy with the end users of our creativity.

The process in designing this garment has been a considered act of doing, thinking through my body to create an item that when worn could resonate with another through the felt experience of wearing the dress. The way the garment restricts and allows movement, the textures felt against the glabrous hairless skin (palms and soles) and with hair skin of the user somatically inform the user of how they wear the item. The somaesthetic response of wearing a garment could be said to be an empathic response of the design process and vice versa. Our bodies are a key focus in how we learn and the vehicle, the physical container of our worldly experiences and knowing.

Complex personal emotions arise in designing and re examining one's own bodily experiences in the design process that are also informed by watching other people and how they wear their clothing. Not what they wear but how they stand, move and perform in their bodies. Our interactions with materials that cover our physique inform our sensitivities to ourselves and others. Clothing is more than a shield, decoration or status emblem; it allows us to learn and play through our soma in different scenarios. The connections between person, space and clothing is connected to our thinking bodies. Shusterman says a person can have different somatic style, way of being, on different occasions and at different times of the day. This adds to the complexity of designing garments across varying times and locations. Shusterman talks about the mirror neuron system as providing a neurological basis for empathic experience. 'As seeing the movement would activate not only relevant visual neurons but also motor neurons associated with performing that action' (Shusterman 2012). We would try to emulate the movements, copy them, to understand how it feels/felt to perform in a particular way. It is this thinking through feeling,

thinking through my body that has informed this garment and how it will encourage awareness of the users own body through restriction and play. Garments have a performative quality, how we perform in our garments will depend on situation, place and social circumstances. This garment highlights our relationship of our bodies as the key locus of these performances. It highlights the position of the designer and their understanding of their own soma styles and design processes.

This garment has been constructed by consciously exploring prioperceptive, kinaesthetic movement of this designer's body in learning to manipulate and mould fabrics playfully, poetically and sympathetically to the human frame. The dress is the start of exploring somaesthetics and materials in the processes of design. It has been through examining my thinking body that new observations about my practice have become more transparent and other connections to the importance of how we use our bodies in a changing material landscape.

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## “Touch Me, Feel Me, Play with Me”

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### Abstract

“Touch me, Feel me, Play with me”, as a meditative tool invites people to touch, feel, and move for their own comfort. The design process involves a methodological balance between research and design, between the designer's skills and the user's sensorial awareness. The aim of this design project is to contribute to the discourse on comfort by investigating the influence on haptic experience, kinetic interaction, and emotion. In this design approach, dialogue between material explorations and bodily sensorial awareness leads to: (1) incongruent tactile feelings of the properties of felted wool; and (2) haptic experience that consists of both touching and seeing, an act that involves not only the hands but also the entire body. In the context of the haptic touching particularly, the textile invites the wearer to create dynamic modes of touch like squeezing, pressing, and stroking. The textile is designed for the users' act of moving over the textile surface, which makes form discernible. In order to achieve this paradoxical haptic experience, the textile is designed to incorporate an irregular polygon, shaped both concave and convex, to trap air on one side and creating geometric pockets on the reverse side within the felted wool structure. The textile can be configured in various ways by bodily interaction, which allows wearers' to express themselves. In conclusion, the design research project contributes to an understanding of what makes the body “feel good or bad” adopted by body-centered and the sense-driven design approaches. In particular, the textile used in the sense-driven action design approach contributes to enhancing the user's wellbeing and emotional connection to the textile, and therefore are as important as the physical qualities of comfort.

### Author Keywords

Touch, feel, comfort, haptic experience, textiles

### Research Imperatives

The significance of design research project used with a research-through-design approach has two main aspects. First is to contribute to the discourse on comfort by investigating the influence on haptic experience, kinetic interaction, and emotion. We can experience a feeling of comfort based on what we see an object through what we touch and how we touch. For example, we feel comfortable when we touch an old and faded woolen blanket, which absorbs the body's smell and sweat and invites hands to stroke the surface of the blanket. Through touching process, the blanket elicits sensorial experiences such as smooth and warmth. It also elicits sensuous imagery that evokes memory of the senses such as a sense of empathy and nostalgia for childhood. This is what Merleau-Ponty (1962) identified term as a “perceptual field” that means our lived awareness is not the sum of isolated sensory inputs but a dynamic commingling of sensory possibilities. Merleau-Ponty (1962) phenomenological standpoint has opened the door to reconsider how perception is formed by our bodily experience of knowing the world. Haptic experience inspired the author by the philosophical idea of perception of phenomenology (Merleau-Ponty, 1962) expresses unity of tactile and kinesthetic phenomena and unity of senses. In other words, we are able to ‘see’ an object sensuously and perceptually through the hands, which are a perceptual and manipulative organ and the entire body (Gibson, 1966). This perspective is significant for the design of body-centered and sense-driven clothing. Especially, it is worth noting

that how the intertwining of senses and motor skills enhances our emotions.

The second point of significance in this design research project is to contribute to how the design process used with a methodology of haptic experiment influences a design and creates communicable knowledge through the act of designing. Haptic experimentation through body empowerment makes people (including designers) more creatively active (Deleuze, 2003). This is because our body is experienced as a duality, both as an object — you can touch your own hand, and as your own subjectivity — you experience being touched. This is also because people can draw on their imagination to fill in what is in what is the conscious image in their head not through thinking but rather through action involved (Figs. 1 and 2). This action-driven haptic interface has a strong influence on people's strong sensuous response. This perspective is significant that the textile design should take into account how people act or how they are acted upon in the process of interacting with textiles in everyday experience. The context of everyday experience in this sense refers to activities and movements in interaction with nature such as forms of wrapping objects and modes of touching. Accordingly, the textile design needs to involve how the meaning of comfort is experienced by user's bodily interaction. The design approach takes *people's doing not thinking* into account.



Figure 2. "Touch me, Feel me, Play with me" made out of 100% merino wool used with engineering felting technique: 140cm x 125cm x 3.2 cm.



Figure 1. The process of making form of "Touch me, Feel me, Play with me."

## Research Process

The design explorations were done in an experiential manner through action and reflection. The focus in this design research project was reflected in women's (n=15, age of 20-40 years) haptic experience, particularly their responses to:

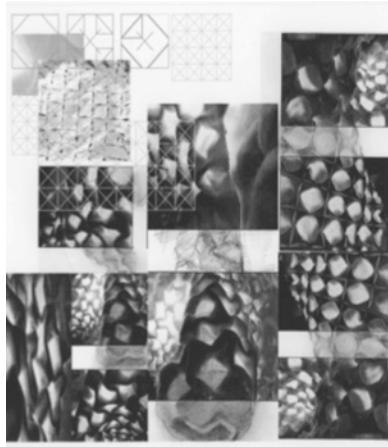
- How they touch and move;
- What they feel through touch;
- How what they see through touch affects what they imagine; and
- How hand touches are related to the other body parts being touched.



Figure 3. Categories of modes of movement; fifteen participants were observed for dynamic touches: stroking, grabbing, fumbling, pressing, rolling, sliding, rubbing, and squeezing.



*Figure 5. Structure of "Touch me, Feel me, Play with me": On the one side, irregular polygon, concave and convex with the trapped air unit structure. This creates different points of body contact. On the reverse side, this creates geometric pockets. When sensors (LED) are embedded in pockets, the felted wool is automatically moved to adapt to body movement.*



*Figure 6. The process of transforming one form into another form of "Touch me, Feel me, Play with me" employed with crafting techniques.*

Four important outcomes, which influenced textile design, were found from the observation applied to the group of women. First, various emotions were evoked by the way participants handled the fabric such as stroking, squeezing, rubbing, lifting, sliding, and pressing. Most of the participants easily experienced passive touch, such as sliding, pressing, and fumbling. However, when the participants exerted active touch, such as stroking, squeezing, pressing, and lifting, they seemed to engage in more sensory experiences (Fig. 3). Active touch, in particular squeezing when the five fingers of the hand compress the surface (detected texture) of textiles enhanced the strongest bodily sensory-tactile experience for "feeling good" while also, paradoxically, "feeling bad." Second results revealed that unconscious movements, which refer to how participants played with an object without thinking seemed to influence positive affective states. For example, unconscious gestures, such as pressing and rolling seemed to make the participants calm, and soothing their state of discomfort, anger or annoyance. In the experiment, it became apparent that such unconscious movements could assist people to evoke positive emotions that modified their negative states and changed them into positive emotion, moods or sentiments. Thirdly, the results showed that active hand touches were related to how the body part is sensorially intertwined. This is because the process of obtaining a sense of hand touch was coordinated with whole body movements. This contributed therefore to the overall impression of "feeling good or bad." Final results revealed that sensory modalities were connected perceptually. For example, when participants touched an object whilst blindfolded, they described the conscious of images evoked "ripples in water = soft = surface = feeling good." The results revealed that what participants touched affected what they see.

The textile, "Touch me, Feel me, Play with me" was developed by reflection on the outcomes from this haptic experiment and the philosophical idea from phenomenology. The primary research question was as follows:

- How can textile empower the body to touch/ be touched, feel/ be felt, and move/ be moved to enhance self-expression and self-therapy?



*Figure 4. Having different inside and outside texture and forms for sense of touch and open to experience the textile design.*

In order to achieve this question, the context of design approach used was twofold: haptic touching and haptic seeing (Craig & Rollman, 1999). In the context of haptic touching the textile was designed to invite the wearer to create dynamic modes of touch. Different modes of touch stimulate different level of sensorial responses (Fig. 4). By taking these dynamic touches into account, the textile was structured to incorporate an irregular polygon, shaped both concave and convex, to trap air on one side and creating geometric pockets on the reverse side within the felted wool structure (Fig. 5). This 3D structure expands different points of body contact in the skin, which enhances sensorial stimulation. Felted wool combined with engineered felt was used as material explorations. This is because felted wool has innate properties such as resilience, versatility, and roughness but still has a feeling of softness and warmth. The quality of the textile was also designed to be open to experience, like to enjoy, to inspire, and to strengthen an individual's identity. For this reason, the textile can be configured in various ways by bodily interaction, which allows

wearers' to express themselves. Body becomes an essential structure in crafting the form of the textile design (Fig. 4).

In the context of haptic seeing the textile was focused on texture and crafting. "Touch me, Feel me, Play with me" was employed with crafting techniques — sewing, folding, and engineered felting — that fuses conventional craft skills into technology involved in felting process (Fig 6). In the design process, the textile can allow people make together through sewing, which can create interpersonal dialogue between them. This dialogue can lead to personal attachment of their stories to this prototype. By taking these crafting techniques into account, the texture of the textile looks very sophisticated and a bit coarse, but maintains still soft texture. In addition, the textile was designed for the users' act of moving over the textile surface, which makes form discernible. To sum up, by intermingling beneficial properties of felted wool with crafting techniques involved in 3D felted wool structure, the textile can invite people to touch in the various ways of touching modes, which amplify the feelings of mystery for the wearer who enables to elicit compound emotions (Fig 7). In addition, the fact that textile was designed to be open to experience can lead to express dynamic self-expression. The wearer therefore could experience various feelings and emotions while interaction or even without interaction with the textile.



Figure 7. Dynamic tactile experience through 3D felted wool structure and crafting techniques.

## Research Outcomes

This research project showed how design practice synthesizes from theory of phenomenology of perception (Merleau-Ponty, 1962) and haptic experiment from user test. "Touch me, Feel me, Play with me" proposes how the people interact with the textiles in the sensory-motor and emotional way with which they explored and enhanced their self-expression and even worked out as self-therapy. It is worth noting that how dynamic modes of touch could assist people to evoke positive emotions that can modify their negative affective states and change them into positive emotions or moods. Designers should give greater consideration to what seems a central feature of the touching process, which can be fruitfully employed in the interactive design process. The fact that people can appreciate small differences in touch enhances their psychological benefits from interaction with the textile, helping to relieve depression and increasing a general sense of wellbeing. This design project argued that these qualities have the potential to enhance the user's wellbeing and emotional connection to a textile, and therefore are as important as the textile qualities of comfort.

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- This research is linked to the ARC Linkage project "Innovative Solutions for Wool Garment Comfort through Design" (Project ID: LP0775433), in conjunction with the Wooldesk at DAFWA (Department of Agriculture and Food, Western Australia).
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## Illustrating Fashion's Invisible Woman'

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*'While there has been some improvement in the offer for this age group, the over-55s fashion market still remains largely untapped' (Sender, 2012a: Unpaged).*

*'Figures gathered from the 6 main UK broadcasters suggest women disappear from TV screens as they get older' (Age UK, 2013: Unpaged)*

*'According to Mintel's report Lifestyles of the Over-55s – UK – April 2012, one in six females aged over-55 don't feel that advertising is aimed at them, peaking among over-75s.' (Sender, 2012b: Unpaged)*

### Abstract

In this homogenised, saturated fashion market opportunities to engage new customers are rare. However, market intelligence suggests the existence of a relatively untapped market in the older fashion consumer (Sender, 2012a: Unpaged). Growth in this market is being fuelled by a shift in spending power from the traditional younger consumer to the relatively more affluent 'Baby Boomer', supported by an increasingly ageing female society, a longer working life and greater longevity due to better diet and healthcare (Mintel, 2000: Unpaged).

Despite this, the over-50s consumer remains under-represented in the current fashion marketplace. The reasons for this continue to be the subject of debate, but initial personal research reveals that not only does the industry seem unable to recognise her, but more significantly, she is unable to recognise herself in either the fashion product on offer or imagery designed to attract her. Furthermore, recent research shows that this problem has implications beyond fashion and that the older woman 'disappears' from broader popular visual culture too (Harman, 2013: Unpaged). In its continued use of stereotypical and outdated reflections of the older woman, the media sends a clear message that in both society and visual culture she is to be neither seen nor heard.

This research is a personal exploration of the relationship between fashion, age and identity through fashion drawing, and forms part of an existing personal interest in addressing diversity through fashion drawing. In the early stages it became clear that not only is the original question 'how can fashion illustration meet the needs of an ageing market?' too complex to be resolved within the scope and limitations of this project, but that further questions were emerging that required consideration. For this reason this project focuses on

the early stages of academic and creative research in interviewing and drawing older fashion muses from life, and stakeholders<sup>1</sup> responses to the drawings. The proposed output will therefore be a creative process journal of work-in-progress to date that will inform future creative direction.

The longer term goal of this research is to give the 'invisible woman' a presence in the fashion market through fashion illustration.

### Author Keywords

age; fashion; style; illustration; diversity; identity;

### Research Imperatives

Professional work as designer-maker, illustrator and teacher, has resulted in a portfolio career with all elements underpinned by an interest in ethical practice. The chosen focus of initial research is diversity within fashion illustration, with visual responses to issues of gender, body type and race undertaken to date (Fig. 1). Learning more about the over-50s consumer, her relationship with fashion and its impact on her identity; and to respond to the tension between fashion and age through drawing is a natural extension to this initial research and offers an interesting challenge.

The use of an illustrated muse is significant due to its dual role of stimulating the designer and connecting with the client, if relevant, and also the target consumer. Sketching the muse at the design stage often sets the creative direction for promotional imagery and styling for photo shoots, and ultimately model casting.

<sup>1</sup> Stakeholders include a range of potential audiences such as fashion professionals e.g. designers, retailers, journalists etc., older fashion consumers, and fashion students.



*Figure 1. Examples of the author's fashion drawing from life using mixed media in response to issues of body type and gender. Above: Kate (2012). Below: Farika (2010)*



## Research Process

An analysis of terms, mind mapping and planning tools initiated the research process, and this enabled further clarification of both scope and limitations of the research and subsequent planning. The enormity of the set task became clear and a rethink was necessary to ensure the aims would be met. As the research was exploring identity, qualitative data was discovered through interview questions in the first instance, and the findings were used to inform the drawings. Secondary research was conducted using a

Initial research raised questions as to the reasons behind the disappearance of the over-50s woman from fashion and visual culture; are older women less inclined to consume fashion and, if so, why; or are their needs simply not being met? Or could it be that the fashion media simply prefers to promote its products and services on traditional younger models, regardless of the target audience? Mintel's Senior Clothing and Fashion Analyst, Tamara Sender, suggests that the latter may be true (2012b: Unpaged). Additionally, research supported the hypothesis that the relationship between age, fashion and identity was not being addressed by the creative industries beyond tokenism (Twigg, 2010: Unpaged; and Barry, 2013: Unpaged).

As contemporary research on the subject seemed to be generated by health and/or social scientists, there seemed potential for both originality of perspective on the subject matter and impact on the fashion industry. Furthermore, as a tutor working with students whose choice of muse usually reinforces the status quo, the opportunity to inform and inspire future fashion professionals in their choices, or even their careers, could not be resisted. The creation of original artwork as a result of academic research supports the project's potential for originality, subject to a positive response from identified audiences both to the illustrations and to the discussion it provokes.

PESTEL<sup>2</sup> model, and also potential creative influences such as illustrators, photographers and artists.

In defining fashion it is clear that it goes beyond the clothes people wear and how they wear them. It can be an individual's interface with the world, identify them as a member of a particular group, or set the wearer apart. On a deeper level it can reveal the physical, emotional, intellectual, spiritual elements of the wearer's identity. As an illustrator I have a particular interest in not only the visual relationship between the body and the cloth, but also the subliminal messages and narratives fashion conveys. For this reason the research process had to involve discovering the messages and stories behind the models' relationship with fashion and using the findings to direct the physical representation through drawing.

Inspired by secondary research findings I went in search of fashion's 'invisible woman' by conducting an audit of older women in key fashion magazines: Vogue (as a driver of style) and Grazia (as the best-selling 'fashion' magazine in the UK), as well as conducting a search for older models on the Autumn 2013-14 catwalk shows at London Fashion Week. While there was some evidence of eccentric, celebrity or incredibly youthful over-50s fashion icons in the fashion press and related blogs, primary research confirmed that these women were considered inaccessible and removed from the typical over-50s fashion consumer. The choice of muses was therefore crucial. They had to both inspire me as the artist and be aspirational and accessible to the over-50s consumer. My first thoughts were to use eccentric older women that would offer the high impact and light heartedness that would suit my style of drawing. But this notion was abandoned as a result of initial research findings (Barry, 2013: Unpaged). I eventually chose women that not only inspired me visually, but also that I knew very well and that I knew had a positive relationship with fashion and their own distinctive style:

<sup>2</sup> PESTEL is an analytical tool researching Political, Environmental, Social, Technological, Ethical and Legal influences on the market.



*Figure 2. Muse 1: Despite a direct gaze the model appears older than she is due to the passive pose and the style of chair.*



*Figure 3. Second sketch (detail); the model appears younger and more fashionable with the quicker line quality which implies movement and energy.*

Muse 1 (Fig. 2) is 51 years old and works as an art teacher. She has a commanding physical presence due to her athletic build, height and minimalist style. Her fashion tastes are smart casual with minimal makeup and styling, preferring to let the quality of the clothes make the statement for her. She is influenced by American fashion, in particular the 'preppy' look. For special occasions she prefers shift dresses in bold colours and interesting fabrics. She describes herself as at her most confident age, 'I've become more confident in knowing what I like... Yeah ...and what I don't like. I shop less, but I'm more discerning' (2013). She admires stylish icons such as Catherine Deneuve and Katherine Hepburn who radiate confidence without being 'tarty'<sup>3</sup>. Muse 1 doesn't feel there's much out there for her as 'it just seems as if it's aimed a particular market and I'm kinda (sic) caught between what's happening, you know, on trend at the minute and then stuff like bloody Marks and Spencer's' (2013). Nor does she feel as though she sees herself reflected in the imagery of fashion, which is 'all kind of celebrity, isn't it?' (2013).

Muse 2 (Fig. 4), an artist, is 69. She exudes an attractive haughtiness with her short, ash blond hair that she describes as 'thin', and has an animated personality. She is both fashionable and stylish, and is one of the few older women I know who have not remained in the style of their 'peak' years, but is actively interested in contemporary fashion. She considers 'dressing up and putting outfits together' as a hobby, and constructs her look as she would one of her paintings. Every Saturday she goes out for dinner with friends and enjoys the ritual of preparing to 'present herself' as part of the occasion. She often 'disappears for hours upstairs to play dress-up', experimenting with styling her outfits just for fun. She favours a layered silhouette in a range of sophisticated colours and fluid fabrics that enhance her animated presence. Her aim is to present an elegant and individual look and she doesn't mind looking older as long as she looks 'right'. She likes her look to be 'together' but not matched.

<sup>3</sup> Initial primary research revealed there is an overwhelming fear in the over-50s interviewed to avoid being 'mutton dressed as lamb' at all costs. This was confirmed by secondary research findings.

## Research Outcomes

A series of drawing sessions was arranged and the work analysed for future direction. During the first session with Muse 1, 2 drawings were produced. Figure 2 shows a seated pose with a direct gaze at the viewer, chosen to reflect her minimalist style and confidence. The chair was a high backed red leather Chesterfield style, chosen to represent Muse 1's classic style. She was wearing a striped matelot style sweater, scarf and jeans. Her hair was scraped back and she wore minimal makeup. The drawing started off well with a likeness captured. However, it was completely overworked and there was too much of the chair involved. The result aged the subject, did not show her vivacity and the literal representation of the chair made her look like a resident of a care home. Although the subject did not agree with my own interpretation of the drawing, further discussion suggested a linear depiction of a more 'contemporary classic' chair might address this issue, or the use of a less passive pose. Figure 3 attempted to redress this. It was more quickly produced and focused on the subject's distinctiveness of body type, lustrous hair and fresh faced minimalism. Quick bold lines were used to convey her hair, and coffee was used in a brush pen to tint the skin, suggesting simple facial lines in a subtle way. The result was a closer representation of her age and was both glamorous and conveyed her character better. The drawing style was also more appropriate to the fashion illustration genre. Feedback from the subject was positive and raised much discussion. Artistically, the bold colour of the dress initially overpowered the subject in the drawing and further attempts were made to achieve a cohesive result by using the cobalt blue of the dress in the shadows of the face and hair. It was felt important that the dress did not 'wear the person', as research revealed that both muses felt confident and at ease with their looks and style, and the drawings needed to reflect this.

As fashion is about attitude as much as the clothes, initial drawings of Muse 2 focused on capturing her facial styling (Fig. 4). Again, as she was wearing black, the resulting drawing was overworked in



Figure 4. Muse 2 - static pose is ageing and despite physical similarities to subject, does not represent model's character.



Figure 5. Second sketch - direct gaze and context introduces link to interests and connection with others.

terms of the garment rendering, which killed it. To take this forward a less opaque medium such as ink might be used when illustrating fluid black garments for a lighter result. Although her face did not look older, the composition failed to capture her vivacity. Feedback from Muse 2, and her husband, was flatteringly positive, but the results were not what I wanted, and I started to develop them further in the studio from smartphone photographs (Figure 5), with more fashionable results – lengthening the neck, a lighter touch in use of media, composition etc. However, the 'light bulb' moment for the project eventually came when applying the following research to the drawings. Dr. Ben Barry (2013) found that women were more likely to purchase fashion if they saw themselves mirrored in the choice of model, but that these images still had to show a *distinctive creative direction* to motivate the purchase. My personal practice must therefore explore the potential conflict between the 'rules' of fashion illustration, i.e. minimising the signs of age and imperfection, and producing fashionable, characterful drawings that reflect and inspire the older consumer. Rexbye and Povlsen's research (2007) into visual signs of ageing found that *perception of age to be more complex than physical appearance alone* and involved style, grooming, openness to activity and connectivity with others and society. The ageing effects of a static composition and lack of narrative context in my initial drawings seemed to support these findings.

In conclusion, initial research showed that while some progress is being made to reflect diversity in fashion in general, there was still work to be done to redress the existing tension between age and fashion in particular, and that there was scope for further study. Critical review of initial personal practice based research also indicated that further experimentation with composition, style of drawing, fashion styling and narrative content was necessary to move further towards achieving the project aims. Furthermore, additional consideration needs to be given to the type and purpose of the fashion illustrations i.e. design sketches that are communicative, and mood illustrations that are aspirational, promotional or persuasive in function. If they are to challenge existing attitudes towards the older consumer, the drawings' 'fitness for purpose' will also need to be tested on a range of audiences; the older consumer, design professionals, students.



Figure 6. Examples of illustrations of older models (Various sources, 2011)

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# Legibility Investigation: Towards controlling typeface variables

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## Abstract

One frequent problem in legibility investigations is that the tested typefaces vary on too many variables. In an investigation that compares typefaces that vary on letter width, weight, contrast and skeleton, it will be difficult to determine precisely why the findings come out as they do, and the external validity suffers. By applying a method of integrating design practice with academic research, I have designed a new typeface family that addresses this problem of multiple typographical variables. At its current stage, the typeface family Neutral Test has seven members. One is the master typeface; three of the remaining typefaces have one stylistic feature that differs from the master (skeleton, weight, and width); and three have two stylistic features that differ from the master (weight/skeleton, weight/contrast and weight/width). In an experimental investigation where the test material is based on the different members of Neutral Test, the researcher will thus be able to identify the specific stylistic feature that causes a given difference in performance.

## Author Keywords

Type design; fonts; legibility; reading; perception

## Research Imperatives

Many studies into typeface legibility are carried out by researchers from a non-design oriented academic background. These researchers – naturally – do not have a professional understanding of typography, which tends to reduce the suitability of their test material. For example, basing the test material on the typefaces Times Roman and Courier will cause problems in the analyses of the outcome, since the typefaces differ on a number of stylistic features including stroke contrast, weight, height-width proportions, letter skeleton and the shape and style of the serifs (fig. 1). It will consequently be difficult to draw any conclusion about why the results came out as they did. Such comparisons will only inform us about the difference between the two typefaces in question, without providing any new knowledge to inform our understanding of typeface characteristics in general.

This comparative method of testing typeface legibility has – until recently – been the main approach for legibility testing (for a review see: Lund 1999). In some cases, this is likely because the researchers' key area of interest lies elsewhere. In other cases, researchers have struggled with the technological limitations before the era of digital type design.

This latter problem no longer exists, and a number of recent studies have implemented test typefaces that are controlled for unwanted variables (Bessemans 2012; Chahine 2012; Dyson 2011; Beier & Larson 2010; Morris et al. 2002). The test typefaces in these studies are developed specifically for the investigation in question. Because the variables are controlled, it is easier here to determine why the results come out as they do, and the produced findings consequently support a broader understanding of how typefaces

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Figure 1. The typefaces Times New Roman (top) and Courier (bottom).

These typefaces differ on so many stylistic features that in a test situation, it will be nearly impossible to identify why the findings come out as they do.

## Research Process

The intention behind the design of the master style was to create a typeface that is as neutral as possible. This follows the idea put forward by the renowned type designer Adrian Frutiger (1998; 2008), in that all characters are modelled on a basic letter skeleton, which emerges as a dark area when the most popular typefaces are superimposed on each other in light shadings. The theory is that this skeleton constitutes a neutral letter shape, since its features are identical to the shared area of the eight popular typefaces. The master typeface is derived from this basic skeleton (figure 2). The remaining members of the family all derive from the master style.

In the work of isolating typographical variables, a number of dilemmas arose. Some of these relate to the bold weights of the family. The intention with Neutral Test Bold is to vary from the master solely on the added weight. To maintain the same level of stroke contrast as found in the master, the stroke should have the same weight added in all parts of the letters. However, when weight is added in this way, letters such as 'e' and 'a' will close up in the inner space (top row, figure 3). Consequently, the added weight could not be the same in all bold-style letters. A second dilemma pertains to our perceptual understanding. It is a well-documented phenomenon that we do not perceive all shapes and forms in their mathematically correct dimensions. For vertical and horizontal strokes to appear equal in weight, horizontal strokes should be lighter in weight than vertical strokes. The issue is well known

influences the way we read. The downside of this approach, however, is the time-consuming task of developing test typefaces from scratch for each new project. As a typeface family that, on the one hand, is subtle in expression and, on the other hand, is designed for the control of variables, the typeface family *Neutral Test* offers a useful test material across a wide range of legibility investigations.

among type designers (Gates 1969), and it is something that all professionally developed typefaces take into account. Obviously,



Figure 2. The letter matrix model (top) is based on the typefaces defined by Adrian Frutiger as the most widely read: Garamond, Baskerville, Bodoni, Excelsior, Times, Palatino, Optima and Helvetica. The design of the master font Neutral Test Regular (bottom) was based on the superimposed typefaces from Frutiger's letter matrix model.

this method of adding different weight does not constitute a scientific approach, where all letters and letter parts would have to change at the same mathematical formula. However, to create functional typefaces, it is necessary to make perceptual adjustments, and so these adjustments were made in the bold weights of Neutral Test.

Typographical variables tend to have a strong influence on each other (Beier 2012). This too resulted in a number of dilemmas. One of these relate to the perceived difference in weight between styles of different stroke contrast. The high stroke contrast typeface Neutral Test Contrast has the same letter width and the same



Figure 4. The family Neutral Test

Three of the family members have one stylistic feature that differs from the master, while three have two stylistic features that differ from the master.

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Figure 3. 'Neutral Test Bold' (bottom) is adjusted in stroke weight to avoid the counters closing up as it happens in the top row where the stroke weight is the same in horizontal and vertical strokes in all the letters. The middle example shows the two versions superimposed.

weight in the vertical strokes as Neutral Test Bold. The two differ solely on contrast. However, due to the light hairline strokes of the Contrast style, this may result in the style being perceived as lighter in weight than the corresponding Bold style. The same dilemma is found in the relationship between the styles of regular width and the styles of extended width. Due to the extra white space inside the letters of the extended width styles, these may appear lighter in weight than the corresponding regular width styles, even though the stroke weights are identical for the *Regular* and *Expanded* styles and for the *Bold* and *BoldExpanded* styles. This dilemma is difficult to solve; if the styles were adjusted for apparent equal weight, the real boldness of the styles would not be identical, and thus it could be categorized as an extra stylistic feature. On the other hand, if the styles appear to have different weights, that too constitutes an unwanted difference.

## Research Outcomes

The range of dilemmas related to how the different styles are perceived by the viewer demonstrates that the task of isolating typographical variables has its difficulties. However, when held up against the method of comparing completely different typefaces such as Time Roman and Courier, it still offers a considerable improvement.

In addition to the master style, the six current members of the typeface family can be divided into two groups (figure 4). Group 1 holds the typefaces that all differ from the master on *one* stylistic feature, and the group 2 holds the typefaces that all differ from the master on *two* stylistic features.

In a comparison between the master and a typeface from the first group, a difference in performance can be located to the added stylistic feature. In a following comparison between the master and a typeface from the second group, a further difference in performance can be attributed to the additional stylistic feature.

As a test material, members of the Neutral Test typeface family can inform us on a number of legibility-related matters. One relevant question is whether high stroke contrast reduces distance legibility. A distance comparison of the Bold style and the Contrast style would shed light on this particular issue. Another question is whether an extremely expanded style or an italic style would hamper continuous reading, or whether the reader adjusts to the typeface without complications.

The typeface family Neutral Test can be applied as test material within a wide range of experimental legibility investigations.

Whenever a new research question comes up, additional test styles can be created, without requiring the design of a new typeface family from scratch every time. One such question that might facilitate the development of additional styles would be to identify the optimal letter weight for a given reading situation. For this investigation, a range of interpolations between the regular weights and the bold weights would be appropriate. Another interesting question is the role serifs play in different reading situation. For such investigations, new typefaces can be created with added serifs functioning as an extra stylistic feature; these new styles can take the outset in any of the existing typefaces of the family.

In that way, the typeface family Neutral Test, is not to be viewed as a finished product; it is a tool that will continue to develop to meet the needs of new legibility investigations.

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# Work In Progress

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Figure 1. 20x20 mm. Sealing wax

## Abstract

I have created a collection of 1,001 models in plaster. To me it is interesting to make things that are not already in the world as the sculptor Carl Andre once said<sup>1</sup>. Things that no one asked me to create, things without a function but with inherent qualities as objects for further study and transformation into different series of depictions. I think that working in a series provides a dynamic and extensive production with a broad investigative and analytical process that expands the field of interest and awareness about procedures. This is a way to reflect on your work and also a way to produce workshops for students. It is in this artistic practice I experiment with architectural models and drawings in a quest for what I call 'operational material': models with inherent ideas, methods, rules and obstructions. The German painter Gerhard Richter put it in this way: "Meine Bilder sind klüger als ich"<sup>2</sup>. It is a process of analysing the material to identify potential creators of architectural processes and future possibilities by a comprehensive process of transforming models into new models and drawings both; 'imaginative drawings' and 'analytically constructed drawings'. The plaster models are transitional models and have the potential as cognitive tools, but are also fragments in their own right. The operational model materialises in parallel with my fascination of watching something emerge; something which in the beginning is just itself - something that can be developed. It is a process of stepping back and forth. An earlier work could prove to fit into a new context: the work in its entirety, through time, is therefore a coherent work - an archive of research possibilities.

<sup>1</sup> "My art springs from my desire to have things in the world which would otherwise never be there". I haven't been able to locate the exact origin of the quote.

<sup>2</sup> "My Paintings Are Smarter Than Me"

## Author Keywords

Models; Objects; Collection; Representation; Creation

## Research Imperatives

The artefacts that I have brought to the conference show different examples of models or objects from an on-going creative process with a huge production that has spanned over three years. I have established an extensive collection of 1,001 different plaster models for exhibitions and further explorations in new models and drawings. These depictions are at the same time works of art in their own right as well as analytical material and possible concepts. The model is there before the emergence of an idea so to speak. In his book *Words and Buildings: A Vocabulary of Modern Architecture*, Adrian Forty shows this diagram as the "conventional" view on the process of architecture<sup>3</sup> (Forty, 2000, p. 32):

Idea → Drawing → Building → Experience → Language

My process is more like this:

Model / object → Drawing → Idea → Experience → Language

On the one hand you have the original work of art and the process of artistic creation and on the other hand the reflection of this work and subsequent development of rules and methods in a quest for what I would call 'operational material' or in other words different representations that could bring me closer to a translation of the

<sup>3</sup> Forty points out that: "...the process of architecture in a diagram whose wrongness will be immediately apparent but which will nonetheless provide us with an opportunity to discuss the relationship between the various activities that make up the whole practice of architecture".

plaster models into architectonic signs and potency – into *ideas*, manoeuvres and rules thus achieving an increased awareness of the model's inherent opportunities.

The research imperatives are:

1. To create a collection: objects to study; exhibition
2. The creative process: transformation of objects; representation
3. The reflection of the process: language



Figure 2. "1,001 Models." Distribution: 1. Photo: Michael Dam

I am very interested in creating forms and shapes - objects without a function for further study. In this case 1,001 pieces! It is imperative to optimize the process when producing such a huge amount of models. The strategy is to develop a minor production to begin with to analyse how to plan or devise the future work in terms of: casting, moulding, wrapping, transportation, storage and so on – also in relation to later exhibitions (Fig. 2 and 3).

Figure 3. "1,001 Models". Distribution: 2, 3 and 4. Photo: Michael Dam



## Research Process

### *Production of moulds and plaster models*

I have produced hundreds of different moulds and combined them in several ways to cast 1,001 different plaster models (with common features).

### Evaluation of models and finishing

I evaluated the models in terms of casting, logistics, proportions and what to cut off in order to obtain a cut surface for future registrations in drawings: I cut away pieces of plaster from the castings to 'alienate' them or simply to cut away features that irritate me. The cut is placed intuitive and done quickly. The amount of models and the repetitive aspect of the process make it easier and less painful to reduce the material.

### Exhibition of models

I did a large scale exhibition at the Royal Danish Academy of Fine Arts - School of Architecture - a four-phased exhibition for a period of four weeks, to explore the 1,001 models, as a tool for different distributions or compositions that went on from very organized structures to a disorganized structure:

1. The grid
2. The negative circle inscribed in a grid
3. The circle
4. The dissolved version - laid out by my former students at the School of Architecture in Copenhagen.<sup>4</sup>

<sup>4</sup> Aviaja Torbensdatter Hermann, Stefan Jesper Gründl, Martin Lukasiewicz, Theis Munk Sørensen, Jonas Johansen and Jonathan Houser

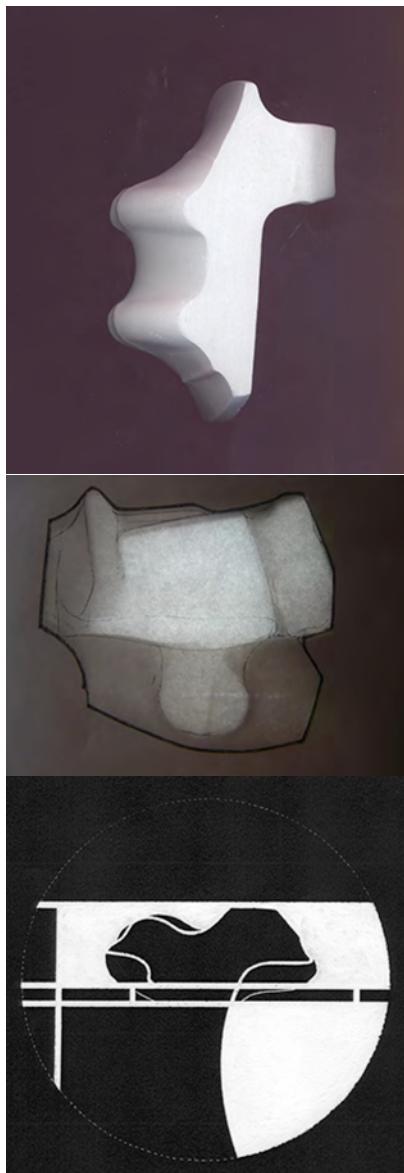


Figure 4. Representations 1-3. Scan, X-ray and ink on paper.

### Evaluation of exhibition

The four distributions were all floor standing as seen in some of Carl Andre's works (see: Malpas, 1998). As Robert Morris put it: "The ground plane, not the wall, is the necessary support for the maximum awareness of the object" (Malpas, 1998, p.16). The models could be seen as a kind of space, negatives, as in the works of Rachel Whiteread (see: Mullins 2004). As a generator in the four different distributions I used the 'obstructions' given by the exhibition space such as the size of the space, fire escapes, the tiling on the floor etc. The four different distributions made the exhibition very dynamic. It proved to be an interesting way of testing 'urban structures', density and how to conquer space.

### Representations and transformations into models and drawings

Further explorations of the plaster models are done by transforming them into registrations of architectural potentials (Fig. 4). The registration of the models is a process of using both the classic analytic measuring of an object and more imaginative and inventive sketches to evoke the models specific nature, or inner idea, by studying simple photographs, x-ray images or scanned images of the model. Like in a cubist painting where the objects are dissolved into geometric shapes and fragments seen from every possible angle in one single glance. These depictions are addressed in various ways of drawing, into a series of more reduced stamps. The models are processed spatially, both as detailed architectonic elements, as models in high relief in various materials (Fig.1 and 6), and, lastly, as structural models in strips of wood that make an evaluation of the spatial qualities possible (Fig.7). I experiment with 'mummification' of plaster models with tape, covering models with jigsaw puzzle pieces, insertion of models into a framework and so forth.

### Evaluation of models and drawings

The explorations in drawings are in fact obstructions or resistance in it self: different techniques and methods of registration. The thousand models are homogenous in expression, approximately

the same size, have the same degree of detail and therefore comparable to a certain extent and may be subjected to the same process and set of rules. I try to reduce the material into stamp-like drawings with a keen interest in the stamp as an instrument or tool in itself as seen in some of my exhibited artefacts at this conference. It is interesting to define the stamp as a model with the properties intact as a tool for stamping. The models are both stamps and architectural models: an operational system with combinatorial possibilities (fig.6). I experiment with 'repetitions' (fig.5), movement, using the same stamp repeatedly and hereafter I elaborate with ink, inspired by for instance Duchamp's *Nu Descendant un Escalier, no.2* from 1912. I work with the black and white balance in the drawing and the negative spaces between the figures (Fig. 4.3 and Fig. 8). I name places in the drawing: courtyards, walls, entrances, fences, stairs and so on.

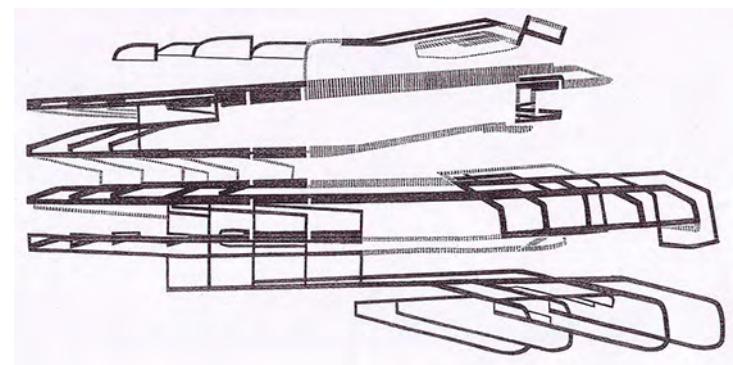


Figure 5. Repetition. Drawing, Ink on paper.

The different model experiments are pointing to the importance of changing scale and work with larger and more detailed models. I am currently in the process of interpreting a selection of a hundred plaster models in order to produce large models of approximately one meter in height. In that way I will change my view of the small floor models to something that relates more to the body and will eventually approach a more concrete architecture.

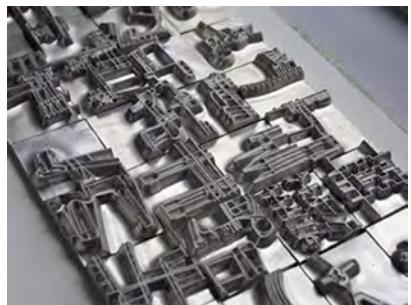


Figure 6. 20x20 mm. Stamps in magnesium.

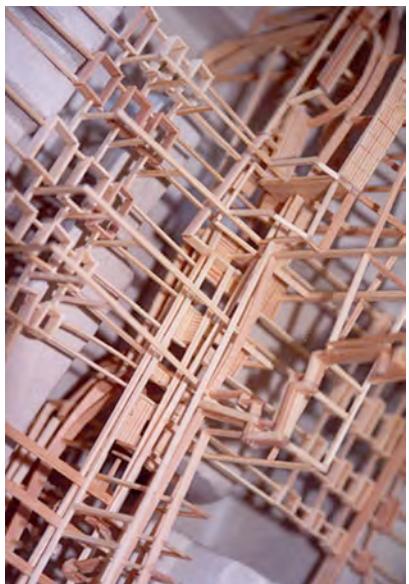


Figure 7 Spatial Structure. Wood.

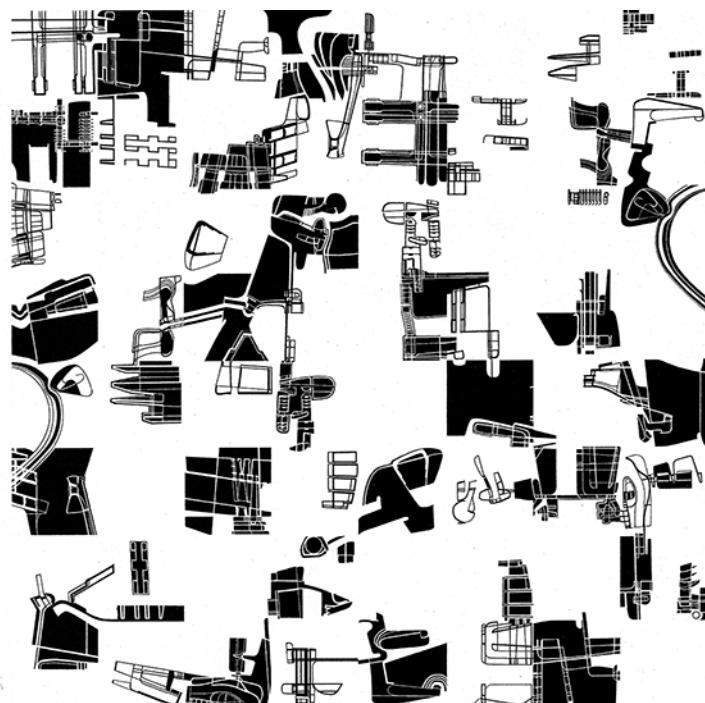


Figure. 8. Blend. Field - drawing

## Research Outcomes

The creative process, the models and the drawings are works of art in their own right and the main outcome of my research – art-based research or research by design – whatever the correct designation is. To me it is a way of being an architect: to construct collections of models and drawings with architectural potency. I see new connections between works I've produced earlier and new works which are brought into relief and form part of the future work, as a particular view of things, a special way to choose to or from in the

material. I'm trying to find my references, the works of other sculptors and architects, to define the tradition I belong to. This is an on-going process – a new and wonderful world. I see the different representations in models and drawings as documentation of the process but also as independent works in their own right – however they are supposed to radiate analysis and process. It is about constructing knowledge and meaning in a process-based practice. It is not a question of whether my work is art or architecture, because I believe that it lies somewhere in between, as it should do. It is already architecture when the first plaster model is removed from the mould and present it self as a new object in the world. I see the models as a kind of Architectural objects as we know them from Kazimir Malevich's famous models in wood and plaster – *the Architekton* (Drutt, 2003).

To me it is imperative to have a dynamic workflow with a broad investigative process that expands the fields of interests and desire to explore the various depictions. This in order to invent techniques and to create a personal expression and original works of art – and not least the reflection of this work and subsequent creation of workshops in relation to my teaching at the academy.

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# The Tao of Solidworks

## Abstract

Through my research I am exploring how novice or graduate designers can make best use of Computer Aided Industrial Design tools (CAID or CAD, specifically SolidWorks) to define and control their design intent in a professional manner. My research is forming the basis for a book to conceive and define effective methods of using CAD tools to explore, define and control design intent through multiple iterations.

The learning material that currently exists is not directly relevant or useful to industrial designers. Designers have different needs and are often working with incomplete information and designed artifacts are subject to many cycles of revision. What they need is a flexible and fluid way to explore ideas and define form(s). Research was undertaken into the evolution of the representation of objects in two-dimensional and three-dimensional form. This was done in order to allow the researcher to gain understanding of how methods of communication have developed in partnership with developments in mathematics, geometry and software tools. This research has led to a new perspective on the interplay between conception of form, knowledge of geometrical construction methods and the potential for them to empower designers to create three-dimensional forms. Further work is needed to explore techniques and tools to this end. The long-term intention is to use this knowledge to create more effective resources to teach students to make best use of digital modeling tools.

## Author Keywords

Digital craftsmanship; CAD; Solidworks; Solid-modelling; spatial-cognition; industrial design education; learning resources.

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## Research Imperatives

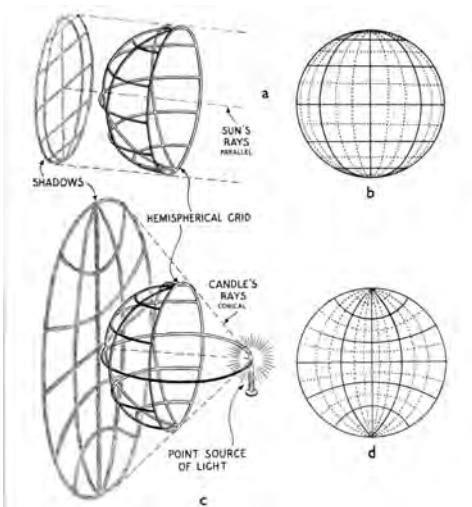
Digital design tools have been in existence for over four decades, yet there are few learning resources available to assist and enable the aspiring designer to make best use of them. Existing resources predominately rely on learning by rote with little or no interrogation of the approach to modelling.

The disciplines of Industrial Design and Mechanical Engineering have particular need to formalize the communication of artifacts. Industrial Design has its' roots in the industrial revolution, changing the way that goods were produced forever.

Most objects were originally made by a single individual, a craftsman. In this context there was little need to define the article being made, as it existed in the imagination of the maker. The design was passed down from master to apprentice, from father to son. The shift from small scale, artisan made goods to large-scale manufacture meant that design intent had to be formalised in some manner – so that it could be communicated and ultimately broken down into smaller, simpler operations to make this possible.

Professional design practice often requires a high-level of understanding of the tools themselves and the approach to using them to create digital artifacts. The difficulty in this endeavor is compounded by the need to go through numerous iterations of such design. This high-level understanding and skill set is one that is borne of many hundreds of hours of usage, learning from more experienced users. This leads to the tacit understanding of the way particular tools work best in a given situation. What can be learnt from the characteristics and knowledge utilised in such an approach in order to better instruct novice users?

The particular case under consideration here is that of three-dimensional solid modeling, widely used in industrial design and engineering to define artifacts for manufacture. The predominate software tools are 'hybrid' modeling tools, that is to say that they package. Operation of any three-dimensional (3D) CAD tool envisages forms, then devises a strategy to define them in software. The main CAD tools provide very simplistic tools to do this; it is left to the skill and creativity of the operator in order to find ways to create complex forms.



*Figure 1. Different types of projection as determined in ancient Greek times.*

### Research Process

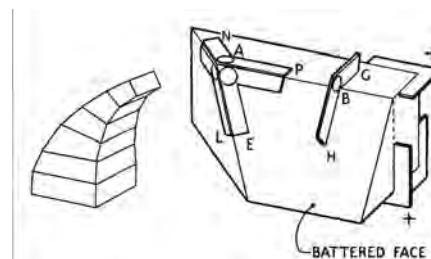
The author has over ten years' experience in teaching CAD skills to undergraduate designers. This has provided useful knowledge in effective approaches to teaching others to use complex 3D CAD tools.

Research was undertaken to understand the evolution of the methods by which artifacts are defined and communicated. This

study was undertaken to look closely at how developments in tools and techniques have informed design practice and the profession. It is evident that design practice has changed markedly in the last two decades due to the adoption of software tools to speed up the design process.

### Research Outcomes

Humankind's conception and understanding of the physical world is informed by many disciplines, Euclidean mathematics and drawing methods are the foundation of geometry, engineering drawing and drafting (Fig. 1). Gaspard Monge is considered to be the father of descriptive geometry<sup>1</sup> (Booker, 1979). The evolution of methods to represent objects on two-dimensional material, using a number of conventions, has empowered people to not only depict artifacts but to use such drawings to calculate optimum forms. Before formal drawing standards existed many crafts and guilds developed their own conventions and methods as to how to mark out material, these methods were often kept secret and remained the privilege of the discipline. Stonemasons in fact developed techniques to work out compound angles by marking out dimensions on the stone itself, as modern draftsmen would use auxiliary views and projections to calculate true shapes and sectional views (Fig. 2).



*Figure 2. Stonemason's technique to mark out material.*

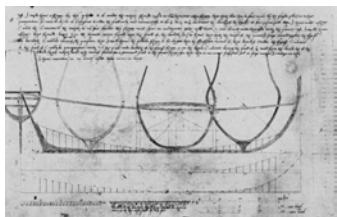


Figure 3. A shipwrights drawing from c. 1586, showing sections superimposed upon the elevation.

There were of course key figures in the development of such methods of geometrical construction, amongst them Gaspard Monge, who was employed as a student draughtsman in the fortification design office of the Mézières Military School in France, approximately 1760. His understanding and development of theories of descriptive geometry led him to develop more efficient ways to calculate the 'angle of defilement' of a proposed military emplacement. His method was so valuable to the School that it was classified as a military secret and he was forbidden to publish a book on these new drawing and geometrical construction methods until publishing his application to the Academy of Sciences in 1780, at the age of 34<sup>2</sup> (Booker, 1979).

This development of mathematical theory and geometrical construction led on to the development of polynomial equations (Bézier and de Casteljau) that allow designers to define complex spline based entities, the potential of this innovation was unrealized until the accessibility of relatively low cost computer processing power necessary to use these calculations to depict such geometry on a 2D display. Pierre Bézier (Renault) and Paul de Casteljau (Citroën) were pioneers in developing complex splines for use in defining automotive forms, leading to the creation of UNISURF in 1971 using de Casteljau's algorithm<sup>3</sup>. This technology and approach was also developed in other automotive manufacturing organisations and was largely kept proprietary until the advent of commercially available software tools in the 1980's. Due to the limitations in computing technology it was not until 1989 that specialist hardware was made available by Silicon Graphics<sup>4</sup>. This allowed real-time interactive manipulation of NURBS curves.

Almost any contemporary computing device (even a basic mobile phone) is capable enough to process such calculations with ease. Bezier curves are in fact closely related to methods previously employed by shipwrights in defining, reproducing and scaling complex curves to produce hull forms for marine vessels. Shipwrights would use thin flexible strips of a material and weights of a given size placed on them at measured locations in order to

bend the strip to a desired shape. This relatively simple and reproducible method informed the manner in which 'Bezier' splines (and in turn Non-uniform Rational Bezier Splines, NURBS) are created and manipulated in software tools today – it resembles the physical nature of their predecessor (Figure 3).

The confluence of the theoretical understanding of geometry, software implementation and affordable computing power has made these tools commonplace and accessible to designers around the globe.

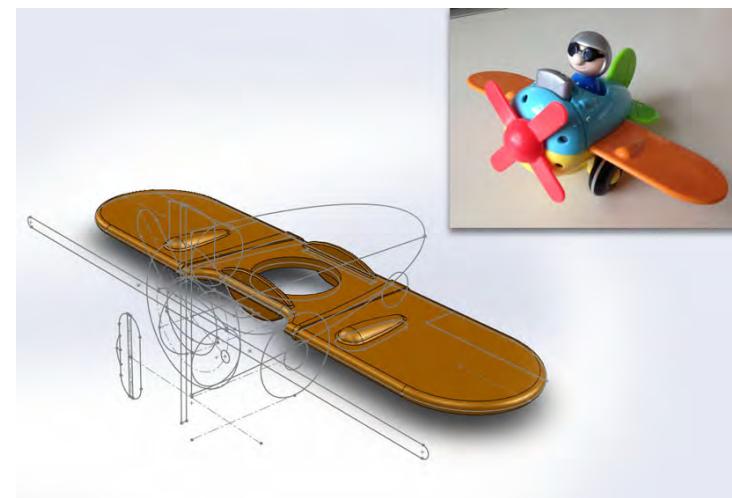


Figure 4. Solidworks model of toy plane, in progress. Inset image is actual item. Note the grey line sketches that form the master model that defines the overall form and details.

The development of these tools, in particular those that have parametric functionality (Pro/Engineer, Solidworks), revolutionised the practice of making visual representations of artefacts. Three-dimensional parametric solid modeling packages function in a completely different way to traditional drawing. The key principle is that of constructing a central database of geometry and that you can then create 'outputs' from that. Operators using software functions to define geometry, add secondary details, specify

material and colour information to entities. The screen-based representation is itself a construct. Calculated from the data contained with each file. This dataset can be used to create two-dimensional drawings and other digital artefacts. The key difference is that creating a two-dimensional drawing is a snapshot of a point in time, the 3d database can be edited as desired and the drawings made from that database will update according to changes made (by means of the parametric functionality). So the database is a digital asset and drawings, PDF files etc. are ways to exploit the asset to your advantage, saving time and money in redrawing things manually.

It is evident that as methods and techniques for depiction of artifacts develop (i.e. through formulae or software) – the capability of authors is improved. That is to say if all you are able to construct on paper are arcs and lines then you are limited as to what forms you can depict. If you have greater understanding and better tools then you can create more complex forms. Therefore, an individual's spatial reasoning and cognition enables their virtuosity with physical and virtual tools to explore, create and communicate form.

The more capable designer is able to apply complex analysis to a given piece of geometry and break it down in to a series of steps. This allows them to devise a strategy to build it in physical and/or virtual form. The process of analysis and strategy is not adequately understood or documented – therefore the opportunity exists to define such approaches and devise a means to transfer that knowledge from the expert to the novice.

This research aims to analyse and understand the spatial reasoning employed by designers when they imagine and express form using software. This is done in order to define methods and approaches to this undertaking; so that better ways to instruct others can be developed.

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# A Sheep in Synthetic Wolf's Clothing: Creating a Hybrid of Natural and Man-Made Materials to Combine Protection and Aesthetics in a Cold Climate

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**Abstract**

For thousands of years, humans have experimented with methods of joining materials, not only to create objects for practical use but also to satisfy their desire for decoration and embellishment.

This research project aims to combine a man-made technical textile with sheepskin (one of mankind's oldest protective clothing materials), in order to investigate the potential of creating an aesthetically pleasing garment that also offers high performance. This concept is an inversion of the recent trend for mimicking nature in textile construction.

In this paper the processes explored will include the rationale for material selection, as well as construction methods such as bonding, welding and minimal seaming, together with ergonomic pattern cutting. Aspects of aesthetics will also be investigated. By combining these materials, processes and fabrications into a female-specific hybrid jacket, the intention of the research is to resolve the tension between garment aesthetics and the need for thermal regulation in a cold climate.

**Author Keywords**

Aesthetics; joining materials; man-made; natural; sheepskin; technical textiles.



*Figures 1 and 2.*

*Combining the best of ancient and modern materials.*

*Wool's unique structure and crimp creates a "buffer zone" keeping the wearer warm and dry.*

*A durable water repellent finish to the synthetic textile prevents the sheepskin from wetting out.*



## Research Imperatives

This concept is an inversion of the recent trend for bio-mimicry or imitating nature in textile construction.

For example, since the 1970s, synthetic fleece knitters have been developing “fleece” that shares some of the properties and performance of wool, yet is faster drying, less bulky and offers higher warmth to weight ratio.

It is from this inversion of the trend for bio-mimicry that this paper draws its title— a sheep in synthetic wolf’s clothing. The intention, then, is to create a post-modernist play on the usual discourse of highly technical performance wear.

By using a natural material to replace the manmade textiles that are the norm for this type of garment, we intend to create a different aesthetic, both visual and tactile, improving comfort and fit for the wearer. In choosing sheepskin, a sustainable product, for the inner of the jacket, the environmental impact may also be reduced.

Sheepskin will be combined with a technical, synthetic textile. The anticipated benefits will be:

- to apply a durable water repellent finish to the outer surface to prevent the sheepskin “wetting out”;
- to improve abrasion-resistance;
- and to provide a vehicle for colour.

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## Research Process

The research process embraced three distinct phases: material selection; experimentation with pattern cutting and construction methods; and investigation of aesthetic qualities.

### Material Selection

Sheepskin was chosen because it is naturally thermostatic, with a warm feel that is enjoyable to touch and wear. Crucially, it acts as a “buffer zone”, able to absorb moisture of up to 35% of its weight without feeling wet. The exterior cells of wool have a waxy coating, making it water repellent, but microscopic pores allow water vapour to pass through into the inner core where it is absorbed. This buffer zone is key to the comfort of the garment: as the wool absorbs the moisture it produces heat, so that the moisture is passed through the outer fabric as vapour. Thus, perspiration can be absorbed until it is transported through the outer layer thus keeping the wearer’s skin drier (and hence warmer).

The structure of the inner cells also gives the wool its flexibility and crimp allowing the fibres to trap insulating air.

Three potential synthetic textiles were considered:

- woven 100% polyamide;
- woven 100% polyester with a waterproof and breathable membrane;
- recycled mechanical stretch woven polyester with a protective backer.

The latter was selected because it is lightweight (circa 170 grammes per square metre), has a long-lasting water repellent finish and provides a vehicle for colour.

With both warp and weft stretch, it also drapes well and moves with the body. This type of fabric is often used in combination with a fleece backer for technical outdoor performance garments known as “softshells”.



*Figure 4. Sheepskin shapes bonded to adhesive prior to trimming.*

### **Construction Experimentation**

We established that sheepskin and woven polyester could be bonded successfully using sheet adhesive. However, the result was very stiff and reduced drape. Laser-cutting small holes in the sheet helped counter this and also improved breathability without affecting adhesion.

Subsequently, we discovered using smaller sheepskin shapes rather than complete panels further improved drape. Rounded shapes were more successful than those with points, in terms of both adhesion and aesthetics.

Experimentation also showed that wool, unlike synthetic fleece, retains its loft after being in the hot press. Its crimp means that it

can spring back, enabling the use of different heights of pile to create textural/thermal effects.

A number of seam types were also explored. Lapped seams were welded using adhesive tape. But the pressure of the wheel caused seams in the stretch fabric to wave, so were unacceptable. Cross-over seams were created with ultra sonic laser, however these were not strong enough and easily pulled apart. Finally, by using offset T-joint seams, pull strength and visual effect were improved.

### **Aesthetic Investigation**

Aspects of aesthetics were also investigated, with design improvements incorporated as part of an iterative process.

It was found that sheepskin shapes could be bonded across joints, eliminating the need for panel shapes to be dictated by areas of differing insulation.

This allowed some of the seams to be eliminated, resulting in a cleaner design.



*Figure 5. T-jointing to improve seam pull strength.*

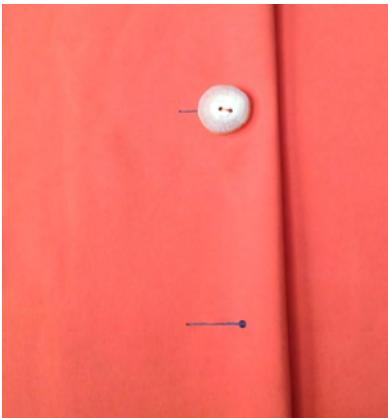
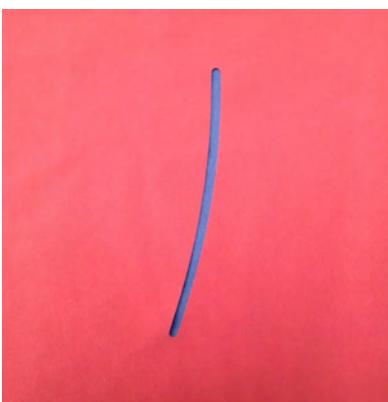


Figure 6. Jacket closed with laser cut buttonholes and horn buttons.

Figure 7. Pocket mouths take advantage of laser cutting to seal textile edges.



At concept stage, it had been intended to close the jacket by inserting a zip by laser cutting/bonding. However, as the textile edges sealed successfully when laser cut, it was decided that zips were unnecessary. Instead, we opted for horn buttons with laser cut buttonholes and pocket mouths - this was considered more in keeping with the desired look of the jacket.

### Research outcomes

This research project set out to combine a hybrid of traditional and synthetic materials, utilising contemporary fabrications and technologies (Jones and Stylios, 2013).

A number of outcomes emerged during the design process. During the material selection phase, it became clear that visual and tactile aesthetics do not have to be compromised to create a garment that performs in a cold climate. Sheepskin and stretch woven polyester offer the best of both ancient and modern, with each contributing complementary strengths.

Secondly, we were surprised to learn how well sheepskin adapts to processes such as hot press bonding, literally bouncing back. This suggests that other materials that have come to be regarded as old-fashioned may be worthy of further investigation, to take advantage of their intrinsic qualities in twenty first century applications.

While we do not expect that a hybrid garment of this kind would compete at the most technical end of the market, there may also be scope for further research into its thermal performance.

Finally, the project demonstrated one of the key aspects of practice-based research. Our final design sketch reveals considerable development since our initial ideas. Although concepts and hypotheses can provide avenues to explore, it is in the doing and making that experiential learning occurs.

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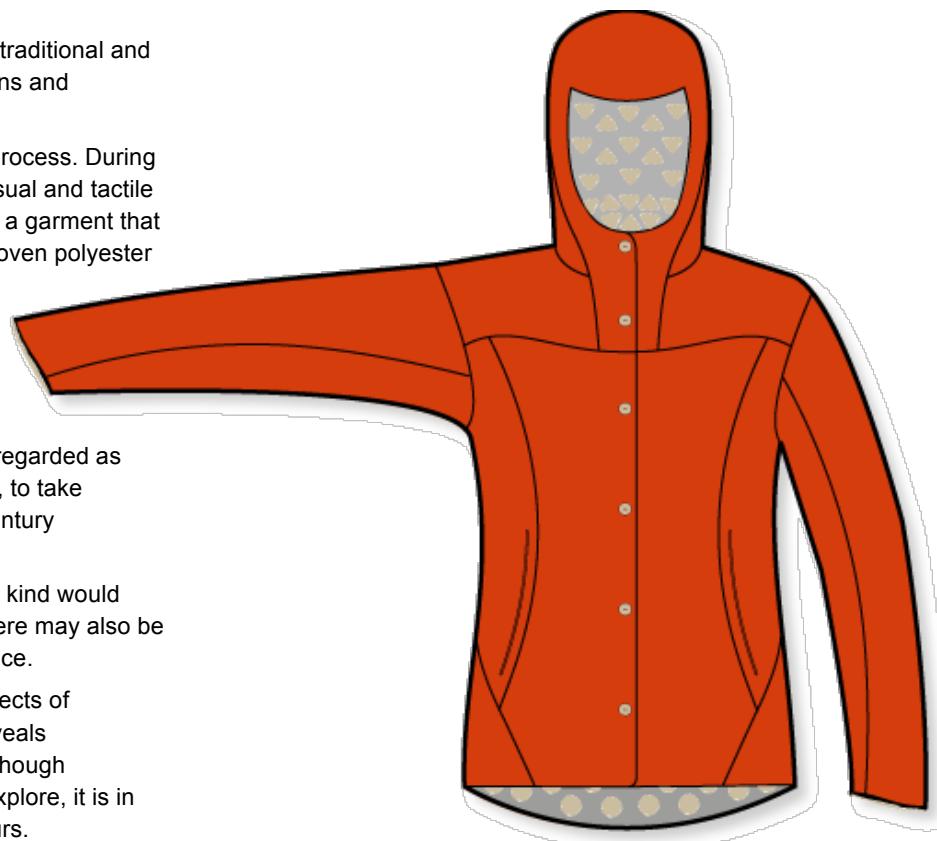


Figure 8. Sketch of final design developed through making and doing.

# Quest for the Esteem Engine

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## Abstract

Tradesman's Wedges and Desktop Empires are the start of a body of research investigating how we gain appreciation of everyday utilitarian objects and the industrial craft knowledge that has been handed down, set against the advancement of technological mystery. The pieces were made to interrogate thinking around Industrial Craft whereby the Craftsman uses an inherited archive of knowledge and skills as he makes instinctive decisions to manipulate tools and materials. The research argues that in our post attention economy, we have a legacy of undervaluing the worth of craft skill and the natural world, where there is no appreciation for artifact or artisan.

The research investigates and examines conversations with tools and materials in the act of making, in order to explore applied value and worth. The pieces serve as counter propositions to our current culture, which focuses on digital devices and social networks.

Within the industrial craft disciplines, there exist overlooked props and aids used within the fabrication and manufacture of artefacts, one such group of objects consists of engineering holding and clamping devices, these items are not regarded with any great value, yet are essential to the fundamentals of mechanics. I revisited these artefacts in order to reveal their potential and worth within a new context focused on aesthetic and tacit value that would draw attention through material and process to reveal beauty, proportion and aesthetic value. An overriding rule of the design process was that first and foremost the objects themselves must be 100% fit for purpose as tools and also challenge perceptions and confront preconceptions of how we understand

and appreciate the world of Product manufacture. The artefacts were manufactured through regional engagement with specialist master craftsmen forming a network of industrial craft collaborators, each bringing specialist knowledge and influence to the final outcome.

## Author Keywords

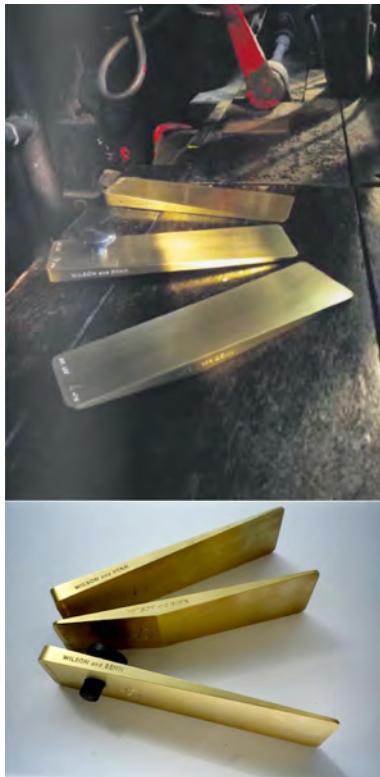
Industrial Craft Knowledge; Making; Appreciation of Artefacts; Digital Culture.

## Research Imperatives

This paper is part of a map that outlines the start of my journey of contemplation around how we gain appreciation of objects and the role of industrial craft knowledge within this set against the backdrop of advancements in digital technology. Tradesman's Wedges and Desktop Empires are the start of a body of work that enables me to explore this terrain and develop positions within it. As such this paper acts as my first tentative step in articulating the terrain and my opinions informed by my 30 or so years' experience of being a designer and maker. I do not set out to offer any final conclusion, for as yet I have not travelled far...

## A Quest(ion)

A knight-errant sets out upon a quest... to explore why our appreciation for the world around us and the things in it has dwindled. I assert this claim from my own experiences as a maker and educator, but also recognize that this is not a new phenomenon it has been rampant since the start of the industrial revolution and the move away from artisan production.



*Figure group 1. Tradesman's Wedges. The wedge is one of six simple machines; a simple machine is a mechanical device that changes the direction and magnitude of a force and has been used for millennia.*

*The series consists of; Plain Wedge, Adjustable Wedge and Pivot Wedge. They are wrought from Brass, Phosphor Bronze and Gunmetal.*

Why today in the world of new multi social media technologies are we becoming more insular? What is it that this new world order holds in esteem? Have we become so engorged on ease and comfort facilitated by a culture of reliance on digital technologies that we no longer value devoting ourselves to an endeavor such as developing a craft skill in order to produce artefacts and instead live a more passive life where the effort and skill involved in the production of artefacts is missed?

This is not an anti-digital polemic. There is nothing wrong with new technologies or the products and services that surround them per se and it would seem to be an act of human nature to want ease and comfort, but what I want to question is at what cost? At this moment it would appear that we are out of balance "In the UK, we are raising the unhappiest kids in the developed world" UNICEF (2007). One aspect contributing to this effect could be the lack of appreciation for the act of making and the art of craftsmanship, which has been eroded to such a point that our view of the world has been skewed; we demand and dam the consequences, digital technology will overcome.

Are we suffering from mass "Nature deficit disorder"? American author and journalist Richard Louv believes that "The future will belong to the nature-smart—those individuals, families, businesses, and political leaders who develop a deeper understanding of the transformative power of the natural world and who balance the virtual with the real. The more high-tech we become, the more nature we need." Louv 2010. When we take this world for granted on mass, the consequences are shocking and far-reaching. One of the best visualisations of how this manifests itself is in the photographic work of Chris Jordan whose art works present us with the magnitude of our consumerism and a sense of the consequences of our mass consumption and action. Yale scholar Stephen Kellert asserts that "When (in America) 300,000,000 people do unconscious behavior it can add up to a catastrophic consequence that nobody wants and no one intended" (2002).

Considering the implications of passive attitudes to the things around us, not only relating to consumerism, but to the modes of production, skill and craft necessary to develop the artefacts that surround us it is my opinion that we need to eliminate the word JUST from our common vocabulary, as in can you 'JUST do this' or, 'It's JUST a.....'. The word cheapens the respect of experience in the ability to do things, in this instance making things, it means that an artisan can JUST make a chair, a boat, a kettle, a knife... and ignores the fact that he/she can only do so by drawing on the generations of inherited knowledge and years of experience that underpin their craft and ability.

Now, for example, if an artefact is broken or damaged, even in the slightest, we are encouraged to JUST get another one. Our consumer culture driven by smart media devices, invites us to upgrade or replace; to move on rather than to live with. We are encouraged to feel a sense of smug satisfaction in the knowledge that we have the *latest* the *greatest* the *smartest* and the *coolest* .....and it's insured....so if needs be, you can just get, another clone and be like all the other individuals. As Killert (2002) argues society today has become so estranged from its natural origins it has failed to recognise our species' basic dependence on nature as a condition of growth and development.

## Research Process

Do we have a built in primordial sense that allows us to appreciate things without understanding them, why are some things immediately nice, how do we know? In order to explore this I considered that a test would be to create objects that have a niche within an industry but to present them out of context so that the observer would have little understanding of their use. Tradesman's Wedges (Fig.1) are an example of such objects. The objects would be implicit in their nature. On exploring the language of making we find that every vocation has within it, its own dialects and sets of jargon. From my own experience within industrial design and manufacture and engineering I selected a set of objects/tools that



Figure group 2. Desk Top Empires.

*A series of wedges, vee blocks, shims and packing blocks that can be used in a machine shop or can be transformed into your own Desktop Empire. These devices are important in holding work steady for accurate precise machining of engineered and designed product. The Blocks are wrought from Iron, Mild Steel and Brass with design skill.*

are in daily use and commonplace, but to an onlooker they may not register as familiar, and therefore create an air of mystery as how they may be first approached.

The tools to help on this quest were chosen for their anonymity, in an industrial sense they are aides to fabrication, artifacts that have been developed within industrial craft and have generations of inherited knowledge (Figs 2 and 3). In their own context they have little intrinsic value, but are essential to the fundamentals of mechanics, they are knowledge that enables the manufacture of such items that is held in esteem rather than the objects themselves. An overriding rule of the design process was that first and foremost the objects themselves must be 100% fit for purpose as tools and also challenge perceptions and confront preconceptions of how we understand and appreciate the world of Product manufacture. The intention of this research was to design and create artifacts so they would reflect the esteem given to the knowledge of 'how to'.

The objects are recognisable to the mind's eye as miniature architectural building blocks that encourage the imagination and promote the act of play. My hope was that on perceiving the objects for the first time individuals may not understand the context of use, but would understand the harmonies of material weight and proportion in a designed object, and foster a belief that what they are handling has a greater value and worth.

In order to appreciate manmade objects it is commonly understood in design education, that an understanding of the proportions of nature are perceived to be beautiful; after all it's how we measure beauty, to find beauty in another creature we look for symmetry and proportion. The further we are removed from contact with nature, our ability to see beauty within things dwindles. Pride in the practical is being replaced, leading to the "extinction of experience" (Pyle 1993) which breeds apathy towards environmental concerns.

This might sound like an introduction to a neo-Luddite manifesto, but the fact is we are moving backwards in our knowledge and understanding of how things work and are produced, whilst technological advancement and development has built up so such momentum that it could leave the majority of users like battery chickens, being fed but having no understanding of where they fit in to the world that surrounds them. Intrinsically there is nothing wrong with the technologies or how they are applied, they are not created to be bad things, and the upgrades and new devices are being developed to satisfy a need. But there is a cost and we are yet to fully appreciate what this will be.

As the Italian philosopher Franco 'Bifo' Berardi has argued we now live in the tension between the infinity of cyberspace and the vulnerable finitude of the body and the nervous system. He asserts that the acceleration of information exchange has produced an effect of a pathological type on the individual human mind and even more on the collective mind. Berardi writes in *Precarious Rhapsody* "Individuals are not in a position to consciously process the immense and always growing mass of information that enters their computers, their cell phones, their television screens, their electronic diaries and their heads. However, it seems indispensable to follow, recognise, evaluate, process all this information if you want to be efficient, competitive, victorious." (Beradi, 2009, p41)

The tradesman no longer puts down his tools at the end of the day in the satisfaction that he has done a good job and his money well made. Close of business is now extended, internet and smart media don't sleep, and you are expected to respond, to search, to keep up in order to get on. "Where love rules there is no will to power; and where power predominates, there love is lacking, the one is the shadow of the other" (Jung 1912).

## Research Outcomes

So back to the toolbox – Tradesman's Wedges and Desktop Empires have been exhibited at ICFF (International Contemporary Furniture Fair, New York) and at London Design Festival. I have



*Figure group 3. Desk Top Empires made within the 'Tools for Everyday Life' project which is an on-going initiative to investigate the role and relevancy of materials and processes knowledge in the design of functional products. The project is run from Northumbria University's Design Department and draws it's designers from the community of practice that surrounds BA(hons) 3D Design and the post graduate Designers in Residence scheme.*

*The project results in both commercially viable artefacts and opportunities for designers to articulate their positions on the creation of things in general and the relationship between craft knowledge and product design more specifically.*

used these opportunities to view how an audience of designers and laypersons of all ages interact with the objects, how long they handle them for and explore them and how they relate to them. The feedback strongly supports a case that an involvement with the natural world creates ability for esteem to exist in objects. There would appear to be a generational split, the general opinion of an audience now in their late twenty's that, although at first they have no understanding of the objects, there persists an enquiring willingness and playful understanding. Counter to that is the younger generation in viewing the objects who seem to lack the ability of persistence, their attention threshold is very low, if they don't get it they walk away, the effort to find out is too great, there is no immediate gratification. Perhaps an indication that bears out the premise that in an attention economy the objects are of little value and worth and there is no appreciation for artifact or artisan.

As I stated in introducing this work this is my first step into considering these notions and the objects that I have made have served mainly as a way for me to think through these issues through making. I intend to develop this work to explore these issues and this polemic further.

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# Personalised Mass Manufactured Products: a possibility or a contradiction?

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## Abstract

Personalisation in product design refers to the ability for users to alter or add features to products to best suit their needs and wants. This can occur during different stages of the design process, but it is better known to occur in the manufacture phase - a process known as mass customisation. However, true personalisation in mass customisation is often somewhat limited, restricted to a palette of materials, colours and styles that can be mixed and matched.

In this paper, a case study of the *Pop light* will be used to explore the possibilities of a higher level of user personalisation in a mass manufactured product, than is currently offered in mass customisation methods. The design of this product implements a design methodology that the authors term *user-completion*. The user-completion methodology defined by the authors comprises two key elements - a 'design kit' and aspects of the product left 'open' for users to finish. The design kit delivered to users has the potential to be mass manufactured. Providing users the opportunity to personalise their mass manufactured products once they take ownership of them, has the opportunity to arguably increase the intangible value of the product.

In addition to the case study discussion of the *Pop light*, the paper will also briefly describe the development of the user-completion approach through an earlier testing of the methodology in the 2012 *Stitch light*. The *Pop light*, and its predecessor the *Stitch light*, are designed by bernabeifreeman, a leading Sydney based design company, of whom one of the authors is co-director. Both the *Stitch* and *Pop lights* were designed as a kind of 'real life' testing of the user-completion approach.

This paper and associated artefact builds on previous research by the authors exploring design methodologies operating at the intersection between mass manufacture, mass customisation and craft.

## Author Keywords

Product personalisation; user-completion; mass manufacture

## Research Imperatives

The motivation behind this research is to explore the possibilities of designing a mass-manufactured product that facilitates user personalisation. The authors of this paper have previously identified and tested a design approach termed *user-completion* (Bernabei & Power, 2013). The user-completion approach involves users in the assembly and completion of products, during which personalisation of the product can be achieved.

Personalisation has been defined as "a process that changes the functionality, interface, information content, or distinctiveness of a system to increase its personal relevance to an individual" (Blom, 2000, p. 313). Researchers have identified seven aspects of product personalisation – "Mental effort (degree of consumers' creative involvement), Physical effort (degree of consumers' physical involvement), Flexibility (degree to which the personalisation is flexible), ... Initiation (degree to which the personalisation process is initiated by the designer) ... Goal of product personalisation (degree to which the personalisation fulfils utility-related and/or appearance-related goals), Personalisation moment (when does the personalisation take place), and

Deliberateness (degree to which personalisation is performed deliberately" (Mugge et al., 2009b, p. 91-2).

Typically in product design, personalisation is achieved via mass customisation in which "the end user gets to choose certain features such as colour and apply them to a pre-designed product" (Szita, 2009, p. 109). Frank Piller (2007, p. 631) describes mass customisation as providing, "an offering that meets the demands of each individual customer, but that can still be produced with mass production efficiency." The user-completion approach seeks to offer mass manufacture production whilst offering a higher level of personalisation unachieved through mass customisation. User-completion is particularly concerned with the investment of physical effort by the user in order to achieve personalisation. This personalisation is initiated by the designer through the product being presented as a 'design kit', or a series of specifically designed components that can be fitted together in various combinations by the user (Bernabei and Power, 2013, p. 6). This design approach relies on the specialised skills of the designers to design the components and understand the manufacturing options, whilst leaving elements of the final product for users to finalise and personalise. The "personalisation moment", as identified by Mugge et al (2009b, p. 90), takes place prior to use of the product. Until the user undertakes the assembly and completion of the product through the user-completion process, there is no final product and possibly no function associated with the product. Mugge et al. (2009b, p. 89) would describe this as an "extreme case of initiation", as "personalisation is obligatory in order to use the product."

There are benefits of product personalisation for both the designer and user. For the designer, facilitating personalisation may result in a product that is more finely tuned for its specific function and environment, thus resulting in a better product. From a user's perspective, personalisation enables users to "communicate ownership of the product" and have the product better suit individual needs and wants (Mugge et al., 2009a, p. 468).

While there has been increasing research in the field of product personalisation, such research does not present a design methodology that can be implemented by the designer. In this way, this research is considered original and significant in complementing the existing literature regarding product personalisation. In this paper the implementation of the user-completion design methodology will be described through a series of products, which were specifically designed to test this approach.

### Research Process

The *Pop light*, and its predecessor the *Stitch light*, are designed by bernabeifreeman, a leading Sydney-based design company, of whom one of the authors is co-director. Both the *Stitch* and *Pop lights* were designed as a kind of 'real life' testing of the user-completion approach.



Figure 1. bernabeifreeman, *Stitch light*, 2012.

The *Stitch light* (Fig. 1) was designed in 2012, and has been exhibited at *Object: Australian Centre for Design*. The light is

delivered as a 'design kit', which consists of a series of aluminium spinnings, a perforated aluminium diffuser center panel and nylon cord. Each of these design kit elements can be mass manufactured. The design kit allows users to assemble and personalise the light through assembly variations and embroidery of the perforated diffuser panel, which the users stitch themselves.

The *Stitch light* required a relatively medium to high level of skill from the user to achieve a successful design, particularly requiring skill in embroidery. As a result "people may spoil the product, because they are not sufficiently skilled to design their own products" (Mugge et al., 2009a, p. 473). Any negative experience with the assembly and finishing of the product could have a devaluating effect on the product and the brand itself.

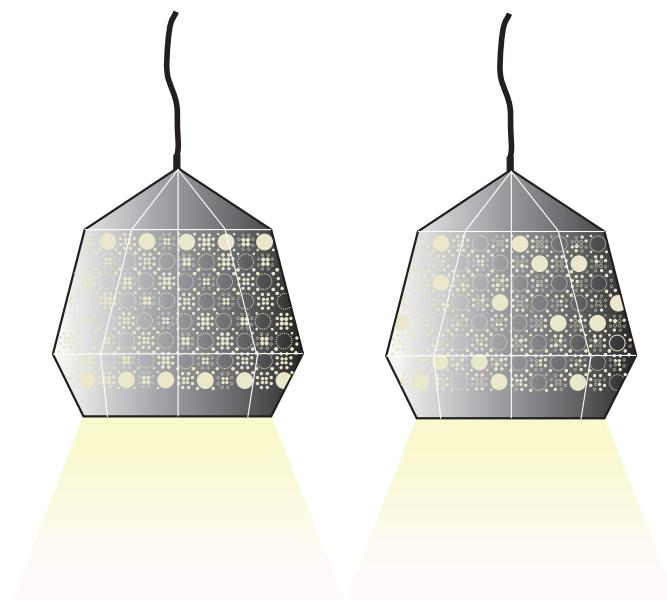


Figure 2. bernabeifreeman, *Pop light*, 2013.

It was with this understanding that the designers embarked upon the design of the *Pop light* (Fig. 2). The design of the *Pop light* seeks to enable an ease of personalisation so that users of all skills levels can achieve satisfaction in the end product. The *Pop light* is a cardboard pendant light kit comprised of six semi-perforated cardboard panels, a polycarbonate crossbar, and an electrical kit. Like the *Stitch light*, each of these core design kit elements can be mass manufactured. The user assembles the card panels as per instructions to create a predetermined pendant light form. Users are then invited to 'pop' out any of the 300 semi-perforated holes on each panel, into any arrangement they wish. Several 'patterns' are illustrated in the instructions, as examples, with encouragement for users to design their own patterns. Popping out the cardboard holes is a much simpler and quicker method of personalisation, than the embroidery of the previous *Stitch light*. For the *Pop light* the designers wanted to use low cost materials, providing the opportunity to analyse if the value of the materials can be increased through the user-completion approach and personalisation.

## Research Outcomes

It could be argued that through the simplification of the user-completion approach in the *Pop light*, the product may have lost its ability to be personalised to the same level that the *Stitch light* is, or that for the highly skilled user, the product does not hold the same challenge, and therefore value. Ruth Mugge et al. (2009b, p. 92) suggests that "designers could search for ways to offer consumers the opportunity to be mentally deeply involved in the design process, while restricting the necessary investment of physical effort." She argues that the satisfaction will remain high while this removes a lot of the potential disappointment that may occur in the 'do it yourself' process (Mugge et al., 2009b, p. 92). We believe this is a fine line and needs careful design and user testing to understand these gradations of user interaction and satisfaction.

To better understand if the *Pop light* is a successful example of the user-completion model and of user personalisation, the authors aim

to 'test' the *Pop light* through a series of workshops over the coming months. They also want to understand if the card light has a 'greater perceived value', through these processes. The planned workshops will invite user groups to comment on completed (assembled and pre-personalised) lights, aiming to gauge user value of the products. User groups will then be asked to complete the 'design kit' as the designers intended (assembling and personalising to their wishes). User feedback and comments will be collected throughout the process. Thus the *Pop light* will form the basis of on-going research and assessment of the implementation of the user-completion approach in product design.

The value of this research is that it provides new ways for designers to consider how product personalisation can be achieved thus contributing to the existing dialogue regarding personalisation. The theory of the user-completion methodology defined by the authors has been implemented into several lighting products and is ready to receive further testing through the *Pop light* in a series of workshops. The user-completion design methodology tested in both the *Stich light* and *Pop light*, provides a new pathway for designers to facilitate user personalisation in mass manufactured products. User-completion comprises two key elements - the 'design kit' and aspects of the product left 'open' for users to finish. Although mass manufacture products may have once been associated with impersonal, ubiquitous products, perhaps they can now become more intimate personal artefacts through designer led implementation of user-completion.

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# Fabric Fobs and Family Ties

## Abstract

How can the co-creation of bespoke, handmade playful objects support children who have complex communication needs? 'Fabric Fobs' are prototypes of digitally tagged objects that comprise key touchpoints of a service system that enables independent access to online communication in a demanding family-centred healthcare context.

In a project funded by the Scottish Funding Council through its Spirit Innovation Voucher Scheme, the research team used a co-design method: grounded in the understanding of the real life experiences, ideas and skills of the people, who use, need and run services. Design and craft methods were used to create an environment in which new digitally tagged objects could be created by parents, children and health professionals to explore relationships and observation, participation, conversation, prototyping and manufacturing could happen in the same space.

The collaborative workshops uncovered a latent need which the team are currently working on – designing a service system to enable the parents and carers of children with complex communication needs to share information about their child's personality, likes and environmental needs.

Working with children, their families and carers in 'craft co-creation' workshops enabled conversations about family relationships, home, music, films, sounds and other activities which paint a picture of the life of a child who cannot communicate be shared and documented. The families and carers of children with complex communication needs became designers of their own interactions.

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This paper discusses the staff and parents' responses to the process and recommendations for the next stage of the process.

## Author Keywords

Design; collaboration; craft; co-design; healthcare; public services; service design.



Figure 1. Mother, daughter and carer engaged with a 'Fabric Fobs' making activity within a co-design workshop

## Research Imperatives

The aim of the project was to explore the value of working with children with life-shortening conditions and complex communication needs, together with their families and carers, to design bespoke

handmade playful objects that enable independent access to online communication.



*Figure 2. RFID tagged textile fob*

A central research question is how can craft-based co-design processes provide innovative solutions to accessing secure social networks that enhance the quality of care for such children and their families? This builds on two previous projects by members of the research team exploring the value of communication systems integrating bespoke handcrafted components: Hamefarers' Kist (White, 2009) is a system developed to connect older people in the remote Shetland Islands with their far-flung relatives, using networked knitted objects to link people and events; Pigeon Post (Hodge, 2011) is a doctoral research project exploring communication between parents and children who are separated through illness or family breakdown, demonstrating the use of digitally tagged toys and accessories which enable very young children to activate Skype calls or send texts to family and relatives from whom they are separated.

The Fabric Fobs project applied these methods and practices to a new and highly challenging research context. Children's Hospice Association Scotland (CHAS) is the only charity that provides hospice services in Scotland for children and young people with life-shortening conditions, supporting over 300 children and families, as well as providing a significant number of families with bereavement support (CHAS, 2012). The relationship between the design research team and CHAS was facilitated by Nora Kearney, Professor of Cancer Care at the University of Dundee who had seen a demonstration of the Hamefarers' Kist and recognised its potential application in a new care environment.

The research team from the University of Dundee brought together a range of expertise: Hazel White and Mike Press: co-design, craft research and service design research, Paul MacKinnon, technology expertise in programming and app development, Jo Hodge and Sarah Nevay textile and design research research and practice and Yumeng Zhou service design and UX testing..The team from CHAS' Rachel House Hospice supported us at all levels, from children and their families, activities and care staff, particularly Alison Blair and Carla Halkett to CEO Maria McGill.

The project explores how technology can be humanised by using handcrafted, often lo-fidelity artifacts created by users to give meaning and purpose to interactions with secure online social networks. The lo-fi approach enables non-designers to participate in the creation and development of the system. In this process, young people and families at CHAS were invited to design bespoke communication systems that specifically met and complimented their needs, allowing those with conditions that may affect their motor skills or mobility or their ability to verbalise or sign to begin to independently build and maintain new bonds and relationships and share their changing likes and dislikes. This "opens up a world of 'can do'" (Carer, CHAS 2013) and aids in self efficacy for young people and their families. Furthermore, as Wallace (2010) states, the co-creation of personalised artifacts linked to these such experiences allow objects to "act as anchor points to events in our

lives and consequently our sense of who we are". For CHAS's young people these objects as communicators and signifiers may communicate, not only a basic need, phrase or like, but a sense of a person.

### Research Process

We began by exploring how tagged textile objects could enable young people with muscular dystrophy to continue to access their favourite online content independently.

Two one day, co-design workshops running four weeks apart were designed by the research team to create a natural and safe environment in which families and staff could comfortably work over a sustained period. Children, their families and staff explored their needs and abilities, and the requirements for the system. With backgrounds in design, programming and craft, the design team used their knowledge and experience of visualisation and making objects to facilitate participating families and staff in becoming designers themselves within the co-design process, imagining how they might use the system in the future and making their ideas tangible.

Demonstrator 'fabric fobs' were prepared in advance: small RFID (Radio Frequency Identification) tagged padded pockets that can be customised by painting with fabric paint, or embroidery or embellishing with buttons, eyes, and bells, or applying transfers of drawings and photographs. We used RFID technology to assign each tag a unique identification number, which is read wirelessly when in close proximity to a reader. This allows for activation without the object needing to be accurately placed, meeting the needs of young people whose gross motor skills may be diminishing. A new iPad version of the app, which powered Hamefarers' Kist, was programmed so that online content could be shown on tablet technology, which is familiar and readily in use by children and staff at CHAS.

In the workshops, participants – children, siblings, parents and

CHAS carers and activity staff - could try out the demonstrators with various handmade, tagged fabric fobs that connected to online content on the iPad. The participants were enchanted; finding this interaction 'magical', expressing delight and wonder, that such a simple, handmade object could control the iPad's online content. We observed a heightened level of engagement from some children when linking their customized fobs to their favoured online content and parents commented on the power of these simple interactions in "giving (their child) a voice" in directing even day to day tasks and activities. As Wallace et al. state " Enchantment does not necessarily imply that the object of enchantment must be novel or extraordinary, rather that the person sees how rich and extraordinary the everyday and familiar can be..." (Wallace et al. 2005)

We interacted with around six children, seven parents and nine staff over the course of these two workshops. The first uncovered a range of design opportunities, including validating the original premise of enabling independent access to online content with some of the children, but suggesting other needs for children with more complex communication requirements.

The research team made a prototype sensor mat to present to new children and families: a multi-pocket felt construction, designed so that each individual coloured pocket contained sensors for different functions. This was trialed at the second workshop with the caveat that it had not taken a long time to make and we work to the principle of 'prototype like you're right, listen like you're wrong' (Moon, 2011). Over the next two hours a system of handmade objects was prototyped that could connect to an online interface enabling both staff at CHAS and the grandparents of one child to easily access music, images and video associated with him. The discussion and evaluation of this rapidly constructed hand crafted demonstrator with the family and CHAS staff led to the development of the key requirements for the next iteration of the system.

## Research Outcomes

Conversations with families and staff, facilitated by the making activities within this research, led us to uncover an unanticipated latent need: for products and services to help the parent and carers of children with complex communication needs to share information about their child/s personality, likes and home life.

CHAS staff commented that they had 'got to know well' the family in Workshop 1 in a relatively short time, whereas they might have expected to have built that relationship over a number of visits. The co-design environment therefore had unanticipated therapeutic and healthcare benefits as families and staff had the opportunity to share their stories, learn from and afford one another a deeper understanding of their needs and personal circumstance in a safe space, without pressure as the making activities took focus.

This project demonstrates the value of craft-based collaborative making in a healthcare context in ways rarely explored by previous research. Corkhill (2007), Argyle and Bolton (2005) and Fratiglioni et al (2004) variously attribute benefits to craft's role in healthcare. Wallace has explored the value of creating jewellery objects for use in clinical contexts. But as Yair (2011) observes, "Craft's contribution to wellbeing is not limited to clinical and therapeutic settings. In the wider community, there are very specific ways in which craft can bring us together and strengthen our sense of connectedness."

Research has thus demonstrated (i) the therapeutic value of making both in itself and as a consequence of its social dynamics, (ii) the value of handmade objects in some clinical contexts and (iii) the community-based value of craft that has indirect health and wellbeing benefits. However, there has been less attention paid to studying the processes of creative making as a mediator between providers and recipients of healthcare. The value of this study is in demonstrating the potential value of this, not only as a means of enhancing communication per se, but very specifically as a process

by which families and carers can be encouraged and enabled to become designers of their own interactions.

The outcome of the project has been the development of design requirements for a system which will enable staff at CHAS and the families and relatives of children with complex communication needs to share the personality of a child through bespoke handcrafted objects which link to private social networks.

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## Empathy and the Individual

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### Abstract

I will argue that an empathic approach focusing on the individual has the potential to create insights that have relevance beyond the individual study and persons involved. I will use one case study and my development of an empathic design research approach, leading to the production of artefacts that reflect meanings and perspectives of individual participants. The case study is a project designed to encourage discourse around grieving while the last section of the paper focuses on how I am using empathy when approaching design research with people with dementia. I will emphasise the value of this approach to design and to design research when focusing on sensitive subjects such as grieving or working in complex contexts such as with people with dementia. Co-experience and co-creation can be used to establish bonds and create artefacts that represent perspectives of individuals but empathy can most easily be formed in a safe environment.

### Author Keywords

Design; Empathy; Individual; Grieving; Dementia;  
Significance/Personal Meaning; Artefacts; Co-creation; Co-experience

### Introduction

When designing for individuals one approach is to gain knowledge of a person's experiences and reflect these back in the design of artefacts (Wallace et al., 2013). I will reflect on aspects, dynamics and sensibilities of how I have developed this approach. I will discuss what is relevant before and during empathic engagements in order to achieve this type of relationship from the perspective of

a designer and researcher and will present artefacts from my research to illustrate this. When using such an approach with individual participants you can still achieve understandings that translate into a broader context. Insights include the ability for a designer or researcher to relinquish a large amount of control during the process, and particular ways of listening and gathering information in order to imagine the experiences and feelings of the individuals.add additional images (Fig. 2),

### Empathy

Empathy is the key dynamic in these engagements. While it can be dissected into various types I will focus on imaginative empathy (Margulies, 1989, Wright & McCarthy, 2008). Unlike in a therapist/client relationship, when a design researcher approaches a potential research participant a more equal, democratic and co-creative relationship is possible. An empathic approach would include direct dialogue with the participants, not only verbally, but also gesturally, through objects and narrative, as well as spending some time in their usual environment. This type of approach has a related yet separate texture to, for example, ethnography in which a researcher seeks not to disrupt an environment through their potentially different behaviour/customs/beliefs, rather it is about co-experience (Battarbee K and Koskinen, 2005) and meaningful interactions with individuals.

What empathy is and how to achieve it has become an increasing concern in Design research and the related field of Human-Computer Interaction (Battarbee & Koskinen, 2005, Dyrks et al., 2009, Wright & McCarthy, 2008). Wright and McCarthy (Wright & McCarthy, 2008) have accentuated the dialogical character of empathy, where "empathy (is) communicative performance built on



Figure 1. Single Tear Catcher, 2009.

The Single Tear Catcher is a series of five corked glass vials, five scrolls of paper and a stainless steel wire and mahogany handle, secured by black satin ribbons in a mahogany and cork box. The original inspiration came from me shedding a solitary tear at a funeral but it evolved into a means to capture important emotional moments in time, positive and negative. Not being overly prescriptive was built into the design process allowing anyone involved to project themselves onto an artefact in some way, resulting in some influence on the final object.



Figure 2. Husband Stilts, 2009.

The Husband Stilts are made from aluminium, cork and ribbon. These are based on the experiences of a woman who could not reach things that her

responsivity to others." They have drawn on Bakhtin here who "characterised this responsivity as aesthetic seeing. He described it as a creative understanding that emerges from seeing each person as a separate unique centre of value and then responding to them from the special value position that is one's own" (Wright & McCarthy, 2008). They make each individual equally important and stress the significance of an equal communication. The imaginative or creative nature of empathy is portrayed as well as the need to be aware of your self while attempting empathy. A researcher can try to gain empathy in various ways such as live action role-play (Dyrks et al., 2009) or through differing types of interviews. Experiencing the same thing as someone else at the same time (Dyrks et al., 2009) creates a bond, an anchor from which to develop more meaningful relationships. This, one could argue, is where the real empathy starts.

### Case Study: 'Non-Therapeutic Tools of Grieving'

The design project forming this case study portrays the start of an empathic approach to design with the goal of encouraging discourse around grieving. The project was approached with a focus on a sensitive subject and the affected individuals. Due to the sensitive nature of grieving, I interviewed three people I knew who had had contact with death and, therefore, would talk openly with me. I also immersed myself into C. S. Lewis' *A Grief Observed* (Lewis, 2009) as a good account of the grieving process. Finally, I explored my own experiences with the grieving process. If I had not known the interviewees, one challenge would have been how to create the trust and comfort to allow them to share intimate feelings with me. Rather empathy was primed by my pre-existing relationship with individuals. However, I was aware of the risk that empathy could have transformed into too much overt sympathy and was sensitive to this.

Listening properly is important because the interviewee is less likely to be forthcoming if they feel that the interviewer is not interested in the conversation. You must listen to everything from

body language to tones of voice while perceiving insights and making useful connections. You need to direct the conversation to keep it on topic while allowing freedom for the unexpected (McCracken, 1988). From an empathic point of view, the interviewer needs to perceive the emotional state of the interviewee to give them time and space. A balance has to be maintained between awareness of your own experiences, personality and emotional states with those of the interviewee. My own knowledge of grieving gave me insights into other people's experiences but I needed to use my imagination for empathy regarding individual variations and nuances.

Resulting from insights gained from the interviews and my own personal reflections I presented twelve design artefacts on a blog for public comment (Coombes, 2009). Several artefacts were adopted by people who had seen the blog in order to gain further feedback around perceptions and meanings of the objects. After the adoption period of 1 week, the adopter was interviewed with the object and their interactions were documented. Comments from the adopters and my observations as they handled the objects were valuable to the design process, giving me insight into the relationship they had created with the objects and how they felt about them. The result was three artefacts, the Single Tear Catcher (Fig. 1), Husband Stilts (Fig. 2) and Cuticle Protectors (Fig. 3) that I made in response to feedback throughout the project, including the adopters experiences and interactions with the objects and comments on the blog.

Throughout the project, I needed to be empathic with different groups of people and perspectives of grief, the original interviewees, the adopters, people commenting on the blog and people at the exhibition. It was difficult balancing my self-awareness with that of the people I interviewed but in the end I created artefacts that represented experiences and concepts that most people could relate to. The making process enabled me to articulate complex insights and empathise further by making things that responded and reflected the nuances of people's grief.

husband used to get for her, before his death. They became representative of any physical practicality that becomes problematic after a person's partner is no longer around to help.



Figure 3. Cuticle Protector, 2009.

The Cuticle Protector is a brass ring, worn at the top of your finger, over your cuticle in order to stop you from picking at or biting your cuticles. This was based on a realisation, during an interview, that biting and picking at a woman's cuticles, was a nervous habit that she began after a traumatic experience of being next door to her friend who got stabbed at school. This object partly became one of the final three as a large number of people, more than I thought, related to this nervous habit.

All three final designed artefacts now encompass a broader range of experiences than those with which they originally started.

## Towards Empathy

Next I examine and reflect on what is involved in developing an empathic approach with people with dementia. Unlike the first case study I don't have any previous relationship with any participant. I am, however, calling on similar skills and sensibilities, such as the ability to really listen and to be sensitive and empathic when creating a dialogue around emotionally charged subjects.

It is important to emphasise the time preceding empathy, the recruiting of participants and the introductions and personal knowledge of the participant. In conducting research with people with dementia there are gatekeepers; people whom I will call 'introducers', who can lay an invaluable knowledge base about participants before the researcher's feet. Empathy is more likely to happen once this knowledge is gained, in order to be built upon.

From listening to and working with several creative researchers and practitioners, such as Occupational Therapist, Claire Craig (Killick & Craig, 2011), several observations were made. Firstly, getting to know the individuals involved. Secondly, the importance of how appropriate the environment, in which an activity is occurring, is for the people and the activity. Whilst the physical environment is very relevant, I would like to focus on the psychological or emotional environment. Gerber discusses the relevance of Johnstone's drama improvisation principles to brainstorming in design (Gerber, 2007). She uses his principles as a way to create an environment suitable for good brainstorming. The same environment is ideal for creating empathy with people with dementia. Johnstone's general principles (Johnstone, 1981) of improvisation are "Be Obvious," "Accept Offers" and "Fail Cheerfully." His principles emphasise building trust in safe environment in which people can be creative and spontaneous without fear of being judged. This may be the best possible approach to co-creating/research with people with dementia and for creating empathy. Thirdly, the ability to adapt can be encouraged by concepts of improvisation.

Sharing experience can precipitate a feeling of connection. While gardening I noticed a care home resident playing with potting mix and found myself doing the same, becoming very aware of the textures against my skin. Also, I was asked to test a design for a contemporary two-person rocking chair. Rocking at the same time to feel comfortable created a connection, a shared space or co-experience between me and the designer. These scenarios could present further opportunities for empathy but are most powerful with mindfulness. This is argued to be how people with dementia increasingly experience the world (Allan, 2010).

## Conclusion

The grieving project showed, with the use of empathy, the ability to imbue complex meanings and concepts around loss into artefacts, enabling a wider audience to connect with the fabric of people's grief. When trying to establish empathy, you can create an embracing and safe environment by applying principles of drama improvisation. From this, a meaningful, multifaceted dialogue can take place through, for example, co-creation and co-experience. The ability to listen and get to know participants is essential to the development of empathy. The ensuing empathy may lead to richer data and important insights for design research.

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## Writing Practice as Contemporary Practice: Experience, Imagination, Knowledge

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### Abstract

This paper puts forward a fashion practice that experiments with writing as a means to provoke the experience and imagination of fashion. As the core of a practice-based PhD research project, the practice of *writing fashion* aims to expand the ways by which fashion is expressed in the form of narrative and through the medium of words. The concept of fashion is premised as embodied phenomenon and depth of aesthetic experience – whether real or imagined. Beyond the written page, the research also explores the ways by which the fashion text is communicated and experienced *live*, through audio-based installations and reading performances. Tapping into the performativity of fashion, the goal is to test what the writing *does*, to see how knowledge is enacted. It is about exploring how the weight of fashion, as experience, is performed through the gravity of words – to find a language that supports it and a medium that performs it.

The discussion in this paper is drawn from one of the prose works produced as an experiment in *writing fashion*, entitled, 'Through My Writing Body, A Beginning of a Narrative.' The idea of the 'writing body' tests the implication of the writer's body and voice in the production of an imaginary narrative experience. As a metaphor for the 'dressed body' in fashion, it explores how narrative and meaning are generated and performed by and through the self and social body. This piece was written for the purpose of a public reading performance – to capture *live* the dynamism between my own body and the written body, between the reader and I. Through shifting points of view and voices, the writing pursues a heightened awareness of the multifarious body. It is an attempt to approach fashion through the intimacy of words. By writing, reading and

listening in, my purpose is to provoke a deeper sense of closeness – not only towards the body in fashion but also the embodied state of writing. My own voice is on the line – disembodied, but immediate.

### Author Keywords

Writing and fashion; imagining; communicating/performing; fashion as narrative; experience; fashion knowledge and knowing

### Research Imperatives

Fashion plays a vital part in the cultivation of our individual and collective selves through the everyday experience of dress. And yet much remains unwritten (unheard, unknown) of the intimate dialogue between the subjective body and dress experience. While there is interest in the scholarship of fashion and dress as embodied practice (Entwistle, 2006), it remains a marginal area in fashion, dress and body studies. Extending from the concept of body-dress relation as lived phenomena, and guided by a phenomenological undertone, I propose that the language used to express it must have the capacity to provoke a sense of subjectively embodied dynamism. To this end, the research draws from diverse voices across fashion criticism, body studies, fashion performance, fiction, confessional writing, embodied writing and poetry, to augment the effect of language on our understanding of fashion in relation to the self.

The research is located at the juncture of the lived experience of fashion and dress, the body as site of imagination, and the construction of narrative as an approach to knowledge. It resists

the commonly held view of fashion writing whose main function is to describe, explain and report on the visual – in all cases playing a supporting role to the figure, drawing, pattern and image. What *writing fashion* aims to do is to explore what happens when our experience of fashion is generated and mediated solely through the process of writing and the potency of words. The proposal is that this mode of expression could expand the formal spectrum of fashion practice and knowledge.

The formal spectrum of fashion writing includes writing on and about fashion that positions itself as official, factual and explicatory information, such as in academia, journalism and reportage. The format, style and voice of the writing must follow conventions and rules. This is writing that premises truth, accuracy, precision – writing which is research and evidence-based, opinion-led, objective, and with necessarily (though arguably) distancing language. Another form of fashion writing that could be considered ‘formal’ is the writing that functions purely as description and clarification of the visual, such as instructions in dress-making manuals and patterns, magazines, product catalogues and exhibitions. Again this is writing that premises facts and the transfer of precise information in order to support the image in fashion.

My practice is posed as an opposition to these forms of fashion writing. I use the writing as a process to draw out the relationship between the body, dress, fashion and the self, rather than to define it; it is about writing as the instigator of experience rather than its closure. To this end, I am specifically interested in how text is used in fashion-art exhibitions, events and happenings not to merely describe or represent the content, but rather to perform as content and mediator of expression and meaning. A contemporary exemplar is the work of fashion curator Judith Clark: resisting the traditional function of text to describe the provenance of exhibits, text – through the curation of its affect and experience – is used to expand the possibilities for encountering fashion and dress histories, and the subsequent formation of meaning, in relation to present experience. For the exhibition and publication project ‘The Concise Dictionary of Dress’ (Fig. 1), Clark collaborated with

psychoanalyst Adam Phillips to choose a series of ‘definitions’ of selected words based on their sartorial, spatial and psychological significance. The definitions were then used as prompts to curate 11 site-specific garment installations. The associations between the words, definitions, images, spaces and materials set each other off to bring about imaginative narratives. Clark’s use of text as the medium of experience was also evident in the project ‘Captions’ (Fig. 2), which was an experimental project around the elements of dress display. A dramatic Alexander McQueen silhouette was exhibited in the gallery and visitors were invited to write captions that were then nailed to the wall opposite the gown. Clark’s curatorial experiments with text resonates with the way I use writing to mediate the experience and imagination of other worlds, to generate possibilities for knowing. The research asks, ‘how does writing generate and shape fashion expression and how does it contribute to fashion thinking? In other words, the question is not about ‘what kind of writing on fashion should there be?’ but rather, ‘what kind of thinking on fashion should there be?’



(Left) Figure 1: *The Concise Dictionary of Dress* by Judith Clark and Adam Phillips;<sup>1</sup> and (Right) Figure 2: *Captions* by Judith Clark.<sup>2</sup>

<sup>1</sup> Clark, J. and Phillips, A. (2010). *The Concise Dictionary of Dress*. Exhibition at the Blythe House, London.

<sup>2</sup> Clark, J. (2000). *Captions*. Exhibition at The Judith Clark Costume Gallery, London.

"Our methods were not the same. Hers was to collect a heap of vivid objects and good words and make a pattern; the pattern would be projected from somewhere deep inside, from her very distinctly evolved myth. My method was to find a thread and draw the rest out of a hidden tangle. Her method was more painterly, mine more narrative, perhaps." (Agarwal, 2003, p.172)

*The poet Ted Hughes, on comparing his writing approach to that of his late wife and fellow poet Sylvia Plath.*

## Research Process (through Writing Practice)

The research process is drawn through the writing practice, which is in turn driven by specific intents. It is important to note that the writing is not based on the conventions of writing genres but rather framed as a mode of creative practice. The process explores the production of prose works, as well as the communication of those works to enact the words as experience.

The processes of my research and practice are guided by the following parameters:

1. The multifarious body is the starting point; it is the protagonist and forms the narrative trajectory. The writing is a way of exploring sensations of the dressed or dressing body, my own body as writer or narrator, the body as: static, living, object/objectified, subject/subjective, image, physical, virtual, and the body (as in fashion) in perpetual metamorphosis.
2. The writing conflates fiction, confessional, critical and embodied writing. The voice shifts between first, second and third person perspectives, to augment the sense of reflexivity and metafictional experience innate to all artistic production and processes.
3. Vivid scenarios are juxtaposed with sparse narratives. Narratives are driven by painterly impressions, bodily sensations, sounds, mood, atmosphere and tone, rather than plot. The narrative is gradually drawn out from fragmented scenes unfolding from extreme close-ups, fading out and dissolving of images.
4. The writing employs intertextual elements such as allusion, quotation, appropriation and satire. Iconic fashion figures, images and events are referenced and juxtaposed with the fictional. Other texts are referenced by folding the voices/bodies of other authors into the writing – as if in dialogue with them.
5. There is an inherent performativity to the practice through procedures of writing, reading and listening; public readings, text and sound-based exhibitions and happenings are used as devices to express such performativity.

The specific prose work presented with this paper is entitled 'Through My Writing Body, A Beginning of a Narrative.' It explores how fashion and dress construct, as well as transform, the experience of our bodies and voices – and how this experience could be written as, and through, narrative. It was a way to work through the issues of *how* and *what* to write, *who* to write *for, from whose* perspective, and in *what/whose* voice. Subsequently the piece is a juxtaposition of various bodies and voices that interrelate and allude to one another. The intertwining of multiple voices, bodies and disparate references alludes to the parallel experiences and exchanges between myself, the reader and other subjects implicated within the work. It attempts to enact the complexities of mutually implicated relationships: just as fashion ascribes identity onto the body of the wearer, the wearer projects his/her identity through fashion, an imagined protagonist is written into being, and the writer's voice becomes inscriptions on the page.

My writing stems from my background as an experimental fashion practitioner working primarily in sound and live performances, with an interest in the body. I do not write narratives based on plot; rather, I compose the writing with fragments of words and images to generate textual sketches and collages. For the reader/listener, the sense of 'fragmentation' and 'incompleteness' do not indicate a lack in definition, but rather each fragment speaks to another through metaphor, association and disjunction. Each piece is not an end in itself, but a part of an on-going, iterative process. Ted Hughes (refer to left hand panel) conveyed the sense of 'drawing out' as an act of bringing forth, eliciting, evoking and extracting, from the depths of our imaginations and experiences, leading towards the formation of a narrative. As with any creative production, my writing process is spurred by a self-conscious effort to pursue a particular concept or idea – to bring into clarity a certain

impulse or an impression, and herein lays the power of writing as a function of expression and subsequently knowledge.

## Research Outcomes

The research is driven by two interrelated operations and their outcomes: (i) the production of texts as experiments in 'writing fashion'; and (ii) the communication and dissemination of those texts. Firstly, in terms of its written outcome, while the work draws from design criticism, metafiction, fiction and embodied writing, it should be evaluated on the grounds of *expanded fashion practice* rather than against the conventions of criticism and literary genres.

Secondly, as alluded to throughout the discussion, the practice being undertaken is not just writing, but also its communication and performativity. Using live scenarios such as reading performances, voice/audio-based installations and 'fashion happenings' to present the work, the intent is to experience the immediacy of words through live participation. This taps into a broader spectrum of experimental fashion/art practices and projects that emphasise fashion as communication, operating across visual performance, film and publishing. As 'performative agents,' they employ strategies of fiction, satire and artifice to coax the audience to imagine and speculate what it means to 'experience fashion.' Examples include *Bernadette Corporation's* semi-fictional fashion label 'BC Fashion,' the magazine 'Made in USA' and also 'The Complete Poem,' *Keupr van Bentm's* 'Friction/parade,' *Dolci & Kabana's* '#thathautecouturefeeling,' and Adele Varcoe's 'Imagining Chanel.' These are 'non-garment-based' fashion practices driven by the experience of the fashion concept rather than the product, emphasising the performativity of actions and language in the expression of fashion. Therefore, in terms of what this research produces and how to position it, it is about creating *experiences of fashion through words, as an expansion of contemporary fashion expression and knowledge.*

In closing, the contribution of my research is an assertion of an experimental writing practice that expresses the immediacy of fashion as experience, in relation to the body, self and subjectivity, and how the writing could be performed/experienced beyond the page. Focusing on the role and possibilities for writing as creative practice and destabilising the formal conventions of fashion writing, it provokes expansive fashion knowledge that premises subjectivity, embodied experience and imagination. Ultimately, the practice of 'writing fashion' is about finding and expressing a voice that adequately addresses the pursuit of fashion/writing as a process of self-expression and cultivation. This is about my own body, voice and the possible selves that lay beyond the words.

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# The Loneliness of the Roving Martian Robot: The Mini Mars Rover

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## Abstract

The Mars Curiosity rover sealed its fate when it took a one-way ticket to Mars. Being a robot, the lonely robot probably doesn't understand that it will be alone until the end, but we, as humans, can sympathise with it.

When the rover is so far out of sight, it tends to slip out of mind. For our empathy to be triggered, we need reminding what the Mars Curiosity is up to. We could look at the data it produces, but for most of us, statistics are not very emotive. What would our response be if we had something physical in our home that made this data feel more real?

Roll in the Mini Mars Rover. The Mini Mars Rover is designed to move in the same pattern as his big brother, as well as display other live data from Mars, such as sounds and images. This project's aim was to take complex data that is currently hard to find and make it tangible, accessible and exciting.

The Mini Mars Rover was built out of sympathy for the real Mars rover. As the Mini Mars Rover moves about a domestic environment, it will make people think about the brave controller, potentially the only life on Mars, battling on a mission of discovery. When the users look at the Mini Mars Rover, what do they see? Do they see a mischievous little robot driving around their house and crashing into walls, or the loneliest robot in the Universe, struggling against the unknown in the hopes of sending amazing discoveries back to Earth?

The Mini Mars Rover was designed to excite space enthusiasts, but more importantly to excite the everyday person and ignite curiosity

about space. The Mini Mars Rover is invaluable in making complex and inaccessible data interesting and engaging.

## Author Keywords

Martian; Data; Physical; Internet

## Research Imperatives

There is currently an unimaginable amount of interesting data floating around the internet in un-assuming and hard to find places. More and more people are starting to make this data a little more accessible and usable by the general public, knowing that there will be someone out there who will create something useful and tangible. As part of NASA's open initiative they launched the SpaceApps Challenge, a worldwide organised hackathon where participants are asked to respond to a series of briefs ("International Space Apps Challenge," 2013). One of those challenges was *Curiosity at Home*, which aimed to bring awareness of the Curiosity rover's activities back to earth. The Mini Mars Rover was built to answer the following questions:

- Can complex, inaccessible data be made physical and easier to interpret?
- Can an object create an emotional connection between the user and the Mars Curiosity rover?
- How can an avatar of the Mars Curiosity rover challenge perceptions of itself?

By making use of Open.NASA data we were able to take previously unavailable data and transform it into something interesting, new, and most importantly, physical.



**Figure 2.** Video still from user testing at SXSW, 2013.



**Figure 3.** Video still from user testing in the domestic environment.



**Figure 1.** The Mini Mars Rover in action outside the University of Dundee.

## Research Process

In creating the Mini Mars Rover, the Wild Thumper chassis was used due to its modular nature (see Figure 1). The easily adaptable chassis meant that it was very easy to retro fit a laser cut body onto it. Under the bonnet is an Arduino ("Arduino," 2012),

motor controller board, and most importantly, an Electric Imp ("Electric Imp," 2013). The Electric Imp is an SD card sized device that allows physical objects to be connected to the internet with ease (see Figure 4). By using open source hardware and electronics we were able to have complete control over the behaviours and appearance of the Mini Mars Rover. This open source approach felt very appropriate as the inspiration for the project came from the open source data of OpenNASA. The complete instructions, design and code for the Mini Mars Rover is open source and available online at <http://productresearch.dundee.ac.uk/mini-mars-rover/>.

To give the Mini Mars Rover a sense of character we took design reference from the Mars Curiosity rover, abstracting some of its details to make a robot that was recognisable as part of the Mars Curiosity family and also an intriguing, friendly looking robot ("NASA - Mars Science Laboratory, the Next Mars Rover," 2013). The aim was to really make sure that the users/observers could easily make the connection between the Mini Mars Rover and its counterpart, off exploring Martian territory in complete solitude. The intent of this decision was to provoke emotional perceptions of the object.

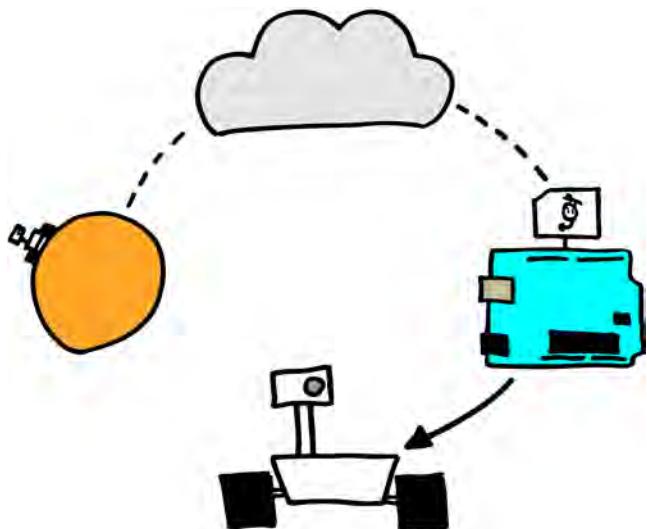
From the outset this project aimed to access the live<sup>1</sup> data produced from the Mars Curiosity rover. We hoped to gain access to both the travel data as well as other data from the thirteen main sensors (including photos) that the rover produces on its day-to-day business. Unfortunately, as the Mars Curiosity rover is a military owned device, gaining access to this data is not easy. In the meantime (as we continue to try and procure this data), we have created an experience prototype (see Figure 4).

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<sup>1</sup> As live as possible as there can be anywhere from a three to a twenty-one minute time delay as the data makes its way across the universe.



**Figure 5.** Diagram illustrating the basic user interface created to control the Mini Mars Rover. This can be accessed through any web-enabled device.



**Figure 4.** Diagram showing the proposed flow of data from the Mars Curiosity rover to the cloud to the electric Imp/Arduino to the Mini Mars Rover.

Whether the Mini Mars Rover was going to be controlled by live data or not, it still needed to be an internet-controlled object that could challenge users perceptions.

To keep the input method for the Mini Mars Rover flexible we made an easily adaptable platform that could be controlled in many different ways, from live data to a mobile phone app. The basis for this internet-controlled platform was created using JSON, PHP and an Electric Imp.

The Mini Mars Rover is currently being controlled using a web app (see Figures 2 and 5). There is also a small screen in the head unit, which displays footage from Mars.

## Research Outcomes

There is still a barrier to obtaining permission to access the data, so to simulate authenticity a time delay has been added between the command and the Mini Mars Rover's movements. This delay gives people time to think about both the journey of the data and the Mars Curiosity rover itself. The time it takes for a signal to go from Mars to Earth is anywhere between three and twenty-one minutes depending on the position of the planets in their orbit. The Mars Curiosity rover moves between one and fifty metres at a time. From this data alone we can roughly mimic the way the Mars Curiosity moves. Since fifty meters is quite a long distance for the domestic environment and since our Mini Mars Rover (roughly thirty centimetres) is a tenth of the size of the Mars Curiosity Rover (three metres), we divided the distance travelled by ten so it moves relative to its size.

### Interpreting Physical Data

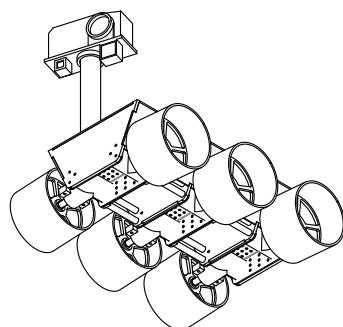
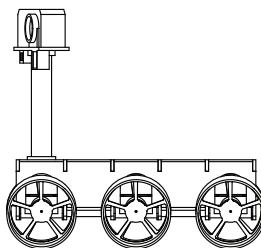
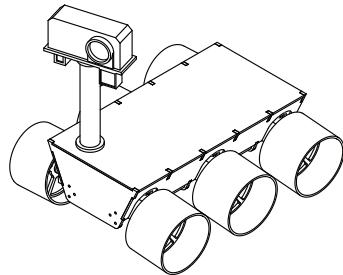
By making the Mars Curiosity rover data physical we created a fun and engaging object from information that would otherwise remain hidden under some virtual rock in a dark corner of cyberspace. Making this data physical through the Mini Mars Rover made it much easier to visualise how the Mars Curiosity rover was moving on Mars.

### Creating Perceptions of Objects

As users engaged with the Mini Mars Rover during testing they felt it had character. They would speak to it as if it were really alive; this demonstrated their emotional connection to it and therefore the Mars Curiosity rover (see Figure 3). As observers watched the Mini Mars Rover their perception of it transformed; instead of mild curiosity about a toy, they wondered about the Mars Curiosity itself.

### Emotional Connections

Observers treating the Mini Mars Rover as though it was alive clearly showed some sort of emotional connection. This emotional connection revealed that people really cared about how the Mini



Mars Rover was moving on earth; they understood there was a direct connection between it and the Mars Curiosity rover.

The Mini Mars Rover is a great example of the current developments of the web driven Internet of Things (Webb, 2013). By making use of open source data, design and technology we can inspire anyone to make things (Anderson, 2012). We can take curious looking items and give them exciting and surprising behaviours through the power of the internet and the incomprehensible amount of data it harbours.

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**Figure 6.** An example of the open source CAD files available online.

## Campaign Badges: Creating Meaning Through Making

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### Abstract

This paper is a reflection on a practice led research project called the Campaign for Objects in Purgatory, which sets out to discover how meaning develops in a possession during its life in the home. It explores the implications for designers seeking to create lasting meaning in their products, particularly in the context of emotionally sustainable design. This paper attempts to unravel the role of a series of badges which I produced and distributed as part of the research.

The Campaign has developed over the last two years and has taken the form of workshops, an exhibition, a series of conference papers and a journal article. The badges discussed here were made as part of an exploratory research exhibition that took place in 2011 at Sheffield Institute of Arts gallery. Visitors to the exhibition were invited to contribute an uncherished gift, in the form of a drawing or photograph and accompanying narrative, and in return they received a campaign badge. Each badge featured a photograph of an uncherished gift submitted by someone else. By wearing it the participant gave the object a new 'voice' and took the Campaign beyond the boundaries of the exhibition space.

In this paper, the badges are the catalyst for a discussion about the disparity between the everyday circumstances that create meaning in possessions, and design practices of creating meaning in products.

### Author Keywords

Creating meaning in design; gift giving; objects; emotionally sustainable design.

### Research Imperatives

A key part of the role of a designer is to create meaningful products that encourage user engagement. This is sometimes motivated by the need to sell products, but there is also a recent drive to create products that are meaningful to their users in the long-term. This movement towards the design and production of emotionally sustainable products is a response to problems associated with overproduction and consumption (Mugge et al 2010, Schifferstein & Zwartkruis-Pelgrim 2008, Chapman 2005). Designing products that people will remain attached to and keep is very challenging, as the product's meaning has to endure through the changing circumstances of a person's life. Traditional forms of design attempt to create meaning through control of the physical, visual and material properties of the product, but this may be an inadequate means of truly creating lasting meaning. My research looks beyond the product itself to the circumstances and practices that influence how and why possessions are kept. This paper considers whether it is really possible to create meaning through the design of a product.

In order to explore how meaning develops in a possession during its life in the home, I initiated a practice-led research project called the Campaign for Objects in Purgatory. The Campaign examines uncherished gifts, which despite their negative associations for the owner, are still kept. Uncherished gifts are very effective research vehicles for exposing the ways in which meaning forms in possessions, because they usually embody a contradiction in emotional value; as much as a recipient might want to rid themselves of an uncherished gift, they may also feel compelled to keep it.

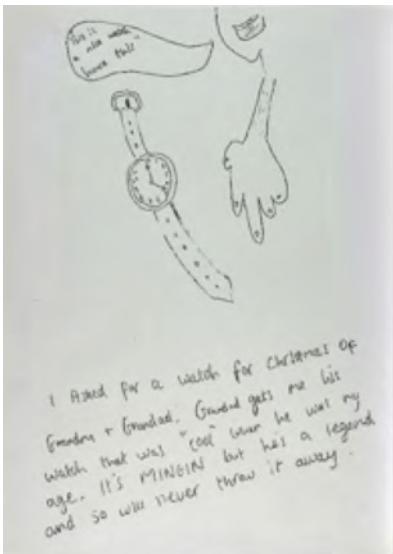


Figure 1. Annotated drawing submitted to Objects in Purgatory exhibition, SIA Gallery, Sheffield May 2011



Figure 2. Campaign badge. Materials: embossed cartridge paper, wax, and a dress-making pin. One of a series of badges exchanged with participants in the Campaign for Objects in Purgatory exhibition at SIA Gallery, Sheffield, May 2011.

## Research Process

### Uncherished Gifts and Conflicts in Meaning

The first significant stage of the Campaign for Objects in Purgatory was a live event and exhibition (SIA Gallery Sheffield, May 2011) during which participants were invited to contribute the story of their uncherished gift in the form of a drawing (figure 1), written or audio narrative, or a photo. A diverse range of conflicts in meaning connected to the gifts were evident in the submissions. Most commonly, contributors expressed distaste in connection with their objects, and this was often expressed alongside disappointment with a fake brand, perceived material cheapness, or a style conflicting with the home interior. Yet despite these negative associations the participants were compelled or motivated to keep their objects. Meaning was often present, expressed as connections to memories, important people, and appreciation of a personal investment, e.g. hand-making. (See Keyte 2013 for more analysis).

### Badges: Exploring Material Meaning

As part of the exhibition, I created a series of badges (figure 2) to stimulate data collection and to explore my ideas about conflicting meaning embodied in possessions. I gave a badge to each participant, in exchange for their contribution of their object and story. Each badge featured a photograph of an uncherished gift submitted by someone else.

The badges were hand-made from embossed cartridge paper, wax, and a dress-making pin. I chose materials that are of little obvious material value, but the brooches embody an investment of my labour, creating a dilemma for the recipient; should they keep it, and care for it? The badge exchange was a purposeful and playful reflection on gift exchange. Giving a gift creates an obligation to reciprocate, and I wanted to draw attention to the instrumentality of the obligation in compelling the recipient to keep the gift.

This wasn't the only way in which creating the brooches allowed me to explore my ideas. A badge or brooch is a unique platform for projecting a message, as it is displayed on the body. It gives the experience of the badge a kind of intimacy; the viewer encounters it when worn by another person, and it usually holds meaning to the wearer. Sometimes the meaning is very personal. Brooches sometimes contain and frame other objects, such as precious stones, or photographs. They employ visual and material language to communicate the significance of the contents.<sup>1</sup>

The badges made for the Campaign for Objects in Purgatory made use of the capacity for badges and brooches to function as a platform for visual communication. They exposed objects (uncherished gifts) and associated scenarios that are usually private and invisible. The uncherished gifts were thus given a new 'voice'. I was also interested in the capacity for the badges to 'spread the word' of the Campaign. The exchange gave them a kind of agency that extended the Campaign beyond the confines of the exhibition space.

Contributors to the exhibition were able to choose the badge they wanted to take. They usually enjoyed this process, and enjoyed hearing the stories of the objects in the photographs. Their choice of badge was often empathetic; they frequently chose badges containing objects that related to their own contribution in some way. For example, a contributor who submitted a glass pumpkin he had received from work colleagues, chose a badge featuring a photograph of a small angel ornament also given to the recipient by work colleagues.

The badge exchange raised awareness of the instrumentality of gift giving, however I wasn't possible to trace the subsequent journey of the badges after they had been given to the contributor. I don't know whether they were all kept.

<sup>1</sup> The badges could also stand upright on a flat surface, as a framed picture; a small, free-standing ornamental object, like many gifts.

*Carriage Clock (see figure 3 below)*

*"I think he got it really cheap, to tell you the truth, I think it might have even been a freebie,"*

*"I don't know why, he must have thought we needed a clock"*

*"we're sort of permanently attached to this item, bless it"*



Figure 3. The recipient of this carriage clock believed it to be of little material value and probably acquired by the giver as a free gift. The clock was initially kept simply because it was felt appropriate to do so in acceptance of the gesture. It was kept in a peripheral space; the office, on a shelf with books. It was brought to the attention of the recipients every now and again when the batteries needed changing, however it was eventually superseded in its function by a nearby computer. Following the death of the giver the bond between person and object strengthened, and it became harder to contemplate getting rid of. Ultimately its status has been elevated and its location referred to as 'a bit of a shrine', as a photograph of the giver has been placed nearby.

The reviewer's comments made in the submission process for this conference paper highlighted an interesting contradiction in my research that previously I had not fully appreciated. I designed the badges in order to explore meaning through material ephemerality, and I created them with instinctive designerly intent to make them beautiful and make them well. However, many of the submitted gifts are objects that probably weren't conceived with aesthetic principles as a priority. Do I need to resolve the disparity between the material and aesthetic intentions expressed in the badges and the apparent aesthetic impoverishment of the submitted gifts?

## Research Outcomes

The badges were an effective and interesting part of the Objects in Purgatory exhibition, which itself was a creative means of collecting the stories and scenarios connected to uncherished gifts. The focus of the research centred around the exhibition was an exploration of the conflicts in meaning associated with the collected objects.

The participants in the exhibition often expressed distaste for the objects they submitted, as they perceived them to be inauthentic or of poor material quality. However, it is very difficult to pick out clear patterns in the types of object submitted and their material and aesthetic qualities. The data doesn't suggest any definitive categories of distasteful objects or material impoverishment. Perhaps this isn't surprising in the context of taste as expressions of choice that form part of a person's identity (Bayley 1991), or expressions of difference from others (Barker 1992). Taste is culturally and socially informed, but idiosyncratic.

Despite the objectionable qualities of the gifts and the associated emotional discomfort however, the recipients felt compelled or motivated to keep their objects, and the objects hold meaning. In this particular scenario of people-object relations (uncherished gifts that are kept), there is a clear separation of the visual and material qualities of an object (how it looks), and the formation of its meaning. This throws up some interesting challenges for the

creation of meaning through design. In conventional approaches to design, designers seek to create meaning in a product through its visual language and material associations, in order to encourage desire for the product, or fulfill the user's needs.

In developing his material-centric approach to understanding the relationship of designed objects to people, Verbeek (2005) discusses the 'sign-value' of products. Market oriented approaches to design identify users' lifestyle choices and needs, and use directed symbolic or referential language to appeal to users' values. Verbeek builds on design theorist Wim Muller's (2001) identification of two types of utility which designers try to combine in their products: 'material utility' (the primary function of the product) and 'social cultural utility' (its social and cultural meaning). Predicting how the material utility of the object will be interpreted by the user is fairly straightforward, but the possible interpretations of the social cultural utility are harder to read. It depends on the user being correctly culturally placed to 'read' the language of the product. This suggests that market centric approaches can't always adequately respond to the individuality of personal meaning making.

In the case of the collected uncherished gifts, meanings are formed not through the visual and material attributes of the object, but through the circumstances that surround it. Positive associations such as memories, family ties and personal investment can be powerful enough to encourage the recipient to keep the gift, despite the failure of the gift to contribute positively to self-perception (Keyte 2013). These positive associations are formed through the gift exchange, or through other practices, such as adapting or altering the gift, or keeping it for long enough to grow new value (figure 3). These findings draw attention to the difficulties of creating meaning through the design of the product, using conventional design approaches. In the scenarios explored in the research, the intended meanings of the designer haven't transferred successfully from designer, through the gift giver, to recipient.



Figure 4. Visitor to Objects in Purgatory exhibition submitting and uncherished gift.

## Conclusion

The badges made for contributors to the Objects in Purgatory exhibition were created as a playful exploration of gift exchange and the creation of meaning in design. They successfully provoked people to think about the dilemmas created by gift giving rituals.

It is difficult to reliably assess whether the material and visual quality of the badges was instrumental in making the badges meaningful to their recipients, as it has not been possible to find out whether they have been kept. However, contributors to the exhibition clearly enjoyed engaging with the objects featured in the badges and the stories connected with them, and they responded with empathy. I know that some of the badges were worn or displayed once they were taken away, because they prompted new people to visit the exhibition. It may be that the process of engaging in the exhibition and brooch exchange was more instrumental in creating meaning in the badges, than their visual and material properties. Part of the process of engaging in the exhibition was personal contact with me; I acted as an intermediary for the objects; passing on the stories, and the meanings, to new people.

The possibility that the social aspects of the exhibition were more instrumental in creating meaning than the aesthetic and material qualities of the badges echoes the findings of the research. In the case of the collected uncherished gifts, meanings are formed not through the visual and material attributes of the object, but through the circumstances that surround it. This points to the need for design to seek alternatives to market-centric approaches, which acknowledge the intimacy and idiosyncrasy of creating meaning in possessions.

The badges are not a straightforward reflection of the uncherished gifts they contain photographs of. But perhaps by framing the aesthetically impoverished objects, their role is to draw our attention to the gap between the intentions of the designer, and the everyday circumstances that create meaning in possessions.

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## 'Sole Searching' – Mediating Material Narratives for Meaningful Products

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### Abstract

This submission will present research and objects generated by the 'Sole Searching' and 'Material Meaning Making' project, which uses the fabrication of pairs of shoes, each made from a waste material as the methodological basis for forming more 'meaningful' products. The research tests the hypothesis that waste materials can embody and facilitate material narratives which when applied, can imbue products with greater meaning, narrative and value(s). The research is predicated on the basis that products that are made more meaningful and valued can promote and nurture ethical and sustainable attributes.

- Communicating complex messages of ethics or sustainability in accessible ways to consumers
- Helping market and popularise 'more ethical and sustainable' products and materials
- Enhancing and transforming the cultural, industrial and societal value of waste materials.
- Providing authentic user experiences, extending product life-spans and forming user attachments

Each pair of shoes provides a useable design/craft method for 'meaning making' that is structured around the *shoe*, the waste *material*, the *process* of fabrication and the *user*.

The project endorses and demonstrates the value of 'designed' objects and materials as critical aspects of the methodological process and in facilitating research and new knowledge production.

### Author Keywords

Meaning making; materials; ethics; consumer culture; semiotics; semantics; sustainability;

### Research Imperatives

The project utilizes the formation of pairs of shoes made from waste or by-product materials to engage audiences (public & industrial) and research participants in issues of 'material meaning-making'. The research tests the hypothesis that waste materials can contain, embody and facilitate material narratives which when applied, can imbue products with greater meaning, narrative and value(s).

The research tests the hypothesis that waste materials can contain, embody and facilitate material narratives which when applied, can imbue products with greater meaning, narrative and value(s).

The research is predicated on the basis that products that are made more meaningful and valued can promote and nurture sustainable attributes and promote more sustainable consumer behavior including:

- Communicating complex messages or facilitating understandings of ethics, science and sustainability in accessible ways to consumers
- Helping market and popularise 'more ethical and sustainable' products and materials
- Enhancing and transforming the cultural, industrial and societal value of waste materials as resources
- Providing authentic user experiences, extending material and product life-spans and forming user attachments

As well as providing designers with methodological tools, the research aims to promote the work of charities and NGOs that campaign for changes in areas of problematic material culture or who are exemplar 'materialists'.

## Research Process

Each pair of shoes is a distinct 'material story' and methodology composed around four key 'actors' - the *object* (shoe), the *material*, the making *process* and *user (hypothetical)*. Central, and seminal, to the consideration of the shoe and the subject is the unique relational notion of the material seeing these as waste, this project reveals these materials as having enriched and exploitable, embodied histories, stories, meanings and experiences held within their materiality. Each material narrative and methodology forming distinct algorithms for 'material meaning making' that are then exhibited and evaluated by public and industrial participants. The stories are established by the researchers identifying waste streams and/or associated organisations that promote the ethical consideration of material culture.

The project is not about shoe design per say, but deliberately employs the popular and cultural iconography of shoes as a vehicle to carry content. Shoes were selected as an appropriate conduit to mediate the research as they would be engaging for public participation and there is relative likelihood of greater public literacy in terms of their manipulation as objects for communication purposes.

A dissemination and data gathering exhibition and lecture was devised by invitation at PUMA HQ (Sustainable Design Collective), where industrial designers from brands such as Dragon Rouge, Adidas, Ideo and PUMA were asked to provide qualitative data, providing evidence of transferable processes for design and 'meaning making' through the processes / methods devised to greater or lesser degree. Participants were asked to grade each pair of shoes (meaning making methodology) according to their *meaning or meaningless, value or valueless and applicability or not* to the participant's own industry. Example of this tabulated data is shown in Figure 3.



Figure 1. Businessman's Brogues / 'Product protest' - reformed synthetic wine corks

**Reformation of a 'faux' material product into a 'faux' leather shoe and story. Resembling reptilian skin, they expose the contradictions of our contemporary material and cultural rituals and ethics whilst promoting the value of natural cork as a sustainable material tradition.**



Figure 2. Breast Milk Baby Booties – fabricated from donated breast milk (casein protein), to promote World Breast Milk Donor Day in collaboration with the NHS and UK Milk Bank. Also exploring the inherent perceptual contradiction of our 'love of children' and their objects and our aversion to human 'waste'.

Examples of individual shoe stories (methodologies) and processes for exhibited shoes (of 10 pairs made so far):

**Shoe title:** Flip-flopsam and Jetsam (see Figure 5). **Method title:** 'Pride of place' **User:** Volunteer conservationists **Material:** Plastic beach waste collected by local volunteers. **Process:** Volunteers are rewarded by heat pressing the beach waste into a pair of flip-flops that are also embossed with a map of the local area. As a memento of the event and act of good will the value, local significance and meaning is embodied and carried through the material.

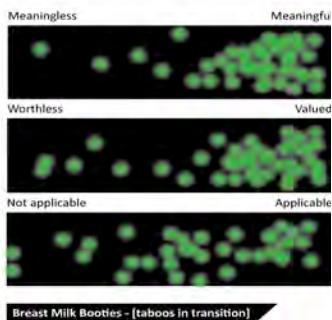


Figure 3. Example of qualitative data table, gathered from industrial designers



Figure 4. Example of qualitative data being gathered from industrial designers at PUMA HQ



Figure 5. 'Flip-Flotsam and Jetsam' / 'Pride of Place' - volunteer rubbish collectors are rewarded by fabricating a pair of flip-flops from waste thermoplastics on the beach. Promoting Marine Conservation Society's Summer Clean Up campaign.

**Shoe:** 'Breast Milk Booties' (see Figure 2) **Method title:** Taboos in transition **User:** Premature baby / donor mums. **Material:** Breast Milk (casein)

**Process:** Donor mums provide breast milk to be used by the UK Milk Bank to feed premature or sick babies and in return receive a pair of bootees made from their milk. The shoes are used as a reward and raise awareness through 'provocation in the press'.

**Shoe:** Businessman's brogues (see Figure 1). **Method title:** 'Product protest'. **User:** Businessman

**Material:** Recycled synthetic corks. **Process:** Reformation of a 'faux' material product into a 'faux' shoe and story. Resembling reptilian skin, they expose the contradictions of our contemporary material and cultural rituals and ethics whilst promoting the value of natural cork as a sustainable material tradition.

## Research Outcomes

The research forms insights into the mediation of meaning through the embedded, enhanced and/or composed narratives of waste materials, understanding the communicative values of materials as a vehicle for meaning (Lohmann 2012). This responds to the need for product designers to create products that transfer meaning and the further exploration of the capacity of materials to carry narrative (Karana 2010) and form designable narratives (Chapman 2005). In particular, in this case, how 'recycled' or waste materials can perhaps show this in 'obvious' ways (Dagmar 2009). Developing a lexicon of material language, narrative construction and methods for meaning. This will help provide rational tools to bridge the gap between meaning and design decision-making (Kazmierczak 2003).

The Breast Milk Booties were used by the UK Milk Bank and NHS to promote International Breast Milk Donor Day (May 2013). Press coverage in mainstream press (BBC TV) and over 61 websites (including the Mail Online as the world's largest online newspaper) raised awareness across international audiences (Israel, Canada, USA, Australia, India, Ireland, Germany, France). Blogs and comment forums provide additional qualitative feedback as well as demonstrating the communicative and mediation value of the methods and meaningful materials. The research has also formed, proven promotional channels for the associated and partner NGOs and charities.

The PUMA data gathering event was filmed and presented at brand design headquarters globally to members of the world's largest lifestyle brand. PUMA embedded the ten methodologies derived

## Research Through Design 2013



*Figures 6 & 7. Industry designers engaging with shoes and providing qualitative data at PUMA HQ*



*Figure 8. Flip-flopsam and Jetsam details of sole embossed with map of place where waste materials were gathered to reinforce the designed provenance.*

through the shoes into their '50 Ways to Sustainable Design' corporate toolkit. The shoes / methods featured in trend forecasting articles for the World's largest agency WGSN – with 74,000 design industry clients including Apple, Nike, Walmart and Levis.

The capacity for the shoes (and stories) to promote awareness and deeper engagement with issues of material culture has led to further invitations to promote organisation's campaigns for behavior change through the formation of new shoes, stories and methods. These include Vision Aid Overseas and Interface and the London Zoological Society.

The capacity for the shoes (and stories) to promote awareness and deeper engagement with issues of material culture has led to further invitations to promote organisation's campaigns for behavior change through the formation of new shoes, stories and methods. These include Vision Aid Overseas and Interface and the London Zoological Society.

The research has enabled the formation of 'meaning making', evaluated, methodological processes (design methods) for further application by design and craft practitioners and those wishing to embed products with meaning via material mediation. A lexicon of material vocabularies and material language that is either embedded and enhanced or constructed and contrived is disseminated in the form of case study representational objects, data tables and the design methods derived through the research.

The project will be forming an online toolkit for meaning making that presents the evidence of public and industrial engagements.

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# The 4<sup>th</sup> Wall Project: A Creative Exploration of 3D-Stereoscopic Viewing and Animation

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## Abstract

The stereoscope was invented in 1838 by Charles Wheatstone, a British physicist. 'The term "stereoscopic vision" means literally, "solid sight" and refers to the visual perception of the three-dimensional structure of the world...' (Howard and Rogers, 1996). Stereoscopy works by artificially recreating binocular vision by presenting a pair of images, one to the left eye and one to the right. When viewed through a stereoscope, the two images are combined in the brain through 'stereopsis' to create the illusion of depth.

The project is a technical and artistic endeavour combining 3D-stereoscopic projection technology with purpose-made digital content (animation) with the aim of producing a immersive experience for the viewer. The initial idea was to take the principles of stereoscopic vision and use the distinctive benefits of this medium as a creative and conceptual starting point for an animation project. Traditionally animated films are produced in a 2D format and converted to 3D in the later stages of final production. The 4<sup>th</sup> Wall Project posed the question: What would happen if you started with stereoscopic space and filled it with animation? as opposed to creating an animation and allowing it to then fill stereoscopic space when it is converted to 3D.

## Author Keywords

Stereoscopic; Animation, Immersive, Creative Space, Perception, Engagement, Practice-Based Research

## Research Imperatives

The aim of this research study is to creatively explore the theoretical and practical dimensions of stereoscopic spatiality through a practice-based approach. The driving questions of this work are: How can the combination of stereoscopic animated content and a referential physical volume create new insight into relationships between digital animation and reality? What knowledge can be gained from creating both animation and bespoke stereoscopic viewing systems as a co-existing assemblage of techniques? It is the intention of this practice-based research project to undertake such original creative investigation of stereoscopic depth.

Since the invention of the stereoscope, stereoscopic imaging has evolved alongside the medium of photography and, subsequently, moving image. Over the last 160 years, its cultural status has fluctuated as technology has developed. Stereoscopic imaging requires distinct technical knowledge. Historically, innovation in this field has concentrated on creating or improving a very specific technical aspect of stereoscopic vision as opposed to exploring the creative opportunities.

Animation is another distinct specialist field that until the last ten years has predominantly been a two-dimensional medium. In the last decade, the development of computer graphic animation has allowed three-dimensional stereoscopic options to evolve and be perfected. With this in mind, it is critical to note that in contemporary animation production practice, stereoscopic processing is often left to the later stages of post-production as it is seen as a challenge to create a comfortable and compelling



Figure 1. The 4<sup>th</sup> Wall Viewer prototype, using synchronized HD projectors.



Figure 2. The 4<sup>th</sup> Wall Viewer prototype, using synchronized HD projectors focused on a rear projection viewer.

stereoscopic effect. Examples of successful uses of stereoscopic 3D imaging are the work of filmmakers such as James Cameron (*Avatar*, 2009), Wim Wenders (*Pina*, 2011) and Ang Lee (*Life of Pi*, 2012) who most effectively and in a rarefied manner, weave it into their projects from their inception.

In its simplest form, the 4<sup>th</sup> Wall Project's core aim is the creative exploration of stereoscopic space, unhindered by the grammar of cinema or the audience's preconceptions of the screen. By using the stereoscopic language of the 19<sup>th</sup> Century (two eyeholes) the 4<sup>th</sup> Wall Viewer becomes a single-person stereoscopic experience, thus focusing both conceptually and physically, the experience in one person's consciousness at one time. This solitary viewing method in turn reinforces the sense of discovery, wonderment and visceral experience by masking the viewer's peripheral vision, thereby excluding any distractions.

Wheatstone, over 160 years ago, predicted the transformative effect of combining stereoscopic imaging with animation. He commented to a friend: '[to] combine the principle of the stereoscope with that of the phenakistoscope [...] Then shapes that are simply painted on paper would inevitably be seen in three dimensions and moving, and would thus entirely present all the appearances of life. It would be the illusion of art taken to its highest point.' (Mannion, 2000).

The 4<sup>th</sup> Wall Viewer seeks to deliver to those looking into it the 'transformative effect' that Wheatstone alludes to, and holds the 'illusion of art taken to its highest point' as its contextualising ambition.

## Research Process

The main thrust of the research process is carried our through iterative design cycles, developing prototypes that will undergo a series of tests and experiments. My research is mainly practice based, and will produce both the stereoscopic viewer and

animation experiments.

Mk I and Mk II of the 4<sup>th</sup> Wall Viewer both utilized HD projectors that were focused on small scale (65mm square), rear projection screens. The screens produced an extremely high quality (425 pixels per inch) image, but the calibration of the stereoscopic effect was compromised by a lack of adjustment so it was extremely difficult to align the two images to create high-quality stereoscopic pairs. This was the motivating factor to move to iPads as the choice animation playback devices in the Mk III Viewer since they offer similar pixel density and solve alignment issues.

The Mk III Viewer is currently in development with research into iPads concluding that there is no app available that synchronizes two animations on two different devices. Herewith, a bespoke app. is being developed to achieve this. Intended construction of the Mk III Viewer is a main internal and external chassis made from box section mild steel. The exterior of the box is high-grade birch ply, with laser-etched logo and information. Internally the two iPads and mirror array are mounted on an adjustable steel chassis.

The looping animation inside the viewer is of an orange ball bouncing in perfect, infinite motion. This 'squash and stretch' (Thomas and Johnston, 1981) effect is one of the fundamental principles of animation illustrating how an object in motion has a tendency to change shape but retain its volume. The classic ball is the ideal animation sequence to use to illustrate the perceived (internal) 3D volume of the Viewer.

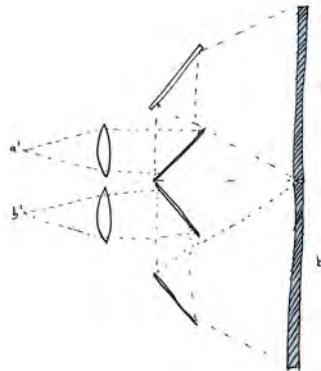


Figure 3. Letters 'a1' and 'b1' show location of left and right eyes of the viewer; letters 'a' and 'b' are iPad minis showing stereoscopic animation. The iPads are mounted in a manner that allows minute adjustments to remove any 'vertical disparity'<sup>2</sup> and avoid discomfort to the viewer.

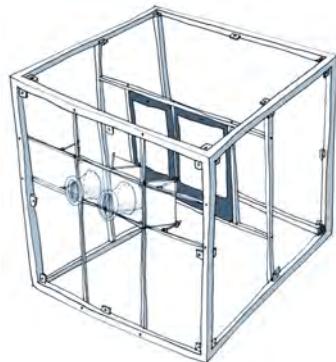


Figure 4. Internal construction of the viewer with the iPad chassis allowing for adjustment in xyz planes of movement for accurate setting up of the viewer.

## Research Outcomes

The 4<sup>th</sup> Wall Project combines three creative fields – industrial design, animation and stereoscopic imaging – and, for the first time, documents and presents this culmination with/in a single physical artifact / immersive creative space – the 4<sup>th</sup> Wall Viewer, Mk III.

The 4<sup>th</sup> Wall Viewer also embodies technical innovation in its use of two synchronized iPads to create stereoscopic effect and through the creation of a unique app to achieve this.

For the person who looks into the 4<sup>th</sup> Wall Viewer to find the orange ball bouncing within the walls of the viewer, the 4<sup>th</sup> Wall Project asks for the subject's 'willing suspension of disbelief' (Coleridge, 1817) and, in return, promises a magical 'transformative effect' (Wheatstone).

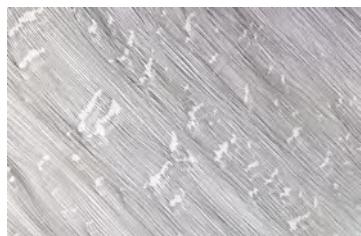
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# Exploring Relationships Between Textiles and Drawing:

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**Figure 1.**Drawing 1, part of a series about damage: 2011

**Figure 2.**Drawing 2, part of a series about damage: 2011



## Abstract

In traditional textiles imagery derived from drawing can be applied to (Print & Embroidery) or embedded within the Textile material (Woven & Knitted). In contemporary digital print and jacquard weaving a more direct relationship between drawing practice and textiles process is developing - the emergence of these new technologies places drawing as central to the making process.

Research suggests that there is, conversely, plenty of scope to consider approaches to making drawing using textiles process and media. This demands a shift in attitude, and requires the making process to be approached with the intention of drawing; I am interested in both the process of making (Textiles) and the process of making (Drawing), weaving has some very interesting parallels with drawing – line, tone, shading effects can all be achieved in both media, and the weaving process is essentially full of drawing, as notation and specification.

However, there are constraints inherent in the process of weaving so it was interesting to consider whether I could successfully weave a drawing and how the approach might impact upon future design work. My drawing practice acknowledges textiles process, and uses textile reference. Through this work I wanted to challenge some preconceptions about an accepted approach to drawing, and explore some thoughts through a practice led, developmental approach.

I am interested in the point where drawing no longer contributes to an act of translation into textiles but where the work is a fusion of ideas and materials- a crossover of making practices and drawing thinking. The work aims to originate and explore a conceptual

viewpoint, using the loom as a tool for drawing to make some woven sketches: developing a drawing attitude through weaving.

## Author Keywords

Textiles; Weaving; Drawing; Practice-led;



**Figure 3.** Detail of *Damage Drawing 6*, pen on tracing paper, layered over print. 42x29 cm. 2011

Weaving has some very interesting parallels with drawing – line, tone, shading effects can all be achieved in both media, there is a very obvious relationship with Jacquard process, and the weaving process is essentially full of drawing, as notation and specification:

"The weaver starts not with a single, continuous line of yarn but with one set of parallel lines, the warp strung lengthwise, through which another line, the weft is threaded crosswise alternately over and under the warp strings. If the weft is all of one colour, then the finished cloth will appear as an unbroken homogenous surface. However by introducing wefts of different colours it is easy to produce straight transverse stripes of any desired thickness. From a distance, these will look like lines drawn across the material" <sup>1</sup> (Ingold, T, 2007, Lines A Brief History, pp 62)

## Research Imperatives

This paper arises from 2 strands of recent enquiry: a practice led research project exploring and challenging some views around the relationships between woven textiles and drawing, and concurrent research into designing and making textiles. In a textiles context the development of new work whether as a prototype for industrial manufacture or individual artifact starts as an idea, progresses through a period of innovation and creativity, and is then realised in material form and ultimately communicated in one way or another to an external audience. This idea of a phase of approaches is relevant to most aspects of textiles practice, and drawing has a link to and a value within the development of all aspects of the process - most of us will be making drawings with a view to a future process. Drawing content is clearly also important in the way it is used not only as an aid to making, in the development of ideas and the production of artefacts, but more obviously is a key part of the essentially decorative nature of textiles. In its application drawing can be described as **on** textiles - print, and embroidery where it is applied to the cloth or **in** textiles where the image is embedded in the cloth construction - weaving for example. There are drawings **about** textiles, structure and process, and drawings about design and decoration. The textiles influence permeates the Fine Art context, with artists such as Teresa Whitfield, a 2009 Jerwood Drawing Prize exhibitor, building an impressive body of work around Textiles references and Roanna Wells whose artistic practice focuses on both the portrayal of the intricacies of drawing and stitch and also the ways in which this can be used to represent conceptual themes. There is some very interesting activity emerging where contemporary textile makers are developing a more explicit relationship between textiles practice and drawing, and a number of weavers developing drawing using both jacquard and hand weaving techniques. The weaver Laura Thomas has produced a series of landscape works which she has called jacquard sketches <sup>2</sup> (Thomas, 2007, web portfolio images). Ismini Samanidou presents work in which the drawing content is clearly evident in underpinning the weaving practice – however recent samples of

weaving have been shown as studies, or drawings, which she describes: 'I am making a new sketch/drawing, just using a different medium'. A number of contemporary artists are making use of weaving process but presenting the work as drawing, Patrick Van Caeckenbergh<sup>1</sup> and Ruth Lasky<sup>11</sup> recently showed work in New York both using weaving process, clearly exhibited as drawing. My drawing practice references textiles processes, but I wanted to challenge some preconceptions about an accepted approach to drawing: given constraints inherent in the process of weaving the objective was to consider whether I could successfully weave a drawing and present it as such into a drawing context. This work considers how the meaning of what is drawing manifests itself through the weaving process. By using knowledge of process to understand and inform the productive process of drawing, the work identifies an approach which attempts to change the supporting role of drawing. It questions pre-conceptions about weaving (for design) and aims to produce drawing as an outcome. The research considers the potential for drawing through weaving in direct response to a subject, or an idea. There are a number of immediate parallels: weaving is constructed through a series of interacting threads - lines, which an experienced practitioner can manipulate to create tonal effects, linear 'marks' and layers.



**Figure 4.** Woven Textile Drawing on the loom July 2012

## Research Process

The project required some criteria & parameters. I decided to take a hand weaving approach, using a 4 shaft table loom: hand craft allows for direct intervention and a greater degree of control, through slow production, facilitates experimentation with process, and is less governed by counting systems and pre-defined weaving structures. The intention to make a drawing was at the core of the work, and so I used a limited colour palette and organic based yarns—linen, silk and cotton, to align better with traditional notions of drawing and associated materials. I had no intention of making a piece of weaving which was a translation of an existing sketch or reproduction of an image which may already exist on paper, and so there was no plan or pre-drawing at all – I was aiming for honesty in exploring drawing ideas through making. I used the project to develop a new approach - liberation from design convention such as repeat, pattern and structure, forced a different thought process to emerge. Structural integrity became unimportant as experiments are not destined for an end use where this is required. I also felt that it was essential to accept some compromise of the quality of aesthetic in the interests of genuine enquiry. Using these parameters as a guide I created a series of weaving sketches, which embody the ideas and thinking around a drawing approach.

There are of course some limitations, (which may provide a focus for further research): In order to weave you need a loom – and therein lies a new set of challenges: tension changes, on and off the loom and can have a dramatic effect on the textile. The view of the piece in progress is often restricted - disappearing around the loom unlike a paper based drawing. The vertical and horizontal nature of the process provides limitations and creating curves is difficult and time consuming, and unlike conventional drawing practice you are making the surface and the drawing at the same time, as in Tapestry construction.

“The design which is woven into the fabric forms an integral part of the textile as the artist /weaver constructs the image and surface simultaneously” <sup>iii</sup> (Colette, C, 2010, Found in translation – *Studies in Material Thinking*, pp1)

Freedom from the constraints of textile design convention is a challenging approach for an experienced weaving practitioner – but I was able to use prior drawing knowledge to effect a paradigm shift in the way I approached creating a piece of work on a loom.



**Figure 5.** Woven Textile Drawing July 2012

## Research Outcomes

Describing the ability to draw well is difficult due to the evasive nature of a definition for drawing, as Deana Petherbridge describes: “Drawing, however seldom attracts consensus views. Instead it invites frustration or obsession in attempting to clarify something which is slippery and irresolute in its fluid status as performative act and idea; as sign, and symbol *and* signifier: as conceptual diagram as well as medium and process and technique with many uses, manifestations and applications” <sup>iv</sup>

(Petherbridge,D,2008, Writing on Drawing, pp27) A summary of the qualities of good drawing has been a helpful way to think. The following definition from the artist Michael Craig Martin seems to offer scope to transfer the ideas across a range of media and contexts, and applies as much to a maker of textiles as it might to any other discipline. “In 1994 Michael Craig Martin wrote an essay for another Arts Council exhibition of drawings where he also avoided hard and fast definitions and instead offered a check list of qualities he felt all good drawings should possess: “...spontaneity, creative speculation, experimentation, directness, simplicity, abbreviation, expressiveness, immediacy, personal vision, technical diversity, modesty of means, rawness, fragmentation, discontinuity, unfinishedness and open endedness”<sup>v</sup>(Farthing, T, 2005, Dirtying the Paper Delicately, pp27) All of these qualities can also be applied to making and weaving, most importantly in the experimental and developmental stages. My work fits with the parameters and definition of Hyper drawing: “Hyperdrawing partly emerged from this bounding of the space, taking a broader and unconstrained approach, beyond rather than between – where drawing could be identified across any and all material approaches”<sup>vi</sup> (Marshall, R, Sawdon, P, hyperdrawing, pp viii) In this context Marsha Meskimon also talks about “drawing’s exceptional ability to materialize thresholds between disciplinary fields or conceptual territories while engaging with many modes of making at once”<sup>vii</sup> (Meskimon, M, hyperdrawing, 2012, pp xi) Direct Intervention in the process has brought about a more ‘poetic’ result, pushing the boundaries of my expertise and knowledge of process. A conscious intention to draw has brought about a paradigm shift in my approach to the weaving process. I am not designing but drawing.

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# Moving Target: The Modification of Intent when Making a Pair of Scissors

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## Abstract

We present a reflection on a case study, during which a pair of industrially produced scissors were reverse engineered to investigate the practice of creating high quality, functional objects in low volumes. Contextualized by contemporary debates on the future of making, and evaluated with reference to anthropologist Tim Ingold's descriptions of production, this paper observes the importance of balancing design intent with the realities of material engagement. It introduces the idea of prioritising certain formal qualities over others during the making process. The paper is intended to accompany an exhibition of the scissors and provoke discussion around issues of 'quality' in low volume production and the practices of making.

## Author Keywords

Digital Fabrication; Hylomorphism; Craft; Making;

## Introduction

The increased accessibility of computer-controlled machines, such as laser cutters, CNC routers and 3D printers can offer makers a new degree of dimensional accuracy at reduced costs. Combined with online information sharing, these technologies might, according to some, lead to the development of artisanal, locally relevant forms of production, radically affecting consumption habits and inspiring widespread user-led product innovation (Gershenson, 2005, Lipson & Kurman, 2010, Anderson, 2012). Whereas accurate form generation was once the preserve of either high-volume, repeat production, or the result of highly skilled manual work, it can now be achieved efficiently during the manufacture of one-off

objects. In the terminology of the most enthusiastic pioneers, making has been 'democratised'.

In this paper, we reflect on a practice-based case study that aims to contribute to an understanding of how things can be made 'well' in the context of contemporary low volume production. As part of a larger PhD project, which draws upon existing research in *quality*, *craft* and the *practice of making*, studies such as the one presented here are being used to inform, evaluate and support an exploration of 'quality' at this scale of production. The study discussed below, in which a pair of scissors was reverse engineered, was devised to explore the relationship between design intent and its realisation, during the low volume production of high quality, functional objects.

Without wanting to disregard the importance of increasingly sophisticated material possessing, we suggest that contemporary discussion of low volume production might be based upon a misconception of making, one which prioritises the realisation of accuracy above the ambiguities of material engagement. Our attempt to reverse engineer the scissors, to try and realise a fully specified design intent, provides an opportunity to investigate this understanding. Through reference to anthropologist Tim Ingold's work on the practice of making, and reflection upon the process of hand filing the scissor blades, we discuss the modification of design intent that characterised the production process. We introduce the idea that it is the prioritisation of certain formal qualities over others, throughout the making process, which can usefully inform the modification of intent.



Figure 1. Original scissors in packaging

The design classic was selectively sampled from Phaidon's Design Classics (Phaidon, 2006) book, as an object of manageable size and complexity. Whilst it is difficult to properly define the merits of a 'design classic' (a term so closely associated with marketing hyperbole), it might at least be possible to say that, by evidence of their continuing reproduction, such products have been proven to be of an acceptable standard over a relatively long period of time, and therefore useful as a standard for an exploration of 'quality' in low volume production.

## Two kinds of making

Tim Ingold argues that scholars of material culture could benefit by shifting their attention away from finished objects, and towards the relationship between practitioners and materials. In the fields of anthropology and archaeology, these views have not gone undisputed (e.g. Miller, 2007). But what are most useful to this study are Ingold's counteractive explorations into the practice of making, through which he develops the case for 'a better appreciation of the material flows and currents of sensory awareness within which both ideas and things reciprocally take shape' (2011, p.10).

Ingold observes two conceptions of making – one which sees the maker begin with a fully-formed, preconceived intent, to be imposed upon the material world; and an alternative vision, which acknowledges improvisation through engagement with the world of materials. In his criticism of the former model, Ingold explains that to see making as serving 'merely to transcribe pre-existent, ideal forms onto an initially formless material substrate' (2011, p.10) is an understanding that fails to account for the improvisatory realities of productive work. Drawing upon the work of philosophers Deleuze and Guatarri (2004, pp.449-51), Ingold considers this misconception of making to founded on a *hylomorphic* understanding (Ingold, 2010).

*Hylomorphism*, from the Greek *hyle* (matter) and *morphe* (form), is a way of thinking about production that can be traced back to Aristotle. Ingold argues that, in western thought, hylomorphic thinking has become ever more dominant and increasingly unbalanced, with form being 'seen as imposed by an agent with a particular design in mind, answering to his or her purpose, while matter – thus rendered passive and inert – became that which was imposed upon' (2013, p.37).

The distinction between this hylomorphic conception of making and Ingold's alternative, which acknowledges real-world material

engagement and improvisation, provides us with a useful basis from which to consider the peculiarities of low volume production.

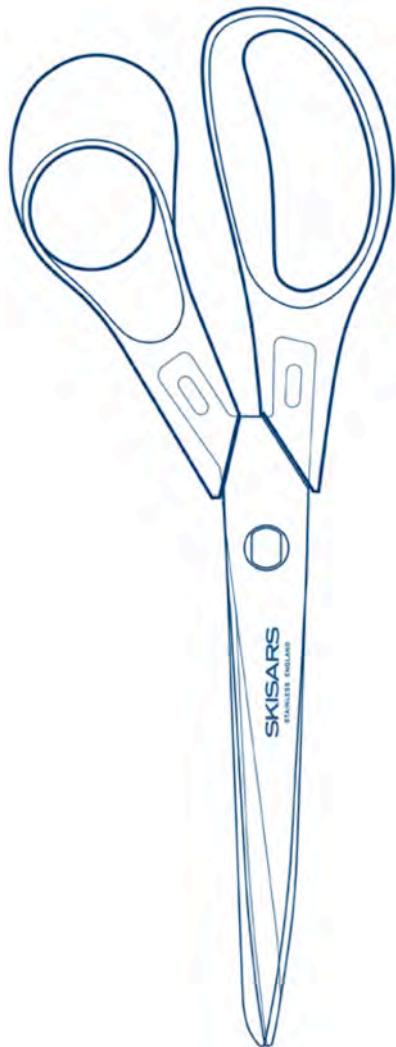
We suggest that the enthusiasm surrounding digital manufacturing technologies could be considered consistent with a '*hylomorphic*' understanding of production. The computer generated design, fully specified in all dimensions and laser sintered into a bed of powder is a powerful example of humankind's control of materials. Evidence indeed of our ability to transcribe pre-existent, ideal forms onto an initially formless material substrate.

Through the case study documented here, we investigate whether this conception of production, which sees preconceived forms being accurately realised in material, is appropriate whilst making functional objects at the low volume scale. How can design intent be balanced with the realities of material engagement?

## Making a pair of scissors

To explore this relationship between design intent and material engagement during low volume production, in part inspired by Ingold's idea of *transcribing pre-existing, ideal forms into an initially formless material substrate*, we have attempted to transcribe a pre-existent, ideal form into initially formless material substrates. Or, as we put it, reverse engineer a 'design classic' – a pair of scissors (see Fig. 1.).

The attributes of the scissors – their form, weight, colour, texture, mechanical action, resistance to decay etc. – provided the ideal that we would attempt to realise exactly. Through trying to create an accurate facsimile, we have been forced to honour a preconceived intent, without the option of redesigning parts to suit processes or materials more appropriate for low volume manufacture. We have, in a sense, enacted a '*hylomorphic*' approach to production. We acknowledge that this is an impractical approach to design and manufacture, which has resulted in an artefact of grossly uncompetitive expense. But, where other



projects (e.g. Droog (2011)) might use designerly ingenuity to navigate the limitations of low-volume production technologies, this approach is designed to test those limits. Against the challenges and material resistances of the real world, where would the intent be modified? In what ways would we fail?

### Method

The inquiry was based around a reflective, autobiographical account of the making process (Schön, 1983), conducted by Philip Luscombe, one of this paper's authors. This method drew upon the approaches of anthropological studies of productive work (see Rosner, 2012 and Ingold, 2011, pp.51–62) and practice-based design research.

To make the scissors, Luscombe collaborated with specialist manufacturers on a professional basis and undertook simple hand finishing operations himself. He began by creating a 3D computer model of the scissors, from which drawings could be provided to collaborating manufacturers (see Fig. 2.). Outside of the collaborations, Luscombe had access only to simply hand tools (such as files, a scalpel, a clamp etc.) to create the scissors. This method was devised to recreate the making conditions of the 'real world', with all its difficulties and resistances, beyond the luxury of a well-equipped workshop. Records of all work, including the time taken on each job, notes on each process, costs and discussions with collaborators, was kept throughout production.

Data from the records, the finished scissors and the originals are exhibited in this conference's exhibition. We would encourage readers to examine and compare the scissors in the exhibition, testing for themselves the different qualities of each. In this short paper, we describe just the production of the scissor blades, focusing upon the process of hand filing the facets and edges.

Figure 2. Line drawing generated from 3D model of scissors.

### Making the blades

The scissor blades are made from RWL34, a stainless steel marketed to knife makers. Whilst the blades were waterjet cut, heat-treated and laser marked in collaboration with specialists, Luscombe filed the facets and edges by hand (see Figure 4.).

Hand filing the stainless steel blades was a time-consuming process, taking 23 hours in total. Whilst it may have been sensible to enlist the help of a blade grinding specialist, rather than undertake this part of the work 'in-house', the process of trying to match the original blades became a valuable investigation into the relationship between design intent and material engagement.

In his work on Chinese *zisha* potters, Gowlland describes how craft practitioners can develop a personal style by seeking 'variation within repetition' (2009, p.135), by balancing their intent, a degree of perfectionism and the varied outcomes that come from material engagement in the real world. Whilst Luscombe would stop short of applying notions of personal style to his inexpert filing of stainless steel, it was a modification of intent, similar to the variations incorporated by *zisha* artisans, that informed his approach to shaping the blades.

The modification of intent was, in this case, a tolerance of variation from the original scissors. Unusually, the 'intent' was already fully defined, more so than any technical drawing, because it already existed as the original scissors. Every quality of the originals, down to the sound the blades make as they pass one another, can be measured and checked. Throughout the project, therefore, efforts to accurately make any part of the scissors were characterised by continual failure.

From the record of production, it can be seen that this failure (the modification of intent) was guided by the prioritisation of certain formal qualities over others. From those qualities that Luscombe could affect on the blades (including, for example, the direction of



Figure 3. Marking blade edge



Figure 4. Hand filing blade edge

*Note from Luscombe's record: "I found it difficult to create a flat surface by hand and, without care, the edges would round off, causing the blades not to catch light in one sharp glint, as with the original scissors, but in a rolling band that formed a gradient across their surface."*

the 'grind' or the angle of the surfaces), the inaccuracy that appeared least acceptable was the lack of flatness to the facets. Through choosing to prioritise flattening the surfaces, Luscombe deemed the shape, size and angle of the facets to be less important than their flatness<sup>1</sup>. Other qualities could deviate from the original more freely, whilst he concentrated on the flatness. By this stage, the design intent had become a 'moving target' (Ingold, 2011, p.217), no longer fully represented by the original scissors, but a concept responding to the results of the filing and guided by the principle of flatness.

## Conclusion

Of course, it might just be the researcher's lack of physical skill that necessitated deviation from the intent. Had he employed an expert blade grinder, it may have been possible to satisfy all requirements of the design. Unfortunately, making the other scissor components, including those utilising the skills of expert collaborators and digitally controlled manufacturing processes, was consistent with the experience of resistance, failure and adjustment described here.

We suggest that the continual adjustment of intent is critical to the low volume production of high quality objects. We have described how this can be informed by the prioritisation of certain formal qualities over others, and believe that the development of such ideas can lead to a better understanding of how to make things 'well' in the context of contemporary low volume production. The example of the scissor blades shows that, even with the most thoroughly specified of designs, making processes can come to rely more on values and concepts (such as that of flatness), than any preconceived, ideal form.

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<sup>1</sup> Unfortunately, there is not space enough to reflect on the decision to prioritise 'flatness' in this paper.

# Reading By Starlight: An Exploration Into Making Space Data Physical And Personally Meaningful

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## Abstract

NASA's Kepler space telescope continually monitors the brightness of over 150,000 stars, looking for periodic minuscule dips in brightness caused by planets orbiting them. The science this instrument is doing is astonishing; finding worlds that are orbiting stars so distant and dim they are not visible to the human eye. Despite this the Kepler telescope and the data it generates is so disconnected from our personal experience of the world it could be argued to be meaningless to us.

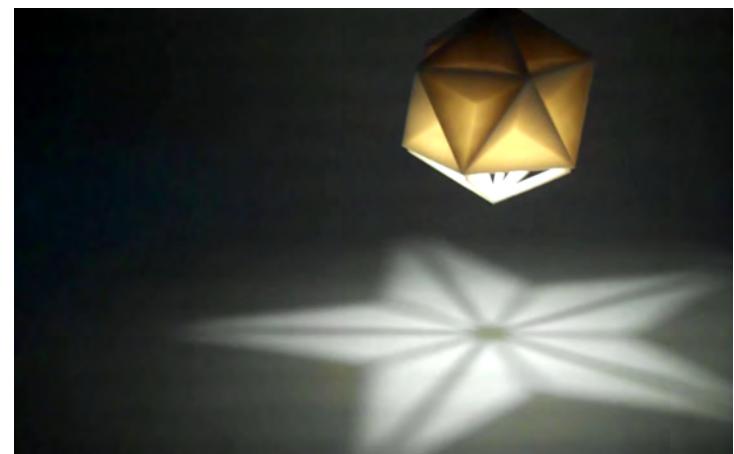
This work is part of a larger "Turning Space Data into Physical Apps" project, in collaboration with the open.NASA.gov initiative, aimed at addressing this disconnect. Open data usually aims to bring transparency to statistical and computational processes. Our work explores an alternative approach focused on embedding space data into a domestic object to evoke a different kind of connection with data and space, centring on personal meanings and daily life.

The "Reading by starlight" piece harnesses Kepler data from a particular star to dictate the brightness and intensity of a reading lamp. The light is encompassed within a form, which takes inspiration from a Kepler-Poinsot solid, discovered by the telescope's namesake Johannes Kepler. Planetary transits produce subtle dips in brightness as detected by the telescope. Through gently embedding space data in the light, we are exploring new ways for NASA's data to have fresh meaning for people and also

new ways for people to connect with space in an intimate, human context.<sup>1</sup>

## Author Keywords

Design; Digital; Meaningfulness; Open Space Data; Kepler Space Telescope; Physical Data



*Figure 1. The Reading by Starlight lamp projecting a representation of distant starlight upon a surface. Space data encompassed within a meaningful form.*

<sup>1</sup> The current form has been exhibited at SXSW Interactive 2013, Edinburgh Science Festival 2013 and at the Digital Futures exhibition, Victoria and Albert Museum, London 2013 and will be exhibited at London Design Festival 2013.

## Research Imperatives

In recent years the United States government has been undergoing a process of promoting “Open Governance”, stemming from the Open Government Directive (United States of America, 2009) aiming to increase transparency, participation and collaboration. To adhere to this policy the National Aeronautics and Space Administration (NASA) published an Open Government Plan (NASA, 2010), opening their datasets and source code and organizing hacking events to produce new technology and build a wider community around NASA. Past involvement by members of our team in one such event, the “International Space Apps Challenge”, led to an invitation from NASA to begin a longer term project with them under the title “Turning Space Data into Physical Apps” (Llewellyn, A., 2013).

The released data, whilst technically open, requires skill and knowledge to access, perhaps meeting the goals of open governance but as a wider non-specialist resource remains impenetrable to many and could be more valuable with easier access. As such the data represents an interesting challenge to the designer. One temptation might be to pursue the goal of making the data *understandable* by designing infographics, but this adds little to connect people on a more personal level to space and the data derived from there. Our approach was to firstly consider space data as a provocative lens on our own frames of reference of things like scale and time as well as our experiences as humans and to secondly value space data as a material to design with. We developed a series of design ideas and prototypes (Fig. 2) embedding the data within physical artefacts and this paper will discuss one of these designs: *Reading by Starlight* here. Further, we propose that the approach of embodying data thoughtfully within artefacts in the domestic space could allow otherwise sterile data to be put on a human scale and foster emotional connection to the majestic astronomical objects producing it, without undue focus on the information itself.

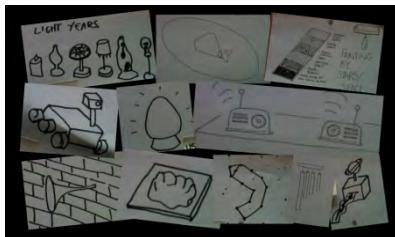


Figure 2. Initial idea sketches. Discussion of potential physical manifestations of space data. These ranged from the whimsical, such as painting with the palette of celestial bodies, to more literal projects such as 3D printed moon terrain.



Figure 3. *Reading by Starlight* lamp, being used for its intended purpose, as a reading light. Its purposeful and subtle imperfection providing a link to the wider universe during a mundane activity.

## Research Process

An initial set of playful ideas (Fig 2) was refined through exploration of the quality of the data available and discussions with NASA, producing a smaller set of manageable and worthwhile projects. *Reading by Starlight* and the work described by Shorter et al (2013, forthcoming) represent the most developed of these.

*Reading by Starlight* started with an exploration of the methods of the Kepler Space Telescope and the context of the data it collects. An orbiting telescope continually observing more than 150,000 stars over a 105 square degree portion of the sky. Any planets orbiting these stars will periodically block a small portion of the starlight if their orbit passes between their star and earth. In detecting these “transits” the Kepler mission has discovered 132 confirmed planets as of May 2013 (NASA, 2013) with a potential pool of 18,406 other potential transiting planet signals (Tenenbaum et al, 2013).

Given the ability of the telescope to discover new and unique solar systems the work has received considerable press attention. The raw data itself is released quarterly to the public, most accessible via [planethunters.org](http://planethunters.org), a crowdsourcing effort to reveal further planetary systems hidden in the data (Schwamb et Al, 2012). Like much modern science however this has no real connection to day to day life. *Reading By Starlight* proposed to take the light from these stars and make it bright enough to read by, whilst still maintaining the signal contained, presenting a means to forge a relationship between the user and a newly discovered planetary system.

The telescope’s namesake, Johannes Kepler, perhaps most famous for his laws of planetary motion, also conducted important work in astronomy, optics and mathematics. One lesser known discovery was a group of polyhedra with star-like aesthetics. Designing the lamp with inspiration from one of these forms, the



Figure 4. Very early exploration of the data through a small LED form with external electronics.

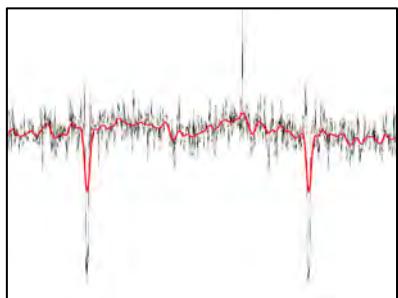


Figure 5. Telescope flux data spanning 12.5 days of Kepler-19's light, signal show represents only 0.1% of total sensor counts. Released flux data (black) was smoothed to produce values suitable to produce light to read by (red).

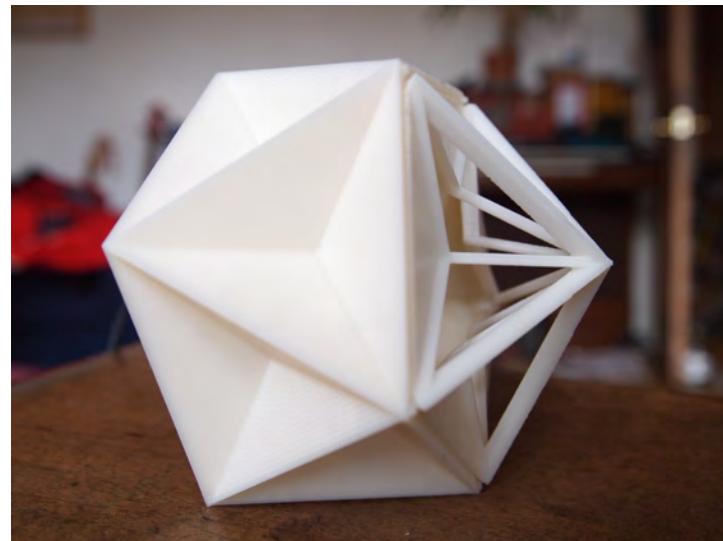


Figure 6. Side view of non-illuminated lamp showing Kepler-Poinsot Great Dodecahedron form. This represents a prototype, consisting of a Fusion Depositional Modelled ABS body, encapsulating an LED module and driving electronics.

Using the telescope's data to provide light suitable for reading presented several challenges. Firstly transiting the data cannot be observed at true brightness or speed, planets only block a small fraction of the light (in the order of 1/10000 of the full brightness of the star) and transit data typically exists on the order of hours, days or months (Fig 5). Scaling the data in amplitude and timescale made the data visible but resulted in a very distracting flicker certainly unsuited to reading. The source of this turned out to be combination of noise from the sensors, variable star light output and things other than planets blocking light. Naive attempts at

smoothing removed both the signal and noise, after experimentation with several smoothing functions in code, observation of the resulting time-series revealed a Gaussian binomial smoothing of 100 passes produces a light suitable for reading but also containing subtle transit data (shown red in Fig. 5).

## Discussion

Further work is required to develop Reading by Starlight into a refined lamp (we are experimenting with porcelain for example), but the process has already raised early insights.

From the first attempt at giving this data physical form, though connecting a bare LED (Fig. 4) to the data, it immediately attracted intrigue from visiting design students and researchers. An object that is now so commonplace (an LED) was being discussed with awe and fascination that via something so small the discovery of planets was being witnessed. When exhibiting the Reading by Starlight lamp to space program staff and interested laypeople at SXSW<sup>2</sup> one viewer commented that he found it moving that he was tangibly connected to something (space) so huge and so distant through an object that felt so intimate, homely and human. Bringing space data into our domestic environments at a human scale opens up an interesting design space. It is thought-provoking to explore how space data can be woven into gentle everyday experiences, like the reading of a book to create around these small acts and small daily occurrences potentially very powerful experiences.

Revealing what the light represents (science discovering wholly new and vastly distant worlds) comments from members of the public when exhibited indicated it inspired awe, as such discoveries rightly merit. Rather than the Kepler data being viewed as a spectacle interest it is lived with through a lamp; a personal object, daily, for potentially years.

<sup>2</sup> SXSW Interactive 2013



Figure 7. Illumination pattern and translucency of current lamp.



Figure 8. Prototype as a table-lamp

In a society overrun by novelty and change amazing scientific finds can be lost amongst the clamour, even to those with an interest. Our digital tools offer access to a wealth of knowledge but also a glut of distractions. With design we can make small monuments to these scientific revelations knitted together with our day to day lives, using physical artefacts on an intimate personal scale to slip by our otherwise overwhelmed imaginations.

This further step of embedding the data in a domestic object is very important, allowing space data to mesh with our own daily rhythms provides a means to step beyond the spectacle and form a personal lasting connection with the object and the larger processes it represents.

This is by no means a universal approach. Care must be taken to choose a data source which can be represented with a simple, easily comprehensible action (be it light, motion, or otherwise). More complex processes needing contemplation would prove a different challenge and this approach may not work. Thought must be given to abstraction of data in the process, in this instance the smoothing of the light and speeding of the data. A balance must be found between providing a more persuasive object and the cost of diluting the connection to the real physical process.

Space data presents a rich relatively untapped resource for designers, and through techniques such as that discussed in this paper, design can provide an emotive day to day connection of the type needed to celebrate scientific discoveries and provide the impetus for us to keep pushing boundaries. This lamp, alongside its useful purpose of illumination provides a subtle bond with a larger context outside our atomized piecemeal lives, prompting an opportunity to step back, look up, admire the universe and feel connected.

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## Utopian Dreaming

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### Abstract

As we move rapidly to a world environment that may not be the utopia that has been predicted we better understand the sparsity of space within our urban realm and the increasing lack of leisure time that we may enjoy. When considering these aspects compounded we should be concerned, particularly in light of population growth. Popular culture often paints a picture of an uninhabitable planet where living space may be the most valuable resource. Should this be any form of prophecy then we should start to better consider how we use the available but unused interior and exterior spaces within our urban environments.

This paper reports on research undertaken collectively by Interior Design Academics and an industry professional of high standing, David Dalziel (Creative Director at Dalziel and Pow - expert in brand environments and communications within our cities). We propose a series of new three-dimensional works that will inform future urban planning, from a user's stand-point. These will evolve through playful and speculative thoughts and result in objects as talking points in beginning to make a directional response to the challenges our towns and cities face going forward.

Our research has considered whether we should look to brave and arguably irrational propositions from the past such as Dreamland, New York which "in fact alienated a part of the earth's surface further from nature than architecture has ever succeeded in doing before, and turned it into a magic carpet that can reproduce experience and fabricate almost any sensation; sustain any number of ritualistic performances that exorcise the apocalyptic penalties of the modern condition.... and survive the onslaught of over a million visitors a day." (Koolhaas. 1994, pg 61). In order to visualise and

conceive of spaces that better reflect the needs of society we should consider that we may even need to create a shield against the realities of life.

Rapid prototyping alongside traditional modeling techniques will be harnessed in the manufacture of models to communicate ideas and propositions and ultimately raise debate and conjecture as part of the 'Praxis + Poetics' conference. Resultant feedback will advance the "Utopian Dreaming" project to the next stage of what is expected to be a series of outputs with the ultimate goal of creating workable solutions to this hot topic of debate.

### Author Keywords

Design; Collaboration; Urban; Utopia; Dystopia; Interior; Exterior

## Research Imperatives

As the natives looked out, with deadened eyes, upon the chaos and carnage they called home, young children circled the dystopian landscape like scavengers looking for a future. The speculative utopian architecture had not predicted this ‘science fiction’ but had instead created a territory for it to evolve.

Not a quote but a prediction for the future, and hopefully one we can do something about. How may we extract utopia from dystopia? The following text starts to dissect the ideas of utopia and dystopia and how they inform one another. Let us try to ensure that the Orwellian condition does not materialise.

“The old civilizations claimed that they were founded on love or justice. Ours is founded upon hatred. In our world there will be no emotions except fear, rage, triumph, and self-abasement. Everything else we shall destroy — everything” (Orwell, 1949)

Utopia describes an imaginary island described in Sir Thomas More’s Utopia (1516) as enjoying perfection in law and politics, of being an ideal place or state. Essentially it is a visionary idea of the creation of the perfect environment within which we would live and exist. Dystopia, however, could not offer more in contrast, it defines a society where human misery, squalor, oppression, disease and overcrowding are endemic. Where there is very little sense of optimism for the future, each day is a grind.

The primary focus within this research is to better understand real urban realms that illustrate the ideas of utopia. Key texts, such as Delirious New York will be analysed, with the aim of determining how utopia may be achievable or at least how we may improve our daily living and life experience in the first instance.



Figures 1 & 2. Unused ‘negative space’ is identified by a volumetric representation upon a generic New York case study.



## Research Process

This is the first stage of the ‘Utopian Dreaming’ project and as such will aim to identify ‘lost’ areas of our urban realm that have potential to enrich our lives through designed urban interactions and insertions that encourage a better connection with our towns and cities. Three-dimensional representations of an intrinsically beautiful and intriguing nature will be produced to communicate findings. Further debate, encouraged by these representations, will highlight and enforce relevant topics and lead to further primary research to advance the ‘Utopian Dreaming’ project.

Visuals illustrate the early stages of the project below with key importance placed on the idea of locating ‘lost’ spaces, within our urban realm, that offer opportunities for development. This will take place through the insertion of ideas and three-dimensional notions that enrich our daily lives.

## Research Outcomes

In starting to consider the utopian dream it would seem inevitable that the perfect state can only exist based upon perfection, in the decision-making and planning regarding our urban realm. It must also consider the occupants within that realm and how they may evolve as a community given their surroundings and also how they may enable those surroundings to evolve. There is a high degree of control in doing this, how do we support communities and individuals to make decisions to enable independence whilst also ensuring that there is ultimate control over a state’s development? Strategic planning, architecture and design must play a large part in creating places and spaces that allow people ‘independence’ and ‘choice’.



Figures 3 & 4. The linearity evident within urban landscapes, such as New York City, lead to research focused on cubist forms.



Popular culture and cinematography play a significant part in how our urban spaces are responded to, used and abused and if we are to believe such fiction "At the end of the 21st century, global chemical war left the planet nearly uninhabitable." And "Living space is now Earth's most valuable resource" (Vanderbilt, Bomback and Wimmer, 2012), then we should start to consider how we better use our vacant and underused space now. Thomas Sharp discussed the idea of a town being a "utility for collective living" (Sharp, 1940, pg 73), this positive notion has diminished over time but could encapsulate solutions to the problems we encounter within our towns and cities. Space acting as a lung for the 'city' has become minimised and the aim is to reverse this trend.

New York 1960 evidences the importance of collective living and community. In the face of polarising 'master builder' Robert Moses, who had already dealt with "the loose strands and stray edges of the metropolitan of arterial tapestry" (Burns. R, 1999), by decimating the outer boroughs of New York with a series of expressways. His intention through urban renewal would rip the heart from the communities of Soho and the West Village and this "was not the rebuilding of cities but the sacking of cities" (Jacobs. 1961), a potential dystopian reality. Jane Jacobs and her community coalition fought the plans and ultimately won, and in so doing proved the importance of community as an integral part of a successful city and that you should ignore the end user at your peril!

Manhattan has been described as an "urban science fiction" (Koolhaas, 1994, pg 15) However, not more than a 30 minute subway ride away is the star of the show and instigator of the show that Manhattan has become..... Coney Island.

Discovered in 1609, prior to Manhattan, the original inhabitants, the Canarsie Indians, named it "Place Without Shadows" a possible nod towards the 'attractions' to come and ensure the fame and notoriety that Coney encapsulates. The island was to become the

'lung' for urban New Yorkers, the location and proximity was perfect. And as New York evolved from city to metropolis, by 1860, the leisure space that Coney offered became critical, visitors arrived on mass. Pleasure and entertainment the key and through enthusiasm, bravery and the use of technology an antidote was developed to counter the seriousness of the world, or at least Manhattan. This is perhaps the closest we have ever come to utopia, if only for a moment and as a transient state.

The challenge is now to evaluate our existing underused urban realm, the various types of space and building stock that we potentially have at our disposal and how we may consider the utopian and dystopian ideas discussed, in developing design and planning solutions that enrich human life, particularly in the context of the city. We must however, never lose sight of the impact of these decisions both positive and negative in ensuring progress is in fact positive for all concerned.

The 'Utopian Dreaming' project starts to consider a series of smaller 'perfect states' as a more realistic proposition to improving the underused cities that we inhabit. A series of strategically placed 'lungs' within our urban realm that offer up small scale utopias that will enrich our individual and collective wellbeing.

A set of three models will be produced that sequentially illustrate our urban environment from the relative macro to micro. In doing so we look to draw a line under the inevitability of our potential dystopian future.

*Model 1* will focus upon the existing urban environment, hand crafted in oak to illustrate the permanence and, in part, beauty of the existing built environment. Citrine resin cast into the oak will highlight areas for the potential improvement of our urban realm, while a 40mm thick perspex base will allow for a variety of sight lines to communicate the wide range of possible opportunities.

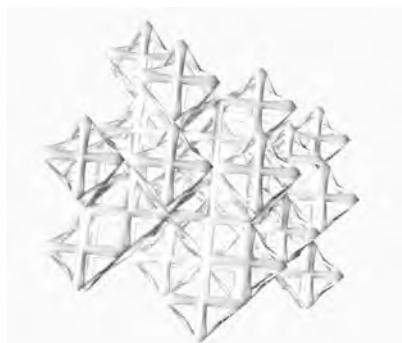


Figure 5. Further digital exploration and manipulation, maintaining an integral grid framework, created playful and intriguing three-dimensional forms whilst continually referencing the lineal volumes within the urban realm.



Figure 6. Further notional insertions begin to give new use and spectacle to the highlighted spaces.

*Model 2 will start to zoom into the pockets of the urban environment that offer opportunities for development. The model will again be constructed in Oak and citrine resin with a 40mm thick Perspex base. Now at a larger scale the volumetric spaces will be able to be more closely examined, to better illustrate and communicate the proportion and type of spaces available whilst also considering the human condition.*

*Model 3 will focus upon the opportunities ahead. Now at street level and human in scale the oak and Perspex base remain but rapid prototype abstract forms replace the citrine resin, which highlighted opportunities in previous models. These are based upon linearity within our major towns and cities and created to spark discussion, based upon opportunities and the forgotten, as to how we better make use of and enrich our existing urban realm. This final model in the series, aims to engage the viewer further in the opportunities that we must all take responsibility within our living urban environment.*

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## Design Fictions: Future Technology in Diegetic Worlds

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### Abstract

Charting the Digital Lifespan is an interdisciplinary research project investigating the digital lifespan of UK citizens both now and in a future where digital natives approach adulthood, become parents, retire, and pass away. These four life transitions form loci for focusing practice-based enquiry on digital personhood across the lifespan. Studying this as an emerging and ‘unmapped’ phenomenon calls for a methodological orientation that embraces the world both as experienced and as envisioned. Within the project’s work programme we are developing Design Fictions: compelling narratives formed through provocative conceptual designs. The approach embeds fictional technologies in imaginatively crafted diegetic (story) worlds to serve narrative functions and anchor speculative thinking, rather than devising use case scenarios for prototypes. Our aim is to stimulate multiple, alternative perspectives from the research stakeholders on possible technology applications for future interactions, supporting critical reflection on what the digital lifespan is (and is not) and what it could be.

The first life transition being charted by the project is End of Life. Using Design Fictions we are interested in the version of self bound up in digital traces – simultaneously the same, but different from, the individual that generates them – that persists after physical death; and the socio-cultural fascination and anxiety surrounding the potential for digital afterlife. The idea of ‘the double’ resonates through folklore, poetry and literary theory, and the graphical, audio-visual and tangible objects that populate our fictions tell stories that draw on powerful cultural associations: the uncanny glimpse of the doppelganger; and what Barthes (1993) described as punctum, the intensely subjective responses elicited

by symbolic representations. Leading from this, we invite our research stakeholders to critically engage with VIVIEN, an envisioned digital estate planning service that enters peoples’ lives and relationships in the transition to the digital afterlife, and gives ‘the double’ new cultural significance.

### Author Keywords

Design fiction; critical design; digital personhood.

### Research Imperatives

The design exploration is motivated by a new interdisciplinary research project investigating the digital lifespan of UK citizens both now and in a future where digital natives approach adulthood, become parents, retire, and pass away. These four life transitions form loci for engaging the research team with the concept of ‘digital personhood’ across the human lifespan. Bringing together expertise in anthropology, interaction design, computer vision and cultural studies, the project takes an empirical, experience-centred approach to enquiry. Somewhat paradoxically, empirically studying the digital lifespan as an emerging and ‘unmapped’ phenomenon calls for a methodological orientation that embraces the world both as experienced and as *envisioned*. For a digital native at the current time, the life transition into retirement is beyond one’s lived experience; and a new challenge arises of how to generate empirical, experiential insights about imagined near futures that are extrapolated from current understandings, values and expectations.

To address this challenge, we are developing Design Fictions: compelling narratives formed through provocative conceptual designs. The Design Fiction approach embeds fictional technologies in imaginatively crafted diegetic (story) worlds to serve

narrative functions and anchor speculative thinking (Bleeker, 2009). Our aim is to stimulate multiple, alternative perspectives from the people who we engage in our research on possible technology applications for future interactions, supporting critical reflection on what the digital lifespan is (and is not), and what it could be.

Design Fiction was coined by Julian Bleeker (2009) to describe the potential of designed artefacts to serve as 'props or conversation pieces' that invite speculation and reflection from those interacting with them about possible worlds and imagined contexts of use. The practice of Design Fiction draws on the notion of diegetic prototypes (Kirby, 2010): compelling depictions of completely artificial technologies embedded in fictional reality (diegesis) as components of a story, which normalise these technologies as practical objects. The purpose of Design Fiction is to facilitate exploration of socio-cultural frameworks for projecting images of the future through the reference points that connect technological possibilities with lived human experience.

Arguably, Design Fictions is aligned with an established discourse about critical-reflective approaches to creative design practice, including those pioneered by Dunne and Raby (2001), which are concerned with designing for the world *as it could be*, rather than as it exists now. Design Fiction "is a way of materializing ideas and speculations without the pragmatic curtailing that often happens when dead weights are fastened to the imagination" (Bleeker, 2009, p. 6). A feature of that legacy work is that, positioned outside of the constructive imperatives of mainstream product development (to deliver to consumer markets), it creates the conceptual space for negative or dystopian experiences and envisionings to be given visibility alongside positive, utopian ones, to capture and invite reflection on the rich, multivoicedness of 'real' life.

Importantly, our objective is not to forecast the future; rather it is to gather understandings of the digital lifespan as it is *currently* experienced and envisioned. By doing this, we hope to shed light

on the socio-cultural values and expectations that form around the concept of the digital lifespan, and how these may shape and be shaped by the use of digital technologies to express personhood.

## Research Process

The first life transition being charted by the project is End of Life. Using Design Fictions, we are interested to explore how the self, bound up in digital traces, persists after physical death, and socio-cultural concerns surrounding the potential for digital afterlife. We draw upon the idea of 'the double', a concept that resonates throughout folklore, poetry and literary theory; and the graphical, audio-visual and tangible objects that populate our fictions tell stories that draw on powerful cultural associations: the uncanny glimpse of the doppelganger; and what Barthes (1993) described as punctum, the intensely subjective responses elicited by symbolic representations.

We have chosen to distil issues of digital persistence after physical death into the story of one couple and digital mediation of their relationship at a point of crisis. The process of developing the narrative took the form of creative dialogue between the authors, which focused on exploring a number of key themes: the impact of serious illness on scope of digital investment; unintended consequences of technological interventions at sensitive moments; potential estrangement engendered by a digital proxy; and the unquantifiable value of personal significance derived from human memory and embodied experience.

The fiction we have designed (a short prose account of which is provided below) is constituted by various artefacts: visual (photos and graphics, Figs. 1 and 2); performative (audio monologues); physical (props). In workshops, research stakeholders are invited to engage, cognitively, emotionally, and tangibly, with the narrative world of the fiction encapsulated by the design artefacts. The purpose of designing a fiction in this multi-modal form is to represent it as a complex alternative reality with several points of

entry. The artefacts are made meaningful by the narrative context in which they are situated but possess their own distinct significance and resonate differently for each participant. In the workshop we want participants to consider and discuss the possibility that people's identities are bound up in digital things that will outlive them, and that technological products and services to manage and safeguard this information may not function in ways that are sensitive to the intense emotions bound up in such representations of self. These are quite abstract ideas that touch on sensitive areas of life; by focusing attention on an imagined reality the Design Fiction invites participants to respond imaginatively to these issues.

The fiction is intended to be polysemic, that is open to many different applications and interpretations. In terms of the responses it elicits from our research participants, there is no preferred reading of the narrative; the future technology is conceived as 'a possible thing' rather than 'a good thing' or 'a bad thing'. In the context of a workshop, the aim is to invite participants to engage with multiple characters' views on the situation, including that of the system itself, VIVIEN, in the sense that 'her' mechanisms are made plausible and compelling by narrative integration. In turn, we invite the workshop participants to offer up their critical perspectives on the fictional world as they experience it and make sense of it; and meaningfully connect these perspectives to their previous lived experiences, values, and expectations, in relation to the subject matter of End of Life being explored.

#### **Design Fiction: John, Iris and VIVIEN**

*After a sleepless night and lots of soul-searching, Iris decided to tell her social networks about her illness. They'd spoken to the family immediately, of course, but she knew people were worried about her and keen to hear some news, and she couldn't face getting in touch with them all separately. Better just to put it out there. Then she could go offline and let John deal with the fallout.*

*Iris quickly realised that this wasn't the best way to deal with things though. John was spending ages keeping up with it all. Then he pointed out an advert to her – it had popped up in one of her SNS feeds – for VIVIEN, a 'digital estate planning' service. It seemed like a good idea, to make everything a bit easier for John to manage.*



Figure 1. 'Photo of John and Iris'.

*John hadn't expected much from this system, beyond reducing the number of passwords he had to remember. But it turned out that VIVIEN was pretty clever. The special things – holidays, births, weddings – were obvious, but VIVIEN could even tell him their favourite songs of the time. It was fascinating, and pretty addictive: remembering things and discovering things he never knew.*

*In hospital it was hard to keep track of the date or what was going on outside, which was why Iris forgot their anniversary. John turned up with a huge bouquet; green foliage and pinkish blooms because 35 years was coral or jade, he said. He'd brought something else too though: a parcel, addressed to him. 'I think it's from you to me',*



**VIVIEN**  
DIGITAL ESTATE PLANNING

Figure 2. The envisioned service has narrative purposes. VIVIEN's function as a character is inherent in the branding.

*he said, 'because VIVIEN knew you'd want to give me something special'.*

*The parcel had arrived a few days ago and John had been intrigued ever since. He hoped, believed it was something fitting (not just a piece of corporate tat). Inside the parcel was a jewellery box and a card with a printed message: 'That which was lost has been found. Love you forever, Iris'. That's how she always signed things to him. He opened the box; inside was a pair of cufflinks.*

*They were so familiar; Iris had bought them for John to wear at their wedding. Afterwards he wore them to work every day. She hadn't thought much of it, until he lost one, years ago now. He was devastated: turned the house upside down. He kept the remaining one on his key ring; it was still there. But here were another two, good as new.*

Supporting and giving material form to this fiction is an ecology of designed artefacts, comprising: VIVIEN branding and marketing media (Fig. 2), and packaged products of the imagined service; and audio recordings depicting individual character monologues, which each capture 'lived' experiences at various points along the character's narrative trajectory and thus offer different orientations to and experiences of VIVIEN.

## Research Outcomes

In the broader context of the project, analytic understanding of the digital lifespan from the Design Fiction workshop is used alongside the findings of digital anthropology to generate a conceptual, socio-technical understanding of the End of Life transition. This understanding informs the next phase of the project, and the development of further critical design artefacts to be used in follow-on user studies about End of Life. The empirical insights gathered from the Design Fiction workshop thus serve as inspiration for doing further 'research through design'.

The designs in this next phase are working prototypes made deployable as probes in the homes of our research participants for extended periods of time; a probe design may constitute a novel interface or device that is mobile, wearable or situated 'in the field', and collects data about its use. The purpose of the probes is to critically explore the findings of the previous Design Fiction analysis, bringing together novel, multiple perspectives on the 'lived' and 'envisioned' digital lifespan. Other areas of the project informed by the Design Fiction workshop output include social data mining and computer vision studies.

## Acknowledgements

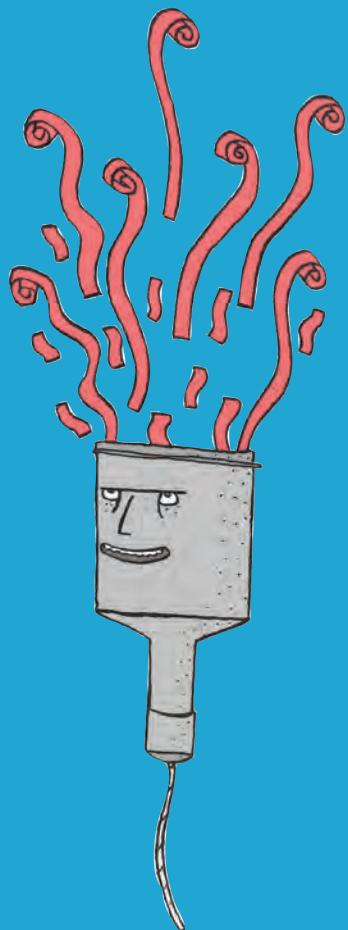
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Praxis + Poetics

DAY 3  
Posters



## Objectifying Sound

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### Abstract

Despite an increasing distance between man and material, additive manufacturing (or 3D printing as a more popular term) brings unprecedented yet unexplored possibilities of object manufacturing. Besides the advantages of 3D printing such as extreme complexity of forms, customization of objects and flexibility in manufacturing processes, 3D printing enables the immediate creation of an object without any intermediary tool. This possibility brings the potentials to intervene into the process of object manufacturing that can change our perception of objects, artifacts, beauty and aesthetics.

However, meaningful intervention to this completely digitized and autonomous process is normally not possible with our conventional toolsets. Since the object is formed according to the digital data, there is no chance of "touching" to the matter in the moment of its formation. 3D printing is a very rapid evolution in the history of mankind that changes the tool and object making process with thousands years of history (Alpay, 2012). On the contrary to this relatively new conceptions of object manufacturing brought by 3D printing, the history of artifacts has always involved an analog character, in which there is a direct relationship between the man and material.

As the manufacturing and design technologies advance, the design process has shifted more towards the CAD environment and software. In these circumstances the distance between the designer and material has increased (Walker, 2006).

This project aims to explore what happens if we have the power to analogously intervene the object manufacturing process with sound and the meanings associated with it. The 3D printing process (FDM

method in this project) is intervened in such a way that the form of the object that is being manufactured can be distorted with sound. For this purpose, an apparatus that deviates the extruder head is interfaced to the machine through a 450W bass amplifier. The amplifier transforms sound waves generated either by a bass guitar, microphone or audio soundtracks to an oscillating motion that distorts the computer controlled original building path. Thus, the intervention constructs a poetic bridge connecting apparently different domains of form, meaning and sound.

### Author Keywords

Additive manufacturing; 3D printing; design; customization

### Research Imperatives

Automated fabrication of objects by additive manufacturing technologies is untouchable by nature, which means no intervention can be made after sending the data to the machine (Alpay, 2012). The loss of the manual and tactile interaction with the material brings in the necessity of specialized CAD software tools that are mainly isolate the designer from the real world (Campbell, Hague, Sener and Wormald, 2003).

Despite many advantages brought by additive manufacturing, human intervention into the material and the process is not allowed, thus excluding the person. Our real life interaction with material includes a continuous and hands-on interaction with material either through mechanized tools or by our hands. Yet, the connection between the computer and the printer's extruding nozzle, the idea and the materializer in other words, seem to create a sublime field that no humans are allowed to intervene. A field that is untouchable by man due to its digital nature and absence of a decent tool for

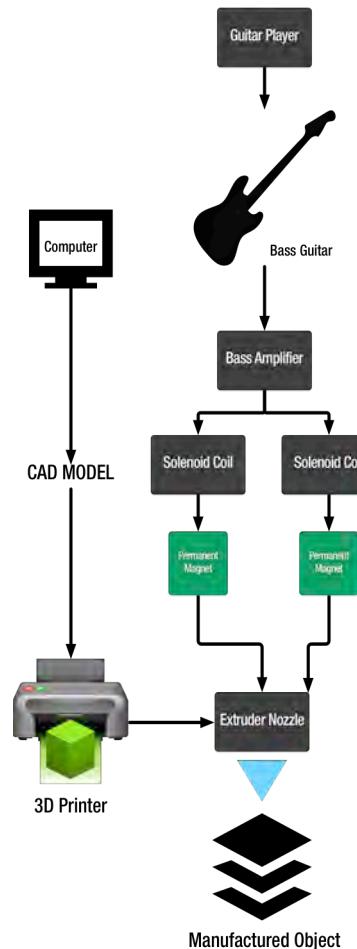


Figure 1: Intervention Scheme.

Diagram mapping the actors in the intervention process.

controlling this process. At the moment that material is extruded through the nozzle of the machine, this digital process turns into a part of a physical object that is frozen in time and space.

Designers are empowered with the usage of such tools in the object creation process. However, these software and processes require specialized knowledge in the field of CAD modeling tools not even mentioning the advanced software knowledge and process know-how to pursue this manufacturing process. In real life however, our relationship with matter is still more physical than digital.

Thus, this study aims to explore what happens if we have the power to manipulate the object manufacturing process with tools that we have more physical connection with such as playing guitar, singing, or talking. The aim of this initial experimentation has been the exploration of the ways of meaningful intervention to a completely autonomous manufacturing process in an analogous way. A combination of two practice-based research models (devising improvements in design methods; and making improvements to designed artifacts), as defined in Pedgley and Wormald (2007), was employed.

The initial research questions for the experiments were as follows:

1. What happens if we have the appropriate physical tools or interfaces to intervene into this quasi-digital process?
2. How such an intervention affects the form and meaning of the object
3. What are the possible potentials of such an intervention for the design process?

This study is an attempt on the exploration of the applicability of using a musical instrument, a bass guitar, as a physical interface for intervening the process of 3D printing. The main aim however, is to modify this completely autonomous process with manual intervention by connecting physical interfaces like a bass guitar to

the extruding nozzle of the machine to make deviations and distortions from the original model that is sent to the machine.

## Research Process

The initial research on finding a decent way of intervention into the 3D printing process resulted in the usage of sound as an intervening input to the process. However sound with lower frequencies were needed since high frequencies could be harder to observe as textures on the surface of the object. Thus, a bass guitar was selected as the tool of intervention.

In order to transmit the vibrations caused by the guitar strings to the artifact's surface, and apparatus consisting of solenoid coils and magnets were built and attached to the extruding head of the 3D printer. The vibrations of the strings also had to be amplified enough so that the extruding head of the printer could make visible deformations on the surface of the object. For this, the guitar was plugged into a 450 W bass amplifier and the output of the amplifier was plugged in series to two solenoid coils (Figure 1). These solenoid coils had permanent magnets inserted into their cores and the tips of the permanent magnets were attached to the extruder's nozzle. In this way, the system acted like a loudspeaker that converts electric signals to oscillating motion and distorting the extruder head's motion.



Figure 2: Test object.

A CAD model of a tube with the height and diameter of 50 mm was used as a test model to see the extent of deviations caused by the guitar. The reason for choosing a cylindrical shape rather than another object or shape was to be able to manufacture a surface that lets easy observation of the deviations caused by the guitar and prevent the initial form to surpass the modified form. Also the cylindrical shape provided a smooth and continuous surface to illustrate the deviations caused by the rhythm of sound. Before manufacturing the objects with intervention, test models were built (Figure 2) in order to determine the build parameters such as filament thickness, air pressure, and layer thickness.



*Figure 3: Resulting Objects - The comparison of initial test tube model, modified with audio loops and live guitar session.*

After determining the parameters, same model was repeatedly manufactured by the printer while intervening by playing bass guitar and audio loops (Figures 3,4 and 5). A brief video documentation of



*Figure 4: Resulting Object: Detail.*

the process can be found at: <http://youtu.be/A1MYopELyyU>. Figure 5 below shows the results of various intervention sessions.

## Research Outcomes

The manual intervention during the process of objectification introduces new identities to a mechanically, and autonomously manufactured object. The strokes and punches on the guitar strings transform to physical representations incarnated as blobs on the surface of the object itself solidifying the moment of the guitar session. In a way, this direct intervention on the object making process transforms the object into a photographic film, which in the moment of exposure to light transforms into a frozen moment in time. Then the object becomes a unique representation of time and space, in a way gaining an artistic value. Of course, the authenticity and aura of such an object can easily be detached from the object and destroyed by means of the mechanical reproduction discussed by Benjamin (2008) yet it is not in the scope of this paper.

The most important implication of this intervention process lies in the fact that the designer is empowered to modify and customize the object during its moment of manufacturing. This intervention during the manufacture gains importance because of its previous impossibility due to the absence of a decent and meaningful way. Of course the process used here (the bass guitar as the interface) has a very limited control over the object. But the main argument here lies in the fact that being able to control the form and manufacturing of an object with a direct physical interface closes the increasing gap between the designer and material as put forward by Walker (2006). Another outcome of the experiments is the broad reachability of the form modification process. Since no special CAD software (that are mainly for designers or engineers) knowledge is required, a non-specialist person can interact with the form of the object, thus intervening to the form of the object.

Although conscious manual intervention to this process is an unexplored field, there has been an exploration attempt on the



Figure 5: Resulting object scale and surface textures.

relation between sound and form by an artist and potter Jonathan Keep who has generated digital vase designs that are modified by an audio track. The results, which are digital CAD files, are then 3D printed from clay as unique vases. Yet, in his work the modification of the form again happens in the digital domain which is still isolated from the user and completely digital. Also the resulting objects and forms are completely duplicable since the deviations on the surface are included in the digital file.

On the contrary to Keep's work, the experimental work conducted in this project involves the manipulation of the digital file in the physical world, thus causing some unrepeatable deviations. When physical factors are also considered (such as changing temperature, humidity, and density of material) the interventions become even more unique. Therefore this factor of unrepeatability increases the uniqueness value of the manufactured object fusing its value with time and space.

## Conclusions

This initial experiment realized with a bass guitar as an intervention interface had a limited control over the object being manufactured. Despite this limitation, however, some meaningful transformations from the player's hand and fingers to the surface of the object are:

- Every stroke on strings by the fingers can be seen on the surface of the object as wavy patterns. This effect is increased in low frequency notes and decreased in notes with higher frequency.
- The deviations realized in the lower layers of the object effects the upper layers, thus can cause collapses of the object.
- Since the object is built in a certain direction, the surface becomes a representation of the playing session from beginning to end.

As cited in Dogan and Walker (2008), current manufacturing technologies bring predictability and consistency at the price of uniformity, which at some point make the aesthetic so predictable that it becomes boring. Thus, unpredictability of the presented experiment as a direct physical interface between the quasi-digital

object and the guitar player in a way combines the mechanical manufacturing technologies and injecting a craft essence to it. The results of the process, although being at the initial stages for now, promise a great potential for the exploration of new conceptions of beauty and value of artifacts.

In a world in which we are getting more and more used to "saving" things as digital entities, this combination of digital and analog brings new horizons to be explored.

## Acknowledgments

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## Design Development: A Veterinary Operating Table

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Figure 1. Example of first batch production. Table shown at mid height.

### Abstract

Veterinary surgery products tend to be similarly based and manufactured on hospital medical surgery units and are primarily focused around static installations in larger veterinary practices. In reality a small veterinary practice is limited in staffing by just one or two individuals. Transporting an incapacitated heavy animal from a vehicle to the operating room, presents a manual handling problem. An opportunity existed to develop a veterinary operating table that was batch-produced to order, priced at the upper end of the market, and possessed market-leading performance on adjustability and stability. The proposed design was able to negotiate door thresholds and include the ability to set the bed of the unit to the boot height of most domestic vehicles.

As an integral piece of equipment in a veterinary practice the functionality of the table is two fold: a prosaic trolley for transporting animals around the practice but also posses the ability to position an animal appropriately to suit the stature and preference of a range of veterinary surgeons. The operating table must fit the 'day to day' use and become an integral, robust and reliable tool used over many years of operating on domestic animals.

The client over many years of feedback from customers had identified a market opportunity at the premium end of surgery tables whilst satisfying the requirements of a small practice. The table was intended to be a departure from existing products in look, feel and manufacture and offer consistent and reliable functional qualities demanded by vets whilst imbuing a confidence and trust from animal owners (Fig.1).

The design responds to a genuine need, this paper explores the design process including iterative design developments.

## Author Keywords

Veterinary: Surgery: Design

## Research Imperatives

Collaboration between client and designer was facilitated and funded by Design Network North. Established in 2008, Design Network North has actively encouraged relationships and collaborations between business and designers in the North East region, responding in part to the Cox Review of 2005 (1) Vet Direct, Client, is an established distribution company with a reputation for serving veterinary practices internationally and equipped an understanding of the needs and demands of the beneficiary and stakeholders. WPS, designer, is a multidisciplinary consultancy specializing in electronic, engineering solutions in a range of fields including productionisation and procurement strategy. The author worked with WPS on all aspects of industrial design, including CAD development and iterative design development. The initial design process was conducted over four weeks with secondary design development, component sourcing and prototyping lasting six months. A fixed ideal was maintained throughout. The device was never intended to be mass manufactured, yet a fixed competitive cost point was necessary to make the project viable. Market advantage could be gained by challenging the prosaic and average and offering perceived value, reliability and longevity expected of a key piece of equipment.

## 'Good restrictions, make for good design'

The design process focused around two fundamental aspects of considerations: firstly that all structural and bracketry components were to be laser cut from 5mm steel with welded assembly. Secondly that stress and dynamic testing would be the catalyst to the look and feel of the unit. Features such as wheels to lock centrally and the bed to incrementally adjust maximum tilt of 45 degrees were key to market research. (Fig.3)



Figure 2. Final CAD Assembly, view from underside in lowest position



Figure 3. Table shown at full height and bed at 45 degree angle.

Development time was limited to two weeks. Functionality was proven and established using a CAD (Fig.2) model generated to test against ergonomic statures and dynamic testing of maximum and minimum heights of bed movement. Finite Element Analysis (FEA) dictated the armature gauge and pivot point positioning and establishing chassis structure with mounted hydraulic ram. Upper and lower height requirement were restricted to a maximum working loading of 250 lbs.

Once the basic principles of the unit had been established a 5<sup>th</sup> scale model took preference to that of further CAD development in a bid to offer clarity of look and appeal. Steel structures and components undertook a number of variations in reducing visual

weight, slimming down and adding subtle curves on more superfluous structures yet keeping to a purposeful and compact quality to the how the armatures connect to the rectangular base structure. The compact and efficient nesting of the structures particularly in the lowest position was best described to the client using a physical model.

Treatment of structures and sensitising of engineering were clarified through a number of iterative models. A physical model the preferred medium to grasp the essence of the design and facilitate group discussion. Final iterative model dimensions and detailing was subsequently transferred back to CAD for further FEA testing (Fig 4.) and dynamic testing of the full range of movement and adjustability. The client throughout a number of iterations was able to fully understand how each aspect of the table was achieved and how in some circumstances one feature might impede on another. Client expectation were managed during a number of staged reviews and the overall output very much the product of good iterative development exceeding original expectations.

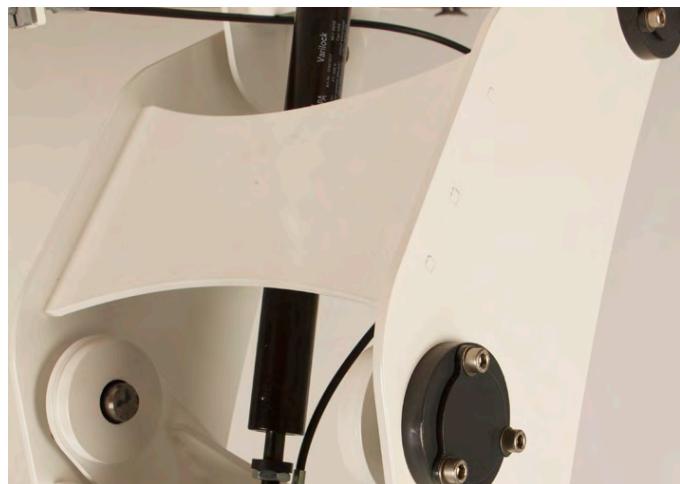


Figure 5. Tab and slot weld detail.

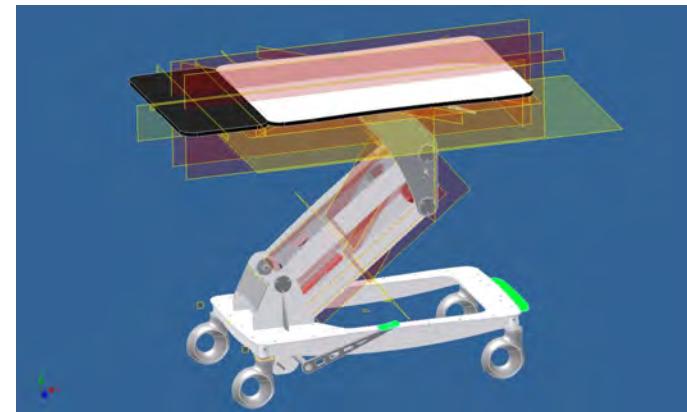


Figure 4. Typical FEA image showing bed structure.

Component selection as with any cost focused solution had an added imperative to help contribute a solidity and robustness gaining confidence with the user. On some competitive rivals all articulating structures are hidden from view, which makes for a less stimulating and less understood height adjustment. Although not essential seeing and understanding how the table acts whilst depressing or releasing the ram adds a certain intrigue and appreciation of leavers and engineering principles. 'Oversized' pivot covers hide nylon sleeved bushes that take up any tolerance in the assembled structure and makes the table quiet and smooth in operation. Green coloured accented handles and foot controls signify all user interaction parts. Steel brackets and structural components are cut with tabs and slots enabling limited clamping and reducing unnecessary welding and finishing (Fig.5). All steel components are powder coated white before finishing assembly (Fig. 6).

## Research outcomes

The success of the project has come about primarily through a robust and communicative collaboration between client designer and manufacturer with a clear and unambiguous shared objective. The idea born out of a market opportunity identified by Vet Direct (2) responding to the needs of its customers, yet keen to develop a unique and interesting departure from the prosaic and mediocre (3) product currently available to the market. The design is a function led piece of equipment that has a bold and characterful appearance. The solution possesses a positive intuitive user input to adjust and manipulate an animal with confidence and assuredness. In this case the designers role can be subdivided into a multitude of awareness. From an appropriateness of detail to low cost production methods, structurally sound yet with market leading adjustability and user centered appeal.

The outcome is less purposefully researched but rather a representation of measured appropriateness and expertise focused on a realistic ideal. As with many flawed products, despite starting with a genuine market proposition the translation between departments and input from individuals provide a gradual journey of missed opportunities and a lack of overall ownership of an ideal. The role of the designer as with many successful products is more than making an object look pretty.

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Figure 6. Prototype showing finished assembly in mid height elevation.

# Recognising the Skill of the Silk Jacquard Designer

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*"Like all bespoke, handcrafted products, few people outside the industry have a thorough understanding of the complexities, limitations and depths of knowledge required"*

*Silk jacquard designer, Stephen Walters & Sons Ltd*

*"Silk thrills us by stimulating all our senses. It delights our sight with its shimmering colours; it caresses the skin with ineffable softness"*

*Andrea Gori, Rubelli  
A Story of Silk In Venice, 2011*

## Abstract

A garment on the catwalk will catch the eye of the onlooker through the combination of cut, style, colour and fabric. To reach this stage, a silk garment will have travelled a long journey from silk worm, to the spun yarn, dyed yarn, to fabric design, colouring and weaving, garment design, cut & construction to its debut on the catwalk. Silk jacquard weaving is still a key part of the British textile industry. There are now only three companies left in Suffolk, who produce luxury silk fabrics for leading fashion houses and the interior design industry. It takes on average, 5 years for a jacquard designer to master the art of creating these complex 3-Dimensional fabrics, which are constructed like a compressed spiders web. Hours are spent linking the 1152 x 5000 individual ends and picks, allocating weaves, using a bespoke CAD system. This research will inform the wider design community of the expertise required to produce an intricate piece of silk jacquard for contemporary design. The process will record the design journey of the fabric from initial sketch, through to 3-dimensional construction through to finished fabric.

Traditionally this industry works behind closed doors. The output from this research will reveal the complexity and value of this multifaceted product and inform the design community of its presence. It is important to recognise this process and its importance to the future of silk jacquard weaving in the UK.

## Author Keywords

Silk jacquard; design skill; luxury British fabrics; jacquard designer, design process and design training.

## Research Imperatives

This research was inspired by 17 years of working within the silk jacquard industry. Research has shown that the skills developed by the silk jacquard designers in the UK industry are rarely acknowledged outside the individual companies. Much of this industry works behind closed doors, partly due to the exclusivity of its high end client base. The aim of this research is to raise awareness of the extensive skills required in designing silk jacquard fabrics.

With the downturn in the British textile industry over the last thirty years, it is important to maintain the skills that do remain, so they can be sustained for the future. In November 2012, in response to a report by Lord Alliance and Professor Chris Carr of Manchester University, Vince Cable (Secretary of State for Business, Innovation and Skills) reinforced his support for UK textile manufacturing, saying the Government would help the industry by encouraging both advancements in innovation and training.

Secondary research has found much coverage of the historical facts around the silk industry in the UK, but very little has been published on its current position. (Scott,1993; Feltwell, 1990; Parry, 2010 and Clarke, 2011). By recognising the "closed" nature of how these companies operate, it is through personal involvement that I feel qualified to research and highlight the skills attained by the designers in developing these beautiful and complex fabrics. This research will focus on the three commercial silk jacquard mills within Suffolk, UK, each with their own heritage and extensive archives, who design and producing fabrics for leading international luxury brands, stately homes and bespoke collections.



**Figures 1** An experienced designer creates the initial design as a sketch for approval by the client. (Photograph courtesy of Stephen Walters & Sons Ltd)



**Figure 2.** The technical designer working on the design creation considering appropriate weaves. (Photograph courtesy of Stephen Walters & Sons Ltd).



**Figure 3.** A simplified illustration showing the basic structure of warp and weft. Each block represents a weft colour, sitting over the warp.

Mathur and Seyam (2011) explain the process of creating designs through CAD. The skill of the designer to select the appropriate weaves is not addressed. Like a painter or a sculptor it is the level of the skill that makes the difference between something considered ordinary and something extraordinary. The same can be said for the silk jacquard designer.

The research question centers around the length of time a silk jacquard designer needs to develop the skills for the design process. Is a degree in weaving enough? What additional training might be required? It is important to highlight why this is specific to silk jacquard rather than other fabric constructions.

### Research Process

The process for gathering primary research includes observations, interviews and questionnaires completed by the design teams. The type of questions asked include:

1. In your opinion how long would someone expect to train before they are fully qualified to be able to deal with the challenges of creating complicated double or triple cloth construction's?
2. What is the greatest challenge you have found in mastering the art of silk jacquard designing?

Unfortunately only one company engaged in this process and interestingly another was wary of "sharing any secrets" that are commercially sensitive. Photographs have been taken to record the journey of the design, which is only a small part that this piece will travel before being seen by the public in a garment on the catwalk. There are a number of stages, which will be highlighted. For the purposes of this paper, I will address two types of designers. The first creating the initial sketch with the second being the technical jacquard designer, who converts a drawing into 3 dimensional fabric using a jacquard CAD system. In some design studios the designers may be the same person. The timescale from beginning

to end can vary from a day to several weeks depending on the urgency, scale and number of people involved. I have witnessed a design created in the morning, woven on the loom in the afternoon and on the desk of the designer in New York the next day. This is the nature of this customer focused luxury market, for which these fabrics are destined.

### Research outcomes

A jacquard design begins as a flat drawing before the technical designer turns it into cloth. Figure 1

A large number of initial sketches may have been created before the final one is selected. The layout of the design will have been considered, in terms of scale, position and flow. Once the sketch has been approved the design moves to the technical designer. The technical designer will consider a number of different factors. How will the design be constructed?

What yarns will be used?

Are all the yarns of the same thickness?

Will "cramming" be required?

Cramming is a term used to describe the additional pressure applied at loom level to close up the weft. Gaps can appear across the cloth, when multiply weft colours are bound at any given point. The process of designing for silk jacquard is complicated due to the variety of variables.

Figure 3 illustrates a single weft over a single warp. This simplified diagram does not represent the fineness of the cloth. In the examples shown there are 76 individual ends of silk within 1 cm. The ends are crossed with 76 weft picks within 1 cm.

It is important to recognize the difference in jacquard weaving as compared to other forms of textile production.

*"The chief advantage of a jacquard is in its ability to govern individual warps threads in each repeat of pattern" (Encyclopedia of Textiles)*



Figure 4. Highlighting a triple cloth with the addition of tissue.



Figure 5. Specific weaves created around the shape.



Figure 6. The design becomes the shape as an integral part of the design.

A number of different construction options can be considered.

Following is a description of these.

A double cloth construction, gives you a choice of running a minimum of two weft colours across at any one time. The beauty of this is that the second colour can appear randomly and can also be "chinzed" ie if the ground colour A is the constant, the second colour could be a mixture of C then D then E, up to a maximum of 7 different colours.

A+B

A+C

A+D

A+E

The total picks =64px/cm, split A=32px/cm and B/C/D/E=32px/cm

In contrast a triple cloth could look like

A+B+C

A+B+D

A+B+E

A+B+F

The total picks =78px/cm, split A=26px/cm, B=26px/cm and C/D/E/F=26px/cm

Figure 4 is a triple cloth in all silk weft, across a "two thread" warp. A small amount of blue "tissue" is added which indicates that "cramming" might be needed here. The number of colours can vary with up to a maximum of 9 colours weaving consecutively within the same design.

Figure 5 is a small section of a design enlarged to indicate the weaves that are an intricate part of the design.

Another construction used, is a single cloth but where "tissue" is added to create the motif. "Tissue" is the term used to describe extra weft colours, which are "crammed" in at a given point. Here the ground picks could be 48px/cm with the motif added at the equivalent number of picks. This type of construction works well when large areas of a plain coloured ground are needed.

Depending on the amount of tissue/colours needed the designer must decide how to construct a design depending on the weight required, yarn and possibly price point (the more picks per cm, the more expensive the fabric).

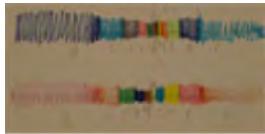
This research has considered the levels of training and experience required. Out of six designers, all have degrees in Textile Design and all emphasize the need for ongoing training. One of the jacquard designers said:

"My degree has been useful in terms of giving me training in the aesthetics of design as well as knowledge on colour, repeats and experience using CAD software to produce designs. University had given a basic introduction into jacquard design but the in house training has enabled me to use the software and have the technical knowledge on weaves, pick rates and fabric construction. Following university there is a lot of training required to get to the stage where you can produce jacquard designs".

Another designer states "The technical knowledge can at first seem overwhelming as there are so many variables on construction, customer and yarn. There is never a "one size fits all" approach to jacquard designing in my experience".

Steven Johnson a retired Jacquard Design Manager said:

"designers joining the company have got so much there for them to learn from. We pass on our knowledge by explaining what works and what doesn't."



Much of the knowledge is recorded through previous design's stored in the digital archive. Steven believes "that the learning process is less than it would be if you were starting from scratch". Unlike other industries many of the designers stay for years and don't leave. The archives and the experienced designers are key to the future.

creative industry of this hidden band of skilled artisans who create the fabric behind many of the show stopping pieces seen on the catwalk and to build a sustainable future for silk jacquard weaving within the UK.

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## We Shape Our Tools, Then They Shape Us

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### Abstract

The artifact is a set of ten cards entitled TED's TEN, developed by the research group Textiles Environment Design (Chelsea College of Art and Design, UAL), a group of education and practice based design academics investigating sustainability in the textile and fashion industries. When used together, the cards can serve as practical guidelines to examine, survey and highlight the problem of sustainability and the role of designers in change and innovation. They present visual evidence of strategic thinking.

Each card identifies a significant, critical area for attention in the lifecycle of the product and suggests a strategy for analysis and change; approach and resolution; consideration and action, acting as a tool to overcome the barriers to improvement. Developed with a focus on textiles and fashion, they have a potential role in generating strategic concepts for the design process generally. They offer a persuasive prototype from design research and are a research tool in themselves, whose relevance becomes clear when used to facilitate design workshops.

The cards promote group workshop discussions in game-play and role-play formats. They are offered as a range of entry points for positive research-led engagement from the practical to the idealistic.

### Author Keywords

Sustainability; textile design; prototype; toolbox; analysis; systemic change.

### Research Imperatives

The name of the research group TED – Textiles Environment Design bears witness to its founding themes. The original imperative motivating our group of practitioners was to understand the growing problems of pollution of the environment from the production of the textile industry. As designers and teachers we needed accurate and detailed knowledge and a general overview of the entire chain of production. It was essential to research and collate the existing body of knowledge, which subsequently turned out to be limited and unconnected.

The meaning and possibilities of sustainability in textiles became a key element in our research. We dedicated our practice to understanding and demonstrating how design could contribute to the future of textile products. Detailed analysis of every stage of the process of production including the ecological challenge to design out wastage of material, energy, water and landfill made it clear that designers must consider the entire lifecycle of textiles (Graedel et al., 1995:17).

Questions surrounding production and consumption in the consumer society, including the role of new technologies in accelerating consumption, became important. We realised the need for a transformation of design education in textiles to be effective for future designers. Awareness of sustainability had to be brought into the core curriculum.

The need for a map of the subject of sustainability, a complex and difficult terrain, became a clear imperative. We focused on the



# Praxis + Poetics

## Research Through Design 2013



Figure 1: The TED's TEN cards (2011)  
[www.tedresearch.net](http://www.tedresearch.net)



Figure 2: The TED's TEN cards used during TED's 24: MISTRA Summer workshop at Chelsea College of Art & Design (June 2012).  
<https://vimeo.com/52461083>

barriers to environmental improvement and devised a cluster of strategies to overcome them. The TEN cards (Fig. 1) are a tangible presentation of those strategies.

As the TED group research evolved, the importance of collaborative and predictive roles, also relevant to other disciplines, became clear. Our imperatives have changed likewise and design activity has shifted from creation to facilitation, to publication, towards the development of our 'toolbox' and outcomes that have resulted from it.

The imperative always remains to develop methods of communication and dissemination and foster relationships as a community across disciplines. Two major challenges of international importance exist concurrently – to achieve viable systemic change within existing profitable industries and to change the perception and behaviour of citizens towards sustainability.

### Research Process

TED research began formally in 1996 when research funding became available. The progress of research within the group was marked by a series of significant events / exhibitions and commissions over 10 years before the introduction of the TED's TEN cards.

At an early stage, exploratory research was necessary to both map the field of sustainable textile design and help identify a structure for a methodology of investigation. Qualitative research methods were used in combinations to develop theory and practice in an iterative sequence.

Through a process of 'constructive research', we identified the need to produce prototypes by 'imagining new things and building them' (Koskinen, 2011), defining our models through practice. This was made visible in our first collective staff exhibition in 2002. A

large installation provided a case study for communication of our hypotheses to the public - a key event in the experience of collaboration.

In 2005-9 an AHRC funded project included a research exhibition on the theme of recycling. We exhibited 'narrative prototypes', explored through making. A significant element was the provision of workshops to encourage the interconnection between the strategies that have since been developed for professional design audiences.

The importance of communication through group workshops was focused on Swedish fashion businesses in workshops with particular reference to the life cycle of textile products. The use of cards (six at first and, subsequently, ten) as tools for analysis, role-playing and prompts for developing strategies began at this stage, with a phenomenological approach to designing for sustainability (Moustakas, 1994). Phenomenology provided a ready-formed methodological basis for our investigation, with our subjective, embodied design experience and our empathy for consumer appreciation of the material qualities of clothing, as knowledge.

As a tool for action and reflection, the TEN cards provide a checklist for designers - a lens with which to view issues of concern, cut through the rhetoric and solve apparently intractable problems. In using this as a tool for analysis of conditions, prompts and enablers, the designer contributes to networks of innovation (Bussramcumpakorn and Wood, 2010). The cards as tools are now used in workshops following an initial lecture and visual presentations, forming part of the delivery system (Fig. 2). As practitioners with tacit knowledge, we can group strategic combinations of the TEN cards to take risks and apply unexpected, sometimes playful solutions via experimentation and improvisation. This process was exemplified in a curated exhibition of artifacts, 2012. Using the cards as a brief to select and commission designers, we created imaginative, stimulating examples for large volume clothing producers, towards a different life view.



*Figure 3: Once T-Shirt (Politowicz & MacLennan, 2012) created using the TED's TEN cards for US apparel company VF Corporation to probe the potential for short life, disposable/recyclable clothing.*



*Figure 4: Fractal Shirt (Earley, 2013), Top 100 project ([upcyclingtextiles.net](http://upcyclingtextiles.net)). Created using TED's TEN cards to extend the idea of material reuse – in this case overprinting a polyester shirt with paper stencils – by engaging directly with the consumer*

<http://vimeo.com/64294297>

In the development of immersive workshops (Cassim, 2010), employing an empirical approach, we have demonstrated the relevance of the TEN cards to product development in industry, replicating and accelerating a proposed product supply chain with a design focus. An evaluative framework of the innovation that the workshops encourage is developed using qualitative research methods in a 'self-report instrument', to map the effects of the cards on the design process. In retrospective assessment of workshop participation, observation and description are used to examine the experience, to generate theories during the action research process for evolution of workshop practice.

This has been a key part of our participation in an international consortium as one of eight research projects, funded by the Swedish government. The multi disciplinary MISTRA consortium includes social scientists, political scientists, material scientists and designers in a 'Meta-design Framework' (Wood, 2013).

By proposing and promoting compelling alternatives to existing industrial structures through cross-discipline collaborations, we encourage social change while challenging assumptions and beliefs about how we live, work and consume. Bourdieu refers to such active researchers as 'cultural intermediaries'. The cards (now TED's TEN) are currently being reformulated for other design disciplines, which is a particularly significant development and testimony to interest shown in the research group.

## Research Outcomes

The TEN cards are a tangible product of our research in the sustainability of textiles. They were created, over a long time period from our research into the body of knowledge, from extensive practice-based research and workshops for industrial companies. The cards are: templates for the development of individual strategies; flexible theoretical tools to help in the investigation of particular problems; and maps for surveying the whole territory.

The body of knowledge gathered from literature, conferences, exhibitions, practice-based research and teaching experience is a key outcome of our research. It informs our studies and has grown by addition from our original activities to the networks, which have developed in recent years. We adapt and update our resource materials for each intervention or engagement – tailoring to suit a broad and diverse industry – from bags to shoes, menswear to womenswear.

As practitioners we make prototypes as examples of innovation used in conjunction with the TEN strategy cards - as exhibited in: 'Artists at Work: New Technology in Textile and Fiber Art', Prato Textile Museum (inaugural exhibition), Prato, Italy (2003); Exhibits in 'Rethink! Eco-Textiles', Audax Textile Museum, Tilburg, Netherlands (2010); 'Trash Fashion: Designing Out Waste', Science Museum, London (2010-2012). They were used to curate 'Well Fashioned': Eco style in the UK', Crafts Council Gallery, London (2006) and to curate and commission work for the 'Responsible Living' section of the VF Corporation 'FutureWear' Exhibition, USA (2012) (Fig. 3). The Top 100 project (1999-ongoing) continually tests the combination of cards, specifically probing the potential for fashion: as a service, connecting the consumer to products for added value and additional lifecycles; and cyclability as a driver for systemic change (Fig. 4).

The outcomes in education have been important and have helped in the modification of the cards. Students researched the usual environmental problems and created a rich variety of visual examples to use on the cards. Some students looked beyond to life-cycle issues, consumer awareness, service and retail delivery and wider social concerns. Workshops in education were held in London, Hamburg, Berlin, Dublin, Eindhoven, Tel Aviv and Stockholm. Sustainability workshops can now be offered as part of the basic curriculum in Textile Design.

Dissemination and education workshops are important outcomes in influencing future professional developments.



*Figure 5: TED's TEN cards in use with Danish fashion companies, at the Sustainable Fashion Academy / NICE workshop, (September 2011). SFA workshops in 2013 now use the Higg Index to measure this improvement by design, giving a pre- and post- TED workshop score.*

*"When educating the Scandinavian fashion industry in sustainability as part of the NICE project, it is crucial for us to include cutting edge tools and resources. TED's TEN provides designers with hands on examples and relevant dilemmas and have been highly valued in the NICE educational programme.*

*Furthermore, we have been much inspired to include TED's TEN in the 'NICE Code of Conduct and Manual for the Fashion and Textile Industry' as a concrete and recommended tool for designers to work with under the UN Global Compact umbrella."*

*Jonas Eder-Hansen, Development Director Danish Fashion Institute*

The development of the workshops in industry is closely allied to the use of the TEN cards and to their current format. After launching the cards via the TED website, we were approached by large and small companies to introduce sustainability to their design teams. Companies recognise the need for general awareness and education concerning sustainability. Some wanted help in direct problem solving; others were concerned with product narrative for brand image and marketing. The experience of running workshops using the cards as strategies, accompanied always with visual examples and diagrams, helped us develop our communication techniques and tailor our efforts to make the workshops of direct relevance.

Our work in TED for MISTRA is particularly demanding and large scale – to look at the future development of the Swedish fashion industry. We collaborate with multi-disciplinary teams of scientists and engineers developing new materials and processes and with social and political scientists who are researching value systems. The work of lifecycle analysts on the connection between systems and speed are of particular interest to our study of the relative speeds within the lifecycle loops of products. This is of direct relevance to our proposals for changing manufacturing processes in order to embed cyclability without compromising aesthetic value or the functional sophistication of textile structures. Apart from collaboration, all TED practitioners have common ground in the sustainability of the lifecycle and the importance of consumer engagement.

Our individual studies include: open-source involvement in DIY and designer-led hacks to slow down the lifecycle of existing garments by refashioning and extending the life of clothes; the use of innovative paper-based fabrics developed from Swedish wood pulp in a radical new fast fashion cycle; a new generation of polyester treatments for closed loop cycles; the life-span of materials in relation to products and identifying the pressure points for environmental damage.

The cards are being used and developed in this exciting context and in the requirements to work with Swedish fashion companies such as H&M and in textile design education in Stockholm. The SMEs in the Swedish Fashion Academy (SFA) (fig. 5) are already using the TEN sustainable strategies in conjunction with the Higg interactive measurement tool (The Higg Index 1.0) to evaluate their TED redesigned garments. TED will present an online exhibition of the findings of our research team.

The development of communication skills is an important outcome in itself. The MISTRA Consortium has attracted an extensive group of like-minded designers and commentator bloggers who contribute to the project. A group of PhD students formally associated with each project in MISTRA have become an international network, bringing a new generation of critical involvement. Textile and fashion graduates, connected to TED through websites, blogs and annual events, are another part of our extensive, critical community. Our networks of communication are agents of change, shaping us and our work as much as the cards and workshops continue to do.

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## Corporeality, creative process and dissemination

### Abstract

As part of my PhD project I am investigating how researchers may be invited to reflect on their written work, through thinking and creating new formats for research dissemination. Two pilot workshops were carried out recently which aimed at creating a space for my colleagues working in the Digital Interaction Group (School of Computing Science, Culture Lab, Newcastle University) to unpick their writing processes. A third session with a theatre practitioner was also conducted as an opportunity to understand how the workshop framework may be applicable in the future for researchers working in disciplines of the Humanities. This paper presents a tool that was devised to facilitate group discussion and individual exploration of future formats for documenting research process.

### Author Keywords

Dissemination; hypermedia; publication; video; visual prompts.

### Research Imperatives

Academic researchers are motivated to publish and disseminate their work by their desires to enrich a collective understandings on particular subjects. A report compiled by the Research Information Network and JISC detailed why and how academics working in the UK are sharing their knowledge. The report explained that UK researchers face difficulties in choosing different channels to communicate their work '...but the perception that their work is being monitored and assessed in particular ways, notably by the Research Assessment Exercise (RAE), has a major influence on how they communicate' (RIN report, 2009, p.4). Although the RAE

will be replaced by the Research Excellence Framework (REF) in 2014, we may still anticipate to find researchers working under similar pressure presented by the new framework.

In short, the changing environment in academia indicates that the notion of publication and dissemination are potentially conflating. On one hand, academic researchers seeks to have their work acknowledged by high status journals, on the other they are also encouraged, or sometimes pressured into making impact on a wider audience through various venues such as conferences, press release and social media (Vines, 2013).

There are various definitions on the term publication and dissemination. The level of ambiguity those two terms carry is somewhat analogous to the level of complexity in the ways we communicate research. When referring to publications, Pike and Gahegan claims that 'Publications are a high-level mechanism for knowledge transfer within a large community, but much of the discourse relevant to science is inaccessible outside of the small groups in which it occurs. Practitioners in other places or times can have difficulty in reconstructing the discursive process that lead to a particular finding' (Pike and Gahegan, 2007, p.661).

Compared to publication, dissemination indicates that the information will reach a public audience. Thorin explained that our use of the term scholarly communication these days illustrates the fact that we are no longer communicating in the traditional model when publication was clearly defined (Thorin, 2006). While most academics adhere to the idea that we tend to disseminate completed results to a public, and scholarly communication mainly includes aspects of academic practice that occurs within a research community, this paper would like to suggest a way to consider disseminating information that is generated during the periods of trial and errors, not only to our peers but to a public of practitioners.

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**Figure 4 & 5.** Details of Bitmap transferred onto acetate, Gelflex and acrylic.

Thus the proposed framework for a workshop in which we may allow ourselves to consider alternative ways of recording our research process and create hypermedia documents as new vehicles for dissemination.

## Research Process

Video-making has become a fundamental part of the dissemination process for many research communities, including Design and Human-Computer Interaction (HCI) field, over the past two decades (Cater; Chow, 1989). Some observations that sparked my PhD interest took place while I was working as a freelance video maker. Therefore the initial phase of my first year study comprised attempts to reconcile my previous professional stance and the new analytical distance I wish to adopt.

### A sketch video – the academic paper as visual object

Producing research videos for academic researchers in Culture Lab not only allowed me to gain insight to certain technological development, it also revealed different ways of seeing images (Berger, 2008). To better understand the difference between the standpoint of a video-maker and that of the researcher, I started exploring ways to first treat the conventional academic publication, printed on acetate, as a *poor image* (Steryl, 2009). This process was documented by creating a sketch video (the full video can be seen on Youtube - <http://youtu.be/A8VOT6plp0U>) with my colleagues working in the Digital Interaction group. In summary, a front page of an academic paper published in the Designing Interactive Systems conference (DIS) was printed on acetate. I then asked ten colleagues to each pick a background for this acetate in order for me to film the object with their hands holding it against their chosen backgrounds. The video was shown as a provocation to my colleagues during a semi-public event in December 2012. The event allowed me to gather ideas and confusions about the project from my colleagues. Some of the

feedback has directly informed the way I prepared a pilot workshop two months later.

The proposed pilot workshops were designed for but not limited to HCI researchers. For the academic group (2 PhD students and 4 research associates), the use of 'video figure' was one of the main topics of discussion. Each participant were invited to share their experience in using videos for conference submissions. Incidentally most participants had recently encounter a new challenge to create a short video clip as part of their submission to the ACMCHI conference – an annual HCI event that hosted over 3000 delegates in 2013. Whereas discussion with a theatre director (Tess Denman-Cleaver) focused on her approach in recording and sharing the creative process one engages in when developing a play. The main motivation to involve the director in the third workshop was that she had just produced a play called *Alice in Bed* (Sontag, 1993) which is a story that explicitly resisted linear reading and demanded an unconventional staging to highlight the bodily experience the central character (*Alice*) suffers from as part of her mental illness. Thus one anticipated that the focus on corporeality in theatre could also bring a radically different dimension when considering alternative formats for publishing.

## Visual Prompts





Figure 6 and 7. Tess holding an artefact created after our interview. An image was laser-etched onto a single-sided acrylic mirror as her choice of medium for dissemination.

*“...I think it’s a really simple thing to do [...] this idea that you’re gonna collage some images, or some text, or some shapes from your research process which are your images. And now we can talk about the decisions you make about how you overlay them or cut them”* [Quotes recorded on 21/03/13].

*Figure 3. Multiple “copies” of the “original” lenticular image of the left. The lenticular was first digitized through scanning and converted into Bitmap. The Bitmap file was then printed on an acetate, laser-etched on a 8mm acrylic, and lastly a form work was created by pouring yellow Gelflex onto the acrylic surface.*

A lenticular image, or more commonly referred as 3D picture was adopted as a device to illustrate multiple perspectives. During the workshop I introduced an analogy between the inherent complexity of research projects and the multiple views on the lenticular image. Depending on how one is situated, we see different things. The visual prompts were brought to participants’ attention in the second half of the workshop when the group discussion began to focus on aspects related to everyone’s own experience in documenting a research projects on video.

## Research Outcomes

The visual prompts caused many initial confusions in terms of its role in the workshop. However, key terms like “translation”, “modality”, or “mental filter” appeared several times during discussions prior to and after the use of visual prompts. When looking at the prompts, some participants were able to associate the visual differences amongst the set of images to the lifecycle of an academic paper. For instance, whilst looking at the image registered on the yellow Gelflex (Fig. 3), a participant questioned the difference between the integrity of a film director’s message embedded in a Hollywood film and a researcher’s main argument presented in a paper. In other words, the array of visual prompts seems to have led some participants to engage in an exercise where they searched for their personal experience that embodies the challenge of meaning making and its transfer onto a physical medium.

As well as using the prompts as a source of analogy, some also commented on its physical appearance. The physical textures of the prompts were aimed to be significantly different from printer

papers - in order to make the images on its surface somewhat ambiguous. However, the range of textures seemed to have encouraged the workshop participants to propose future design. For example, a participant suggested using the location of his field study as the source of materials that could become a new printing surface for the paper that he had written about the project. In other words, the participant attempted to find a physical link between the medium for dissemination and the social context of his original study, thus inspiring a new dissemination format. Whereas another participant considered the challenge of creating radically new dissemination formats as a way of reaching a wider audience. Overall, participants explored the possibilities of new formats, both in terms of its social functions or its aesthetics. The pilot studies offered an opportunity to situate the current debate on publication vs. dissemination within a specific research group. The approach to treat academic paper as visual object has helped create a space for colleagues to reflect on the ways and techniques they have adopted in order to produce academic knowledge. The current workshop framework deserves more explorations in the future. And further in-depth analysis will be conducted to clarify the role and functions of visual prompts in the workshop. The project anticipates to organize a series of formal workshops in September 2013 for researchers working in cross-disciplinary teams.

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# Additive Manufacturing with Precious Metal Clay (PMC); Aesthetic Opportunities that Bridge Digital and Traditional Craft

## Abstract

Paste Deposition Modelling (PDM) is an Additive Layer Manufacturing (ALM) method which presents design opportunities. PDM is explored here, focussing on depositing *precious metal clays* for jewellery. The research draws upon open systems; it uses hacked together hardware and subverts software to explore syringe based 3D printing of metals without a step-change process using a low cost system.

Metal clays (silver and bronze) can be adapted for PDM. This involves diluting them so as to pass through a tapered syringe nozzle. Material reformulations and deposition parameters have been determined that lead to fully sintered parts.

A range of 3D geometries showing the limits of deposition have been developed. PDM has a filament nature which can be exploited as wire-like structures or surface texture. This can be exaggerated by changing the thickness of the filaments. Using printing parameters outside the tolerances of the process can introduce a stochastic element, giving randomness to an otherwise regular form.

It is possible to use self-originated infill structures. This is subsumed within a range of rings that demonstrate the ability to create a product to a target size taking into account shrinkage during firing. The rings were then subjectively treated in view of the conventional methods of working with metal clays. Whilst the filament texture is evident it can be blended and made smooth, according to the designer's intention.

PDM exists in three domains; digital, code craft, and traditional practice. This brings about a process that can be a hybrid in that it is ALM yet regains the nature of being 'touched by hand'. The combination of domains allows design freedoms that go beyond the limitations of the equipment; this brings a change in the nature of practice and one in which coding skill (further to CAD) may become part of the designer-maker's tool kit.

## Keywords

Precious Metal Clay; ALM; Rapid-Prototyping; Paste Deposition Modelling; 3D Printing

## Research Imperatives

3D printing, Rapid Prototyping (RP) or Additive Layer Manufacturing (ALM) are synonymous terms for what has become a mainstream method for producing models, or parts, from a 3D CAD file (\*.stl). There are many systems on the market and a limited spectrum of materials, most of which are suitable for prototyping but often require a step-change with other processes to translate them into the correct material for purpose. In the jewellery sector an example would be the printing of wax masters for investment casting. Direct Metal Laser Sintering (DMLS) and other precursor metal ALM methods and systems have existed for many years but were still not developed for use in the field of jewellery by the time of this project.

In 2005, EOS demonstrated the possibility of sintering precious metals (Paynter, 2005). Since then, EOS have collaborated with Cookson Gold to produce an operational machine.

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Figure 1, Machine setup, depositing 'seashell' build in bronze

Comparatively, what is being developed here is a process by which metal clay can be 3D printed using a low-cost CNC system with reasonably low cost materials. It does this by using materials that are already mass manufactured either as powders or clay that can be reformulated. This makes the technology more accessible to the end user and therefore more open to user innovation. Most interestingly this research approach is 'hands on' and not outside the scope of designer-makers with an interest in experimental enquiry when processing materials; similar examples to this '*alchemical*' approach would be anodising, patination, enamelling or Mokume-Gane. Currently there isn't a low cost metal ALM system that targets this market.

With current ALM systems the goal is to achieve near finished products so as to require little finishing by hand. The trend in ALM system development is towards higher resolutions to eliminate evidence of the process by reducing the layer height (stepping). In doing so however, the opportunity to exploit the stepped quality of the process aesthetically; is lost, without intentional programming. PDM takes an almost retro perspective on this, and being a filament based process, exaggerates the layered visual identity, this allows for experimentation of repetitive textures and wire like geometries.

Commercial ALM systems rely on certainty to successfully reproduce virtual designs in the physical realm as true to the original as possible, this is brought by the iterative development of the machine, software and materials intended for the process. This reduces the palette of materials available and shifts the materiality of making to the virtual domain. In such a controlled environment the uncertainty traditionally seen in craft practices is lost, where reduced control over materials and processes brings about the unpredictability and uniqueness of hand crafted artefacts. In contrast PDM in metal clays brings an element of traditional making to the mix by cross-mapping the hand techniques of clay with ALM, it also opens the possibility of experimentation with materials that were not originally intended for ALM.

This makes a contribution to the digital versus hand debate by exploring artefacts made with the combination of virtual design, programming and traditional hand working techniques where the success of the outcome cannot be contributed to a single domain but to the combination of all of them.

Key research questions concern: 1) adapting metal clays for 3D deposition. In the first instance this means diluting them to a consistency that will pass through a tapered syringe nozzle, determining the deposition parameters, and finally seeing whether the reformulated material will sinter fully. 2) From initial results, to develop a range of 3D geometries that show the limits of deposition. 3) To show how such materials, within the constraints found may be used for jewellery, by creating a range that suitably aligns the aesthetics of PDM and the possibility of self-originated infill structures with the intentions of the designer. 4) To appraise volumetric shrinkage in relation to geometry 5) To evaluate the relationship of PDM in metal clays and conventional PMC working. Figure 2 shows a breakdown of the process.

## Research Process

Metal clays consist of metal particles suspended in an organic binder that burns away upon firing; the metal particles also sinter (like DMLS) and produce a near fully dense metal part. One of the fundamental issues of metal clays is that, despite manufacturer's guidelines, it is difficult to predict the shrinkage. Some characterisation of the sintering process, relative shrinkage and the material properties of the various formulations of PMC has been undertaken by McCreight (2010).

Metal clays are too viscous to pass though a syringe nozzle, so, they are reformulated to a viscosity suitable for PDM by adding water and small quantities of olive oil to the clay. Mixing is by hand on a flat surface using spatulas.



Figure 2, Process film strip,  
from design to product, in BronzClay

File preparation for RP generally makes use of slicing software, this generates instructions for each layer of the object including infill patterns and surface perimeters.

This automated process however, does not allow the designer freedom to generate unique patterns pertaining to the designer's visual identity. To overcome this limitation, the layers of the object are designed individually in 2D within 'CorelDraw' and exported to G-code, where the sequence of layers can be repeated in code as required; this method is more suited for straight walled builds. Alternatively, the layers generated in 'CorelDraw' can be imported into '3D Studio Max' and edited there to create more complex surfaces such as twists and overhangs. This approach allows for greater control over the geometry and the resulting visual and tactile qualities of the artefact. This digital deconstruction method is similar to that used by Drummond Masterton (2007); where he interferes and manipulates the tool paths generated by CNC cutting software to create patterns and cutting marks that are distinctive to his visual vocabulary and not just the outcome of a means to an end. Taking the process output as desirable aesthetic features, instead of grinding and polishing away the evidence of the process.

To build the knowledge required for deposition, basic test geometries were deposited; these included simple log pile structures and cones featuring draft angles from 30° up to 45° at 5° increments, this informed both the deposition and firing schedule parameters. Building on this, more complex hollow geometries were deposited featuring curves and tapers (Figures 1, 4).

Following these tests a series of rings were deposited, rings were chosen so as to demonstrate control over the process by targeting a specific size. The rings were made in both silver (PMC Pro), and bronze (BronzClay). The firing schedules were based on work by Sanderson (2010), where she attempted to characterise the shrinking of PMC in the context of rings and how the firing stage influenced the final outcome. In the interest of validating the firing schedules she also wrought the rings on a mandrel post-firing to

ascertain and compare the strength of the sintered material across the different tests.

A selection of the rings after deposition were treated using traditional PMC working techniques, surfaces were made smooth by burnishing with water. Further to this, once fired, the rings were worked on a ring mandrel to take out the warp from firing. This also served to test the strength of the sintered metal. All silver pieces were patinated to accentuate the texture. Figure 5 shows the finished rings.

## Research outcomes

The creation of texture goes beyond the virtual domain, the material can be led to behave in a stochastic fashion; by depositing at less than optimal parameters filament placement can be unpredictable, breaking the symmetry of the layered texture and producing something unique, this was observed during the cone draft angle tests where the print failed at 45°(Figure 3). This shows the process is open to '*happy accidents*' where key aesthetic features are not reflected in the virtual design stages.

It has been shown that metal clays can be adapted for PDM. They can be prepared with large tolerances using simple tools and dispensed through a syringe nozzle. Firing schedules were determined and it was found that 'BronzClay' and 'PMC Pro' sintered fully and could withstand basic wroughting. Seashell geometries (Figs. 1 and 4) demonstrated that PDM can produce sophisticated, tapered and twisted parts without support material, which bodes well for creating 3D hollow parts. Benchmarking the dimensional stability of metal PDM by ring size shrinkage was attempted. This was combined with developing a body of work to demonstrate some anticipated benefits of coupling the PDM characteristics with self originated infill strategies. Where consistent batches were fired as built (i.e. not worked by hand), there was good consistency within the batch but not between different designs, this is likely to be dependent on the design features of:



Figure 3, 45° cone, 'failed' print.



Figure 4, Seashell in patinated silver.



Figure 5, Rings, in silver and bronze.

external and internal perimeter geometries, infill patterns, wall thicknesses and build height. PDM is in its infancy, for it to be dimensionally reliable a more formalised experimental approach would be required. This would encompass process development rather than a crafts research based context. An exploration of metal PDM for craft outcomes that are not dimensionally constrained would appear an appropriate way forward.

Further to the investigation with the rings, another piece was made, a pendant was developed as a visual expression of the tessellation patterns PDM is capable of when not dimensionally constrained as per previous tests (Fig. 6).

With PDM for metal clays there isn't a step-change and only the material required in the part is prepared, rather than a bed of powder. Together with the range of metals available in clay form, PDM is also a candidate for multi metal ALM, metal clay combinations have been found to be possible using hand methods (Jacobson, 2011).

Whilst a layered texture is evident it can also be selectively blended and made smooth, according to the designer's intention. This brings about a process that can be a hybrid in that it is ALM yet regains the nature of being 'touched by hand'. This approach presents a change in the nature of practice, one in which coding skill needs to become part of the designer-maker's toolkit to take full advantage of the freedoms offered by the process.

This combined with the desktop prototyping merits, could be an open-source, low-cost and versatile process for cold forming metals. Making it ideal for one-offs or small batch production requiring little setup cost, this presents a viable route for designer-makers wishing to work with ALM in precious metals.



Figure 6, Pendant, patinated silver.

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# Magic Interactions? Game design to Counterattack Gambling Irresistible Illusions

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## Abstract

Magic Interaction is an experimental design project aimed to provide a new user perspective on gambling, providing an interactive and emotional experience with a rhetoric value. The objective of the project is to increase awareness about the mechanisms that produce addicting play. The questions leading this experimental project were: how do gamblers perceive the play experience? What makes games of chance so appreciated and compelling? How can digital design cope with this irresistible interaction?

In gambling players are immerse in intense perceptive experiences that depend on game features and play contexts: rules and mechanics, graphic features, sounds and rhythms of actions contribute to cognitive errors and illusions that could end up in pathological behaviours (Parke and Griffiths, 2007). These perceptions and cognitive phenomena are explained in terms of play rhetoric (Frasca, 2007): games are designed to produce meaningful experiences affecting players' thoughts and emotions. Considering three of the main gamblers' cognitive errors - illusion of control (Langer, 1975), near miss (Reid, 1986) and suspension of judgment (Griffiths, 2007) – the project intends to offer an answer to the questions: is it possible to change gamblers experience of gambling? Is it possible, through game play, to improve users' awareness about their cognitive errors? Magic Interaction is a set of digital interactive artifacts (Fast Roulette, Invisible Roulette, Slot Machine What if?) providing micro gambling experiences; these meaningful games intend to lead gamblers toward a new consciousness about illusions of gambling.

Each game is an adaptation of an existing game of chance, suitably revisited to enlighten a specific cognitive error related to play, through meaningful play experiences.

## Author Keywords

Interaction design; Gambling; Perception; Game Design; Meaningful Play.

## Research Imperatives

### *Gambling and Cognitive Theories*

This research investigates gambling phenomena, through a design perspective, explaining how games of chance are structured and how they are related to cognitive errors that occur both in frequent or infrequent gamblers.

Gamblers usually believe it is possible to find strategies, rules and indicators to foresee the result of a draw: even if gambling relies on chance, gamblers play as they are playing a skill game (Croce, Zerbetto, 2001). This happens because games of chance are designed to hide chance and the independence of bets (Ladouceur, 2003). Players are immersed in intense perceptive experiences that depend on game features and play contexts: mechanics, graphic features, sounds and rhythms of actions contribute to cognitive errors and illusions that can end up in pathological behaviours. Those features were defined structural characteristics of gambling "that facilitate the acquisition, development, and/or maintenance of gambling behaviour irrespective of the individual's psychological, physiological, or socioeconomic status" (Parke and Griffiths, 2007, p.212).

From a design perspective, this means finding an answer to the following questions. How can digital design cope with this irresistible interaction? Is it possible to change gamblers' experience of gambling through game play, improving users' awareness about their cognitive errors?

## Research Process

### Step 1: From psychology to game design

Psychologists' approaches to gambling cognitive phenomena were transferred into design research through interpretation of playing game as interaction (Pichlmair, 2004) and play rhetoric (Frasca, 2007). Desired meaningful experiences are achievable designing interactions between games and players (settings, rules, players and game representations), affecting players' emotions, ideas, and behaviours. This perspective, applied to games of chance, proves the irresistible attraction of gambling experience, because it is voluntary based on illusory perception of game features.

### Step 2: Analysis of State of Art

The analysis of existent games of chance in play environments (such as slot machine, scratch card lottery, lottery, online gambling etc.) was useful for a deeper understanding of their structure and the rhetoric relationship between design features, interaction processes, players' interpretation of play experience, and cognitive errors.

### Step 3: Cognitive Errors and Design Answers

I made a classification of design and play characteristics affecting gamblers' cognitive errors, illusion of control (Langer, 1975), suspension of judgment (Griffiths, 2007), and near miss (Reid, 1986), concluding that it is impossible to think of gambling without its illusory playability. Asking if it is possible to change gamblers' experience of gambling, the research finds answer in the design of digital interactive prototypes.

## Research Outcomes

The research process ended up in the design of digital interactive prototypes (developed with Unity3D, [www.unity3d.com](http://www.unity3d.com)) providing meaningful gambling experience to fix players' approach to gambling, and to increase awareness about the perceptive and cognitive tricks connected to games of chance features. The project is supported by the fact that interaction and play are tools to convey meanings inducing behaviours: it is clearly demonstrated by the fact that features of games of chance are designed to induce cognitive errors and then, continuing gambling. Moreover, we can catch gamblers' attention by "speaking their language", but disclosing through interactive experiences the concealed truths of gambling. I proposed three interactive prototypes based on existing games of chance, suitably revisited in their interactive processes and design, to enlighten cognitive errors, through the appropriate meaningful play experiences.

### Prototype 1: Fast Roulette

Fast Roulette is a fast simulation of one thousand draws, showing aspects of roulette game that usually are not, averting the emotions that occur every time players are waiting for the result of a draw. Players are invited to place their bet (Fig.1), and then to see draw by draw what will happen to their money if they had the possibility to repeat the same bet strategy for one thousand times.

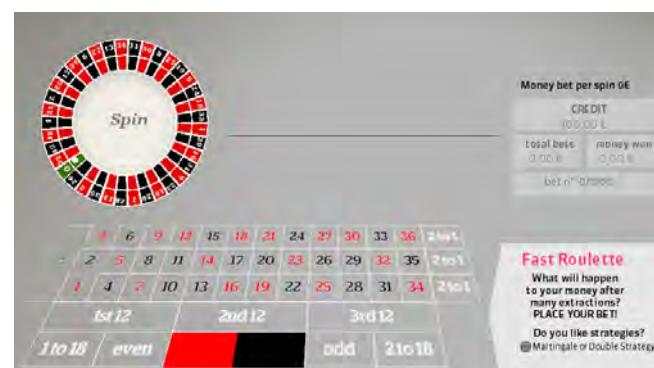


Figure 1. Fast Roulette, starting interface: wheel and table.



Figure 2. Fast Roulette, counters of players' credit, total bet and money won.



Figure 5. Invisible Roulette, second interface with numbers, but not colours.



Figure 6. Invisible Roulette, third interface with colours, but not numbers.

This artefact is focused on suspension of judgment cognitive error, interpreted as lack of player's awareness about money expenditure. If usually, as in many other games of chance, there are no possibilities to keep track of money bet or won, in fast roulette it is clearly showed through the rhetoric power of money visualisation and credit balance display: three counters show in real time actual player's credit, the total amount of money bet and money won (Fig.2), and a line graph for credit balance display is employed too (Fig.3). Speed is another important mechanic employed because the objective of the prototype is achievable only supposing a fast simulation of one thousand draws showing bets results draw by draw.

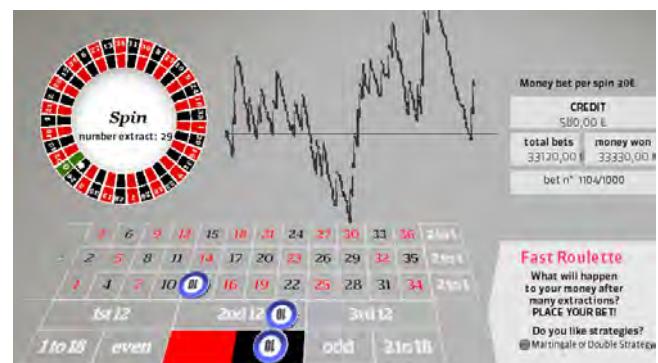


Figure 3. Fast Roulette, final interface: the line graph clearly shows players' credit trend during the interactive experience.

### Prototype 2: Invisible Roulette

Invisible roulette intends to explain illusion of control resulting from player's knowledge of game reference and signs system, questioning how players will decide their next bet. Players never really place random bets, although randomness is an intrinsic characteristic of games of chance: gamblers place bet according to favorite numbers, birthday dates, bets strategy etc. All these beliefs are tied to the complexity (more apparent than real) of games of chance rules hiding the randomness of gambling. For example, in roulette game there are different type of bets (straight, split, corner,

column bets, dozen bets, black or red, odd or even etc.) and players are induced to think that bet strategies provide them more chance to win. The interactive experience in this prototype exposes the rhetoric use of play-world characteristics by eliminating signs and elements that hide randomness in game reference system (for example colours and numbers, and the bet strategy deriving from those). Starting from a standard roulette game interface (Fig.4), illusion of control is tested questioning the players about their next bet in front of the new game reference system: player will face a roulette with numbers but not colours (Fig.5), a roulette with colours but not numbers (Fig.6) and in the end a blank roulette (Fig.7).

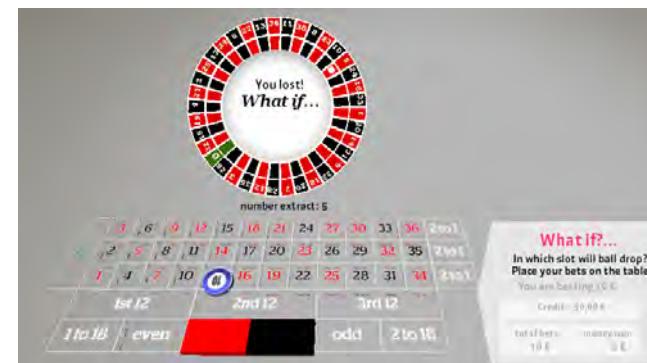
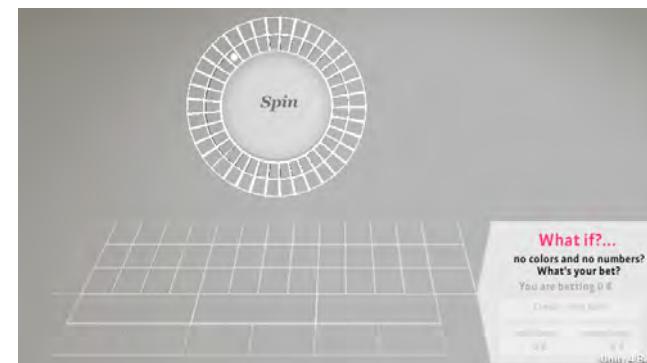


Figure 4. Invisible Roulette, starting interface: a standard roulette.



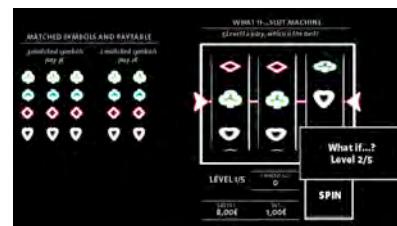


Figure 9. Slot Machine, starting interface: one traditional slot machine.

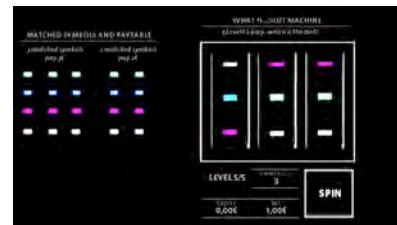


Figure 10. Slot Machine, final interface, without symbols on reels.



Figure 8. Slot Machine, third level interface: a slot machine without lights effects.

Figure 7. Invisible Roulette, final interface: a blank roulette without colours or numbers.

#### Prototype 3: Slot machine, What if?

While playing one slot machine, it is quite clear that its interestingness is related to lights and sound effects: it is an instant lottery, enriched with emotional and entertainment experience. Playworld characteristics are a critical point in slot machine gambling, as demonstrate in the artefact. Abundance of lights and sounds effects inhibits players' awareness about time and money expenditure, therefore the interactive experience is characterized by the gradual elimination of playworld elements, reducing slot machine at its essential function, an instant lottery. The interactive experience is divided into different levels (Fig. 8-10): lights and sound effects are turn on or off one after the other to provide players different emotional experiences. The first cognitive dynamic affected by this choice is suspension of judgment. The use of lights and sound effects only in case of actual win would help player to pay more attention to money expenditure. Moreover, also near miss is affected. Slot machine gambling is so rich and chaotic that it is quite difficult to recognize a successful bet, from an unsuccessful one, especially in case of near miss.

If we do not use lights and sounds except that in actual win conditions, instead, we would help players to understand that losses are more frequent than winnings. In the end, last level is also characterized by the elimination of symbols on reels: players usually believe that symbols appear on reels according to a precise sequence that if learned, could allow them to foresee if the next symbols match, is a winning one or not. Nevertheless, as slot machine is an instant lottery, it is not possible: how would change player control perception when playworld elements are changed profoundly?

The meaningful play experience proposed in each prototype can apply to any other game of chance adapting the rhetoric features of mechanics and playworld to the desired cognitive experience. The prototypes, to be tested, could be part of a complete set of meaningful gambling experiences to prevent the widespread of pathological behaviour, increasing players' awareness through play (project website: [www.andreavitalidesign.it/magicinteraction](http://www.andreavitalidesign.it/magicinteraction)).

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## The New Saint Cuthbert's Banner

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### Abstract

This research narrates the design development and realisation of the *New St. Cuthbert's Banner*, an ecclesiastical banner for Durham Cathedral (North East England), which replaces the original, destroyed in the mid 1500's.

After my commission to design the new banner, the process began with historical research offered by a description of the original artefact in the *Rites of Durham* (1503) (cited by Fowler, 1903 p.26). The creative process encompassed the research and development of floral pattern in the pursuit of a simple 'pleasing aesthetic'. The final version was chosen from over thirty 'variations on a theme', and was an innate response to the variables of materials, labour costs, and the one that just 'felt right'. Craftsmen drawn entirely from North East England completed the four-year project by undertaking the embroidery, woodwork, silverwork and leatherwork to bring the project to realisation.

On 20<sup>th</sup> March 2012 - St. Cuthbert's feast day – the banner was processed through the streets of Durham before being presented to the Cathedral. It now enjoys permanent public display at the entrance to St. Cuthbert's shrine and is used at the discretion of the Dean and Chapter in processions and worship. The Very Reverend Michael Sadgrove, Dean of Durham Cathedral speaks of the banner's timely addition to the Cathedral as "*making history*", and knowing that, "*like its predecessor, it will bring inspiration and pleasure for years to come, and be a source of particular pride to the people of North-East England, Cuthbert's Land*" (Sadgrove, 2012).

The new banner can only hope to represent the zeitgeist of the original. Like the historic and symbolic textile artefacts of the

Durham miners' banners, the new St. Cuthbert's banner symbolises the ideals and aspirations of those who rallied under it, becoming "*the visual memory of a movement*" (Williams, cited in Gorman, 1973 p.19).

### Author Keywords

Design; Banner; St. Cuthbert; Ecclesiastical artefact; Community; Reflection-in-practice

### Research Imperatives

My involvement with *The New Saint Cuthbert's Banner* (Fig. 1) was the result of a design commission from the Northumbrian Association<sup>1</sup> in 2008. The association cites words such as 'identity', and 'community' as the impetus for the banner's creation 500 years after the original was destroyed. They believe the new banner is a rallying-cry to the people of the North East to support the fight to bring the Lindisfarne Gospels permanently back to the North East, and comes at a time when the loan of the gospels to Durham in 2013 sees St Cuthbert's Gospel, the Lindisfarne Gospels and the relics of St Cuthbert come together under one roof for the first time since 1104.

<sup>1</sup>The Northumbrian Association is a registered charity whose patrons include; His Grace the Duke of Northumberland and The Bishop of Durham. The Association exists to maintain and advance the Northumbrian culture, heritage and traditions. Their annual House of Common's dinner uses this platform to present their visions for the future, one such being the permanent re-instatement of the *Lindisfarne Gospels* to the North East.



Fig. 1. The banner being processed on St. Cuthbert's Day, 20th March 2012.  
Photograph: Tony Griffiths

"Much modern social theory refers to isolation, alienation and the breakdown of community – but also the need for collective support and identity in a world dominated by neo-liberal strategies where there is much danger for the individual. The banner comes to represent shared values and the collective sharing could be seen to offer a sense of protection" Stephenson (2013).

The life of St. Cuthbert (c.635-687) is widely documented, with accounts of both his living years and his posthumous spiritual presence serving to maintain the 'cult' that surrounded him. Cuthbert is regarded as one of the most significant saints in England in the Middle Ages (Bliese, 1998, p.215). Documentation suggests that the Lindisfarne Gospels, written by Eadfrith, his successor as Bishop of Lindisfarne, were written to celebrate his beatification. More importantly in terms of this paper, Cuthbert's banner was also posthumously created as an embodiment of his protection of 'his people' against both Scottish and foreign armies. *The Rites of Durham* tells of the banner accompanying the armies Richard II, Henry IV and Henry VIII into battle, where victories were 'afforded' by the presence of the sacred relic. It also recounts the description of the first manifestation of the original banner, used in 1346 at the Battle of Neville's Cross. In a vision, the then prior of the abbey at Durham, was instructed to take St. Cuthbert's corporax cloth "and to put the same holy relic like unto a banner cloth upon a spear point and on the morrow after to go and repair to a place on the west part of the city of Durham called the Redhills and there to remain and abide till the end of the said battle..." (Fowler, 1903, p.23).

Of relevance here is the fact that *the Redhills* now sites the headquarters of the Durham Miners' Union. With a recent resurgence in attendance at the Durham Miners' Gala, the North East's legacy of banner-bearing and the representation of shared values should be highlighted (see Stephenson, column opposite). Stephenson and Wray (2005) reference how the lodge banner, at the centre of all post-mining community activities, is perhaps even more significant for the continuance of the well-being of their communities than when the mine was in operation. Wray suggests that "to some extent, it is as if the banners have gone through some anthropomorphic process and become individuals who possess the collective memory of the community they were created to represent" (2009, p.162).

## Research Process

The *New Saint Cuthbert's Banner* project was realised over a four-year period. This section broadly chronicles the creation of the ecclesiastical artefact. The preceding section revealed 'community' and 'identity' as main influencers for the research. However, the showcasing of the talent and quality of North East England craftsmen in the creation of the banner was also an imperative.

October 2008 - June 2009 | It was important for me as the newly-commissioned designer of the banner to define that my work was based on the contemporary interpretation, or *creation* of a new banner, rather than the attempted *recreation* of the old. Therefore, although historic tapestries and embroideries were appraised for techniques to be used in the new embroidery, the design was not intended to follow a medieval style. With a fairly tight brief afforded by the description in the *Rites of Durham* (see side column, p.3), my research question really centred around the production of meaning - how the design could represent the *brand* of Cuthbert, with the banner becoming a *logo* to embody the effort to reinstate the gospels to the North East. Although parallels have been drawn with the banners of the Miners' Lodges, these historical textiles tended towards a "visual representation of religious scenes, iconic union leaders or simply the depiction of a life that could be" (Gorman 1973, p.13). The new St. Cuthbert's banner in contrast, is a symbol of a narrative, rather than being a narrative in itself.

The start of my creative design work centred around research into wildflowers that Cuthbert would have encountered during his life in ancient Northumberland. Foxglove (*Digitalis purpurea*), Wood Avens (*Geum urbanum*), Cowslip (*Primula veris*), Sandwort (*Arenaria*), St. John's Wort (*Hypericum perforatum*) and Ferns (*Dryopteris*) were chosen to represent the widespread Northumbrian common flora. Hand-rendered sketches of these flowers were made in order to generate original work, and these were then scanned and traced using Adobe® Illustrator® to enable colouration (Fig.2). Once the flowers were digitised, I was able to



Figure. 2. Photographic wildflower research; hand-rendered drawings; digitisation and colouration of floral pattern

*"The banner cloth was a yard broad and five quarters deep... and made fast with all about with red silk and gold. And also the said banner cloth was made of red velvet on both sides most sumptuously embroidered and wrought with flowers of green silk and gold... and so sumptuously finished and absolutely perfected, was dedicated to holy St Cuthbert to the intent and purpose that the same should be always after presented and carried to any battle as occasion should serve" (Rites of Durham, cited by Fowler, 1903, p.26).*

follow the description to create the banner's 'structure' in terms of size, colour and positioning of pectoral cross, and to start manipulation and generation of pattern design work in response to the description of "*wrought with flowers of green silk and gold*". Early 'playful' experimental pattern work revealed that an intertwining aesthetic was the most 'natural' and 'poetic', and intuitively I knew of no real alternative worth considering. Schön (1987, p.25) can be referred to here to support my claim for 'knowing' being tacit in our practice and implicit in our actions. My creative process here was an inherent response as I searched for a simple 'pleasing aesthetic' and balanced the considerations of both material and labour costs (embroidery).

Over thirty 'variations on a theme' were produced over an eight-month period to be reviewed by the Dean and Chapter, and also the Fabric Advisory Committee of Durham Cathedral. The final version was unanimously accepted and was the obvious choice of all involved in the decision-making, as it most closely echoed the key word "*sumptuously*" from the description.

August 2009- January 2012 | The task of realising the banner then passed to the commissioned embroiderer who elected to undertake the task single-handedly using medieval ecclesiastical Opus Anglicanum embroidery techniques, split stitches and goldwork embellishment for richness. Whilst the embroidery was underway, other local craftsmen were commissioned to undertake the woodwork for the poles, leatherwork for the harness and silverwork for the 'sacring bells' and finial cross (fig. 3). I also undertook to film these processes between April and November 2011, to record the communal journey and to help narrate the emotional attachment the artisans had for their involvement in the project.

Whilst the banner project was not in its truest sense a 'community project', the artisans worked discretely, but towards a shared goal, therefore functioning as a 'virtual' community. Stephenson (2013) talks of the 'not doing what', but 'how' in developing a community.

She promotes the notion of the fundraising (£35,000 was needed to subsidise the project) and the developing of the ideas as being key;

*"The process of the production and the creation of the banner in itself created common purpose, builds skills, creates 'community'. Here I am thinking of 'community' as a verb not a noun – community is something that is done, people are bound together in a common purpose". (Stephenson 2013)*

## Research Outcomes

In referencing the practicum, Schön states that; "Emphasis is placed on learning by doing, which John Dewey described a long time ago as the "*primary or initial subject matter*" (1987, p.16). As a 'student' of ecclesiastical design myself, I entered into the banner commission with a curiosity and an open mind. Schön speaks of *exploratory experiment* as "*probing, playful activity by which we get a feel for things*" (1987, p.70), and whilst it is tempting to call my experimental approach 'trial and error', Schön elevates this to what he calls a sequence of "*moments*" in a viable process of reflection-in-action, where we reflect on each "*trial to inform the next*" (1897, pp.27 and 158).

Although there were distinct processes involved with my design work such as research, sketching and design development, I have a barrier to overcome when trying to explicitly describe it as part of my reflection-on-action (see Biggs, side column, p. 4). In considering my role in the production of artefact, I have also been led to the writings of Nimkulrat (2007, p. 4). She identifies herself as practice-based rather than practice-led creative, able to focus on her role once the product is exhibited. She sees herself as a practitioner-researcher who takes the researcher's stance to analysis and contextualise the earlier creative process. Conversely, this role is then reversed again in a practice-focused creation of artefact until the research question is answered. She refers to Mäkelä (2003), who used "*retroactive gaze*" to denote the



Fig. 3. final embroidery, woodwork & silverwork for the pole & banner attachment, leatherwork for the harness and a silver 'sacring' bell.

*"Have we somehow conspired to arrange matters so that knowledge is always what we say about something rather than what we show about it? If so, it would account for the difficulty of using objects as constituting or communicating knowledge. Is the problem that the whole concept of knowledge and research arises out of words rather than actions, or do we simply have too narrow a range of examples, i.e. only lexical examples? Have we defined ourselves into a corner?" (Biggs, 2002, p.1-2).*

retrospective process of considering one's own practice to find answers.

Of particular interest in terms of the public display of the banner in Durham Cathedral, were the writings of authors concerned with product semantics and material culture studies, in particular, the artist-spectator relationship. As Duchamp et al (1957, p2) claim, the creative act is not a sole performance by the artist alone, but the spectator adds to the creative act when he *"brings the work in contact with the external world by deciphering and interpreting its inner qualification"* whilst also determining the aesthetic value.

Andrew (2008) writes about textiles as "*cultural signifiers*", and uses the term "*textile semantics*" to examine the communicative qualities of textiles between the practitioner and spectator. She cites Tilley (1989, p.189) in her work who recognises that material culture can be an individual output, but that *"it is always a social production"*. Andrew (p.40) also cites Jackson who suggests that studies of material culture should realign the focus of the physical production and also the production of meaning by the *maker*, towards the meaning the *viewer* derives from the artefact itself. Considering this in the context of a public display of banners, Jackson's theory suggests that the social and cultural signifiers results from both the physical environment where it is consumed and also the use to which it is put.

Like it's miners' banner counterparts, it is anticipated that the New St. Cuthbert's banner will impact further than that of a mere textile. With the banner's annual parade through Durham on St. Cuthbert's Feast Day planned as an annual event, it will hopefully revive a historic ritual absent from Northumbria for 500 years. My research is on-going - to understand historic and contemporary textiles and their power to connect to a community. In asking these questions, I hope to understand my role as a practitioner-researcher, how my design work can play a part in rallying a sense of community spirit in the North East of England.

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# Re-Designing the Dining Experience: Harpooning Meatballs in the Name of Co-Creation

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## Abstract

This paper describes three design artefacts that are part of a series of designs aimed to challenge and re-invent the social and aesthetic experience of dining. The artefacts comprise a social table designed to either expose or provide an intimate room for the guests, fork-headed spears designed to invite playful behaviour, and a meatball cage, designed to extravagantly display an excess of food while at the same time making it hard for guests to get to the food. The design artefacts were used in a live experiment with eight children, and helped guests take active part in composing, exploring and challenging the dining experience.

## Author Keywords

Social dining; experience design; experiment; reinventing the meal; aesthetic experience, social interaction.

## Introduction

We all eat, and most of us like dining considerably. Everyday experience tells us that a fine meal or eating experience has more to it than simply the food. For this reason, people spend money on romantic restaurants, throw barbeques under the summer sky, and make an effort presenting special meals with silver-ware, candle light and heir-loom tablecloths. In consequence, most adults are quite experienced in designing experiences around the meal, though mostly within certain well-known genres such as 'picnic' or 'romantic dinner for two'.

Around the world, professional chefs have long experimented with taking experience design and dining a bit further. Perhaps being

fed up with how a traditional restaurant looks and works, some have started experimenting with introducing performance theory to restaurants, serving food that need to be co-created at the table, or using tools and preparations that allow for new tastes, textures and interactions.

Intrigued by how the use of design skills can invite guests to participate in the dining situation, we set out to experiment with some of the well-known ingredients in a meal: the table and the cutlery. As a frame for the experiment we chose to challenge the concept of good and bad table manners and through various designs invite guests to co-create a unique dining experience with strangers around a table.

*Figure 1. For Figure 1: The Social Table setup during the experiment, including the meatball cage, fork-headed spears and the intimate room under the table.*



Within the fields of experience design, numerous attempts to shape experiences and invite to certain behaviour have been described. Some work concern the development of frameworks or vocabulary to help designers articulate qualities in their designs (for example Arrasvuori et al., 2010; Petersen et al., 2004). While some of these contributions voice a view on interaction qualities that are closely related to traditional HCI values, such as precision or instant feedback (Lim et al., 2007) others open the field to other aesthetic qualities such as dramaturgical structure (Löwgren, 2008), aesthetic ideals such as sensing or emotion (Lundgren, 2010), or sensory qualities such as the ones described by someasthetics (Shusterman, 2008). Some work is less theoretical and describe practical experiments with designs that invite certain behaviour or reflection. In critical design, for example, a design artefact is presented as a physical representation of a hypothesis, inviting the user/audience to consider for example technology's role in society or mundane life (Dunne, 1999). The work presented in this paper has taken inspiration from the theoretical work in the field but aims to present a series of physical design artefacts that invite to exploration and reflection rather than offer explanations.

In the following, I will describe three design artefacts that we used to shape eight children's experience of a meal. These artefacts comprise a social table, fork-headed spears, and a meatball cage. Further design artefacts were made as part of the experiment, including edible tableware, partnered spoons, 'broken' cups and glasses, and special servings for sharing. These are not the topic of the present paper, but may appear in the photos from the experiment.

## The Designs

The design artefacts were designed to challenge and help participants re-invent the social and aesthetic experience of dining. As such, the artefacts are not stand-alone objects; they are designed to trigger playful behaviours, and are best understood in use. Our exploration was enabled by the participation of eight

children around the age of eight—an age where the play between good and bad manners can be understood and appreciated. The food served during the meal was a three-course dinner and eight snack servings co-designed and delivered by professional chefs. The preparation and presentation of the food was designed to fit certain affordances such as sharing, poking, wondering or making a mess.

### The social table

The central design artefact is a large round table, approximately two metres wide, with room for eight guests (see, figure 1). On the surface are eight manholes in which the guests stand while eating. As a result, the guest is restrained and cannot move to get things out of reach. The table is covered by a long white tablecloth, which reaches the floor, only keeping the manholes open. During the experiment, the room above the table included several cultural references to a formal dining situation, including white napkins, uniformed waiters, and spotlight. The rhythm of the servings and the announcing of the food also contributed to the feel of a formal dining experience.

Under the table, and enclosed by the tablecloth, is a low space with benches all the way round the walls, leaving a small room on the floor on about 1.5 m<sup>2</sup>. Each of the eight bench 'pieces' is fitted with a transparent drawer in which food servings were placed from outside the tent-like room. Each drawer contains a light that during the experiment was switched on when a snack was placed inside the drawer.

The social table was designed to either expose or provide an intimate room for the guests, and hold subtle clues about what kinds of manners would be expected, such as decoration, cultural references and the fixed positioning of guests. These clues were then contradicted by adding design objects with other values to the context. Two of these were the forks and the dish used to present the main course.

### The fork-headed spears

The fork-headed spears are in fact ordinary forks attached to long wooden sticks (see, figure 1). Because of their length they are difficult to balance, and they invite the guest to explore just where to hold it and how to manoeuvre it to make use of it. The fork-headed spears were designed to physically challenge the guests, invite to playful behaviour (such as using them as swords) and to provide the guests the possibility to grab food from the dish used for the main course, the meatball cage, which was placed centrally on the table, and otherwise out of reach for the guests.

### The meatball cage

In traditional cooking, the presentation of food is central to the dining experience, and specialized dishes and arrangements are often used to invoke a certain impression in the guest. Presenting meatballs in an impressive collective serving is a challenge—somehow meatballs don't fit well with fine dining, they tend to roll all over the place, and considering their size and shape they almost invite to being thrown, especially when served in abundance. Our solution for a dish that allowed for the serving of 500 meatballs was a circle of chicken wire, about 65 cm wide and 20 cm high, which perfectly caged in and displayed the meatballs at the same time.

The meatball cage was designed to display an overwhelming amount of food, inviting the guests to reach out of their manholes and in over the table to get the food. The high sides of the cage combined with the fork-headed spears facilitated harpooning in an exaggerated diagonal direction from over one's head/shoulder, leaving it impossible not to break the atmosphere of fine dining, suggested by the tables.

## The Experiment

The three design artefacts were deployed in an experiment, a staged meal with eight invited children around the age of eight. The children were escorted by, and instantly separated from, parents,

and were guided to take room under the table by the use of stage light: the room fell dark and the space under the table lit up, signalling the children to enter. During the performance, change of light settings was used to invite the children to move from dining over the table to under the table, or vice versa.

The experiment was witnessed by 20 guests, who, from dark corners of the dining hall, formed a passive audience for about two hours. Servings and other interventions were based on a dress rehearsal with eight other children, and directed on the fly, with a sharp focus on group dynamics, and according to a detailed storyboard.

During a meal lasting two hours, and facilitated by a series of design artefacts, alliances between eight strangers emerged, cultural norms about behaviour challenged, and about 500 meatballs became either eaten or airborne. The social and exiting experiences aside, the experiential performance enabled by our designs, managed to gently provoke and challenge the cultural assumptions made about good and bad manners, and engage eight children in this discussion.

Inviting guests to become participants in the co-creation of an experience around a meal does not have to entail a theatre troupe or a large budget. Small designs that challenges some of the general assumptions made about the meal is all it takes to create the outline for an experience that is exiting and extraordinary to take part in. The experiment 'Re-designing the dining experience' managed to gently provoke and challenge the cultural assumptions about the qualities of dining, and eight children—who were initially strangers—formed in two hours a strong fellowship and together explored the boundaries for a socially engaging meal.

## Acknowledgements

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# Cookie Riot: The Development of an Interactive Learning Platform for Healthy Food Education

## Abstract

This paper describes the process of designing a personal and interactive learning environment that stimulates children to gain knowledge, skills and attitudes regarding food through experimentation. *Cookie Riot* is a product-system-service combination that intends to promote a healthy, conscious lifestyle and facilitate positive behavioral change. The relevance of the project lies in its multidisciplinary approach, as various stakeholders such as the nutrition centre, an after school daycare organization, the local municipality and an environmental education centre have contributed to and collaborate in the design process.

Through various design iterations and interventions *Cookie Riot* explores whether a hands-on learning environment improves children's healthy food preference and whether it stimulates consciousness towards food. The first three iterations consisted of student projects that elaborated on each other's work and followed a research-through-design approach in itself. In the first iteration the concept of cooking with children was explored, secondly the freedom of exploration in cooking was explored and thirdly the system was extended with games that support children in learning while exploring. Currently the project is in its fourth phase and the product-system-service is being expanded and evaluated by an extended group of people. Different interactive learning environments will be installed in various locations of the city and connected devices such as tablet computers and smart phones will connect to a platform, serving as Experiential Probes that gather data in the context of use (Peeters et al., 2013).

This project offers a theory-based health intervention for children in their natural environment and aims at evaluating its outcomes over an extended period of time. It intends to lay the fundaments for a healthier lifestyle by taking a positive perspective. Moreover, the

project includes children of different socio-economic backgrounds and the focus is on creating an opportunity for all children to start a healthy life.

## Author Keywords

Food Education; Children; Learning-by-Doing; Interaction Design; Games

## Research Imperatives

Over the past decades, the percentage of overweight children has increased substantially (World Health Organization, 2012). To address this societal concern, there is a need to identify the numerous factors that are causing this worrying trend. In contrast to traditional interventions the project *Cookie Riot* intends to increase the value of healthy food consumption through education by taking a learning-by-doing approach. This approach empowers children to learn and to discover the world on their own. Therefore, the main question addressed by this project is whether a hands-on learning environment can improve children's healthy food preference and whether they will gain more appreciation towards food.

It has been argued that supporting children in making healthier food choices is more likely to be an effective approach than solving obesity by means of treatment (Seidell, 2000; Singh et al., 2009). Children learn eating habits during childhood (Shepherd, 2006) and recent studies indicate that developing healthy food behaviors during the early years may be an effective way to address overweight (e.g. Zeinstra et al., 2007). Therefore, children should be the main focus for healthy food promotion.

A better appreciation and understanding of food will influence children's food preference (Hu et al., 2010). Several programs have been developed to promote healthy food preference (Atkinson and

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Nitzke, 2001). However, current interventions are very much based on cognitive learning, while food could support a much richer experience. Moreover, the preference of food in children between 4 and 8 years is experienced particularly on a perceptual and emotional level (Zeinstra et al., 2007). Therefore, we believe that a constructivist learning approach (Dewey, 1938) is much more suitable for children to learn about food. In the constructivist learning approach it is the learner who creates meaning, affected by and reflecting on his/her social cultural environment. By reflecting in action children can learn about food and food preparation while cooking and tasting, i.e. they learn by doing (Schön, 1983). This project aims to achieve a balance between perceptual (the making), emotional (the feeling) and cognitive (the learning) skills by stimulating children to gain knowledge about food by experimenting and cooking supported by informative games.

### Research Process

Three master students in Industrial Design at the TU Eindhoven developed separate projects addressing food and education. Projects lasted for one year (starting in December 2010) and followed a research through design approach. Iterations were inspired by data from input and output from game involvement and tool use as well as from semi-structured interviews. *Supersous* was evaluated at an after school daycare organization with a class of twelve and *Playing with Food* and *Kokkerelletje* at MEC, the Environmental Education Centre, with various school classes. Both environments involved children aged 6-10 years from Eindhoven.

### Supersous

The *Supersous* Game supports an interactive feedback loop with five different cooking utensils, a knife, a beaker, a masher, a rasp and a peeler with incorporated sensors. The game guides the children through the process of cooking by auditory feedback on how children use the tools. Results from semi-structured interviews, suggest that after playing the game, children had a more positive attitude towards cooking. In addition, children had greater

confidence in their ability to cook and had a better understanding of how they could eat healthier (Spermon and Bruns, 2012).



Figure 1. Child using the sensor-enabled knife and from left to right the cooking utensils beaker, masher, rasp and peeler of the *Supersous* game (designed by Manon Spermon)

### Mix and Taste

*Mix and Taste* is an ingredient suggestion system that makes people more aware of the ingredients that compose their meal. The system offers suggestions of combinations of ingredients based upon an online database, when products are placed on a surface display. By providing a direct link to ingredients that are placed on the kitchen table the system gives users the opportunity to create a meal from scratch whereby the ingredients form the basis of the cooking process instead of the recipe. During the evaluation, children with their parents created a range of novel meals, by combining a wide range of (sometimes unfamiliar) ingredients.

### Playing with Food

*Playing with Food* elaborated upon the surface display of *Mix and Taste*. In addition to the ingredients, children can also place tokens

on the table. With the ingredients and tokens, children can play games that provide them with information and insights on food and its characteristics. The main game element is based on working with the most important characteristic of the specific food (or combination), e.g. the amount of water to make non-sticky dough.

### Kokkerelletje

Inspired by the previous three projects we are currently developing *Kokkerelletje*. In this project the interactive surface, with ingredient recognition system serves as starting platform. The surface, incorporated in a little kitchen, is currently located at the MEC. Children visit this centre and can learn cooking skills while playing games displayed on the surface. The games link to the physical realm (the ingredients and utensils), to support the development of both perceptual and cognitive skills. Three new tables are currently being build that will be placed in other locations of the city. The tables are equipped with tools with incorporated sensors, as in the *Supersous*, that will generate data on usage. Furthermore, game applications running on the surface are extended to tablet computers and smartphones, by which children can continue learning at home.

### Research Outcomes

This project aims to stimulate healthy food choices and understanding with children aged seven to nine years. Although we cannot evaluate the success of our intervention yet, preliminary findings indicate that by cooking children create a better appreciation and understanding about food (Spermon and Bruns, 2012). Moreover, while most interventions do not focus on the agency of the child, the current project visualizes children as active agents. It proves that children can take responsibility and have the capacity to legitimately act upon their daily environment. As observed from parent feedback, this project supports learning through the use of didactic games. Thereby, this project offers an approach that does not focus on the problem of obesity, as often addressed in related interventions (De Drog, 2013), but takes the stance of a behavioral change from scratch.

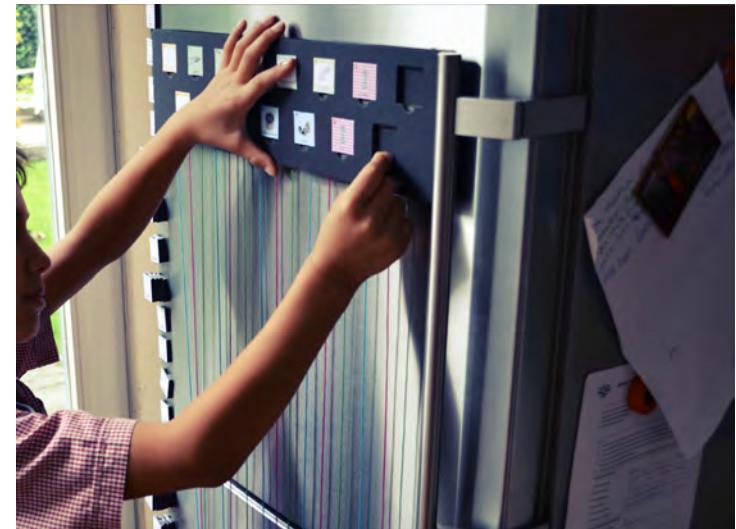


Figure 2. Child evaluating a cardboard prototype of the Mix and Match ingredient suggestion system (designed by Renée van den Berg).



Figure 3. The surface display of Mix and Taste with ingredient recognition

(designed by Renée van den Berg).

Child observing the game displayed on the interactive surface in the digital realm

Child playing with food in a hands-on manner in the physical realm



Figure 5. Example of a game running on the interactive Kokkerelletje table in which children are encouraged to cut the longest apple peel (designed by students from SiNTLUCAS school Eindhoven)



Figure 4. Children experimenting with ingredients supported by an informative game on the interactive Kokkerelletje table (designed by Rob Dijkstra).

Although the project is still in development and we are setting up a longitudinal study, some conclusions can be drawn on how design supports the process of involving various stakeholders. Through the three iterations, users and parties such as the nutrition centre, the local municipality and the MEC got actively involved. Overall these parties stated that they could immediately relate to the envisioned goal of the project, to prevent health problems by teaching children to cook instead of being paternalistic. The fact that stakeholders could experience the system and see how parents and children responded to the games and the kitchen made this vision even more tangible. Due to the designs made for the interventions their appreciation became much stronger in relation to traditional interventions. This suggests that healthy behaviors can be enabled and supported through design interventions, as they are experienceable and highly engaging.

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## Design Thinking set to Verse

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### Abstract

Design is traditionally concerned with the creation of artifacts to fuel consumption. More recently, the remit of design has widened greatly. Design activity is claimed to be beneficial in negotiating a diverse range of complex issues, for example aiding humans attempting to exist on meager incomes or enabling effective procurement practices within government bodies. The methodology termed "design thinking" is argued to help designers and non-designers engage with a broad remit of issues.

As the subject of design thinking is complex, there exists a need for a condensed means of communicating its claimed attributes and remit. The design community has disseminated widely on design thinking. This paper argues that this activity may have contributed to "dissemination fatigue". There exists a need for a means of communicating design thinking's attributes and remit in a new, informative, succinct and easily digestible manner. Poetry is argued to be a condensed method which for centuries has been utilized to disseminate complex notions, pass on knowledge and precipitate emotions. This paper aims to convey some of the claimed attributes and remit of design thinking in poetic verse.

This paper is influenced by the tradition of critical design. The overarching aim is to provide the community with a constructive vehicle to critically discuss the attributes and remit of design thinking. This process is important in helping the community to unpick the debate surrounding this influential notion.

### Author Keywords

Design Thinking; Poetry; Critical Design; Bright Club;  
Dissemination Fatigue.

### Research Imperatives

Design is traditionally concerned with the creation of artifacts to fuel consumption (see Buchanan, 1990). More recently, the remit of design has widened greatly. The methodology termed "design thinking" is argued to help enable the design community engage with a broad spectrum of issues (e.g. Brown, 2008). There follows a brief sketch of some of the claimed attributes and remit of design thinking.

Rather than being easily definable, design problems are complex (Lawson, 2006). Such problems require a non-linear approach to tackle them – design thinking is claimed to be just such a method (Buchanan, 1992). Rather than being reductive, design thinking is posited to be holistic phenomenon (Brown, 2008; Davey et al., 2002).

Design thinking is argued to create a strong competitive advantage in business (Martin, 2009; Brown, 2009). It can result in positive effects on the environment (Davey et al., 2002). Design thinking is claimed to be people-centered: Borja de Mozota (2010, p. 93) argues the *process adds value by "giving voice to silence" – that is, to previously overlooked or unheard minorities*. Design thinking has the potential to profoundly benefit society, for example in aiding "billions of people trying to live on just a few dollars a day" and "education systems that fail many students" (Brown, 2008, p.92). The process can help to realize effective procurement within government bodies (Design Council, 2011). Design thinking is



**Figure 1.** The author's first Bright Club performance (27<sup>th</sup> June 2012). © Elin Roberts.



**Figure 2.** The second performance (23<sup>rd</sup> January 2013). © Richard Kenworthy.

claimed to be vital in improving healthcare: Bevan, Robert, Bate, Mahler and Wells (2007, p. 150) argue it is “*integral to the way many people approach the task of change and service improvement within the NHS*.” Such is the impact of the process, the Design Council argues design thinking to be transformative (Burns, Cottam, Vanstone and Winhall, 2006). Design thinking is not exclusively practiced by design professionals; with training, other individuals can become versed in it too (Manzini, 2011; Burns et al, *ibid*).

As the subject of design thinking is complex, there exists a need for a condensed means of communicating its claimed attributes and remit. Designers and design researchers frequently disseminate information on design thinking in the form of physical or digital artifacts, speeches, academic papers and journalistic articles. Because the community is accustomed to reflecting on these methods, it may be argued that a certain level of desensitisation – or what might be termed “dissemination fatigue” – may set in.

There exists an opportunity to introduce a different method of communicating concepts relevant to design thinking as a vehicle for stimulating discussion. Grisham (2006) claims poetry is a “*compressed communication*” which for centuries has been used to “*convey complex ideas*” (p. 492) to others as well as “*to transfer knowledge and to elicit emotive feelings*” (p. 487). This contribution attempts to convey some of the claimed attributes and remit of design thinking in poetic verse – and consequently in a compressed, new, digestible and emotive manner to the design community.

### Research Process

‘Bright Club’ was founded at University College London in 2009. Its website describes it as the “Thinking Person’s Variety Night” stating (Bright Club, n.d.,n.p),

“*What would happen if we got a bunch of interesting comedians and combined them with all of the fascinating people who work for one of the UK’s best Universities?*”

Bright Club provides a unique opportunity for researchers to narrate the findings of their studies in a novel, lighthearted and inclusive manner to an audience consisting of individuals both working and/or studying in a higher education institution and members of the public gainfully employed outside of an academic setting.

Bright Club currently has chapters in cities across the UK. On 27<sup>th</sup> June 2012 and again on 23<sup>rd</sup> January 2013, the author was invited to perform in its Newcastle-Upon-Tyne branch. The audience numbered around 200 individuals at both performances. Though (thankfully) there does not appear to be any footage of these misadventures in existence, figures 1 & 2 provide a glimpse of proceedings.

The topic of design thinking featured in both performances. On reflecting upon the first stint, the author decided that the subsequent outing would benefit from a succinct yet accessible means of disseminating knowledge on the attributes and remit of design thinking to an audience which was unlikely to be unfamiliar with it. Poetry was chosen as the medium through which to relay this information. ‘Design Thinking Poem Mk 1’ was incorporated into the January 2013 repertoire. Given that Bright Club is designed to be an entertaining experience for a fee-paying clientele, the circumstances did not lend themselves to conducting qualitative or quantitative analysis in to the efficacy of this poem. However, given the audience’s positive response (judged wholly unscientifically by the dearth of both tumbleweed and rotten tomatoes) the verse had made an informative and entertaining contribution to proceedings.

On reflecting upon the prototype delivered at Bright Club, the author has attempted to improve the verse’s metric qualities. ‘Design Thinking Poem Mk 2’ (figure 3) was crafted for this contribution:

### Design Thinking

*If your boss needs interrupting  
We can do some real disrupting*

*If your school is in a mess  
Don't get down and all depressed*

*If you are at death's front door  
You can stick around some more.*

*'Worried over icebergs shrinking?  
Put to bed that linear thinking*

*If you feel like naughts and zeros  
We can be your shining heroes.*

*If your public service grates  
We can help it innovate*

*No need to sit and have a groan  
We can help it all transform*

*Armed with just some sticky notes  
We can change the World you know.*

*And with not a lot of fuss  
We can help you be like us.*

*No cause too small  
Have no fear*

*No fee too big  
No grant too dear.*

*Holistic design thinking  
All round, it's the best idea.*

**Figure 3. Design Thinking Poem Mk 2.**

### **Research Outcomes**

At first glance, Design Thinking Poem Mk 2 may appear slightly whimsical in nature. It is however born of serious research imperatives. It is important to be able to condense some of the claimed attributes and wide remit of design thinking in an emotive and tangible medium in order to unpick the debate surrounding this influential notion.

Performing at Bright Club enabled the author to prototype a novel and condensed means of communicating some of the claimed attributes and remit of design thinking in an informal and explorative setting. A tradition of questioning principles through the creation of artifacts exists in design (e.g. Dunne, 2005). Building on the opportunity granted by Bright Club, this contribution employs a critical design perspective to include an age-old method of communication – poetry – into the toolkit utilized by the design community.

The community's reaction and feedback on the incorporation of verse is crucial to stimulating healthy discussion on important issues in contemporary design research and practice. If poetry can help tackle any stirring of "dissemination fatigue" then its use may have important implications for the community. As such, exploration utilizing poetry could be pursued in future studies.

It is hoped that the author's foray into the world of variety entertainment may inspire other researchers to embark on tackling novel and foolhardy methods of provoking debate both in, and outside of, an academic setting.

### **Acknowledgements**

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# Networked Tactile Objects

## Abstract

Networked Tactile Objects arises from two doctoral research projects; Pigeon Post (Fig.1) and Skyping Scarf (Fig.2). Findings and suggestions from the outcomes of these two studies will be taken further into the Smart Networked Toys project. These projects explore communication between parents and children who are separated through illness or family breakdown. The research addresses the questions: What is the potential of textile based objects integrated with wearable technology in facilitating mindful communication over distances between parent and child? How would these exemplars of textile-based communications embody empathy for the user when communicating emotions to the parent and child? The project demonstrates the use of Radio Frequency Identity (RFID) tagged toys and accessories to enable very young children to activate Voice Over Internet (VOIP) calls, send text messages, emails or access online content, both to and from family and relatives from whom they are separated due to illness, family breakdown or work. The soft textile based 'input devices' are very simple and easy to use, each is tagged with a single URL which means the object can only take the child to a pre-specified online activity or person. It is impossible to make a call to a stranger or visit an inappropriate webpage making it safe for children to use and giving the parents peace of mind.

This paper proposes that new types of 'mindful' communication methods could enhance and nurture parent/child relationships when separated by distance, developed through soft textile objects that integrate wearable technology and smart materials.

By offering users tagged soft textile communication objects, this paper proposes that said objects will enhance connection and communication for both parent and child by being empathetic to the individuals need(s) and unique situation(s).

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Figure 1. Pigeon Post

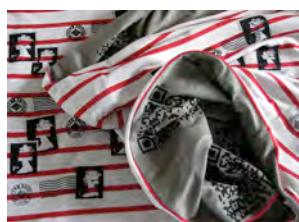


Figure 2. Skyping Scarf

## Author Keywords

Craft; Wearable technology; Smart textiles; Interaction; Communication; Separation; Empathy

## Smart Networked Objects

Smart Networked Objects explores how technology can be humanised by using handcrafted or 'loved' objects, which hold meaning for the user offering purpose to interactions with online content and social networks. It is proposed that by doing this it will enable the user to feel more connected and take ownership of their communications.

## Research Imperatives

There is an unmet need to enable parent and child to communicate in an intimate way over distances.

This research explores communication between parents and children who are separated through illness or family breakdown causing them to live separately at times, weakening the bonds of their relationships

Kelly and Lamb (2000), state that "*Development literature emphasises the importance of parental involvement in both care and play activities, to build secure relationships*".

Where separation occurs it becomes difficult, if not impossible for parents to stay involved within these care and play activities with their children on a day-to-day basis. This research highlights the need for more thoughtful and emotive communicators whilst separated, looking at the potential of textile based objects integrated with wearable technology in facilitating mindful communication over distances between parent and child and how these prototypes of textile based communications could embody empathy. Modern conventional communicators such as the



Figure 4. Extract from Figure 3. Research Focus

## Research Process

This research explores how users might usefully integrate 'the internet of things' into their lives without becoming overloaded by technology.

Wearable technologies, according to Wallace (2007) "are fast emerging phenomena". However, much research in this field tends

telephone, email and other internet based communications, suitable for adult connections, do not allow parents and children to communicate effectively. According to Dalsgaard et al (2006) "*parents and children build intimacy through care and play*" something the before mentioned platforms do not lend themselves to easily.

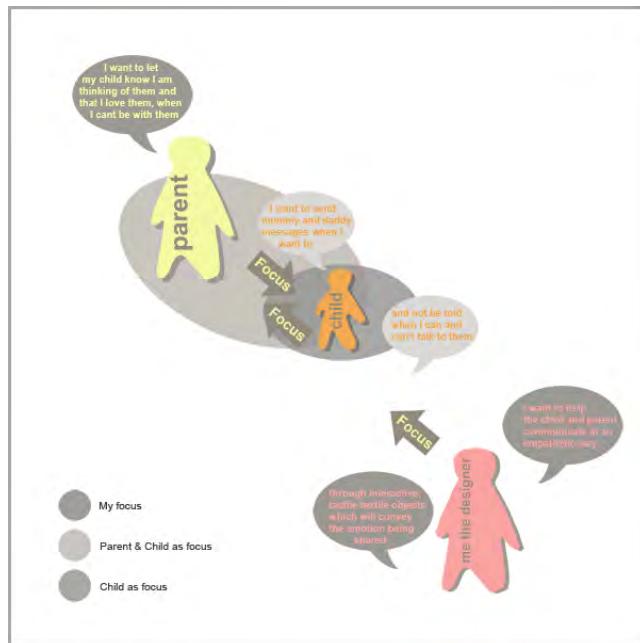


Figure 3. Research Focus

strongly towards the technologically driven and market-oriented.

This research builds on previous research by the principal author exploring how virtual communication methods can be more personal and tactile through the use of smart materials and sought to define new methods of remote connectedness. The Skyping Scarf and Pigeon Post project(s), 2009, are doctoral research exploring communication between two people who are separated.

The Skyping Scarf project highlights the use of digitally tagged accessories and the use of QR codes which enable users to activate Skype calls with family and friends from whom they are separated by either scanning the QR code with a smart phone or internet ready device or touching the scarf (housing a RFID tag) to the RFID reader connected to a computer (both) activating the call.

The Pigeon Post project demonstrates the use of Radio Frequency Identity (RFID) tagged toys and accessories to enable very young children to activate Voice Over Internet (VOIP) or Skype calls and send texts to family and relatives from whom they are separated. The soft textile based 'in- put devices' are very simple and easy to use, each is tagged with a single URL which means the object can only take the child to a pre-specified online activity or person. It is impossible to make a call to a stranger or visit an inappropriate webpage making it safe for children to use and giving the parents peace of mind.

Pigeon Post explores how technology can be humanised by using handcrafted or 'loved' objects, which hold meaning for the user offering purpose to interactions with online content and social networks. It is proposed that by doing this it will enable the user to feel more connected and take ownership of their communications.

Smart Networked Objects draws upon continuing doctoral research within the field of textile design that addresses the question raised by Agamanolis (2008), "*how can we bring back intimacy in communication technologies?*". If two people are geographically remote from each other, can intimacy be enhanced by embedding technologies used in communication devices within textile design? The research is addressing this question by drawing on the inherent aesthetic and emotive qualities of craft practice along with

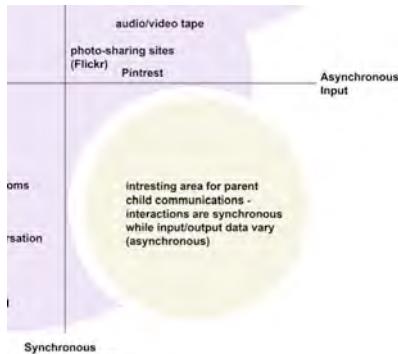


Figure 6. Extract from Figure 5. Researchers interpretation of asynchronous and synchronous communications & inputs



Figure 7. Pigeon Post Project; soft textile tags connecting to Skype via RFID tag and reader.

co-design methods and using them as tools to project personal connections and bonds between the users, and between the users and the mobile device itself.

*"Designing for parents and young children requires a different approach than doing so for friends or adult family members due to the asymmetry in goals and need between parent and child, the challenges posed by the cognitive and emotional limitations of young children, and the focus on play and care rather than direct communication"* (Druin 2009, p288).

With this in mind this paper proposes that for parent/child remote connectedness to be successful, communication needs to be asynchronous in object, while both synchronous and asynchronous in time.

Figure 5. offers two clear areas of focus within the study of Asynchronous and synchronous communications, the blue area where research is being focused on asynchronous applications that have synchronous inputs. Meaning that the communication is not 'real-time' but has the same input availability at either end. This area of research is well saturated so this research was focused within the yellow circle, showing asynchronous input with synchronous communications. Meaning that the communication aimed to be 'real-time'. The input / output methods then have the opportunity to be very different to suit the ages and stages of the communicators. The child for example will have a tactile multi sensory object while the parent will have an application on a mobile phone or tablet to send, store and correlate information and communications with the child. The information each receives will also be very different. Parents will focus on the general health and wellbeing of the child - 'did they eat their lunch', 'what did they have?', 'did they remember their homework', 'have they had fun at their friends birthday party' etc. They will be tracking and storing mood, activity etc. The child will receive fun interactions, play, and emotional reassurances in keeping with their needs from the communications. Allowing the objects to work in this way and to be tailored to the needs of the individuals, will offer a strategy for further research into the area of smart networked tactile mobile

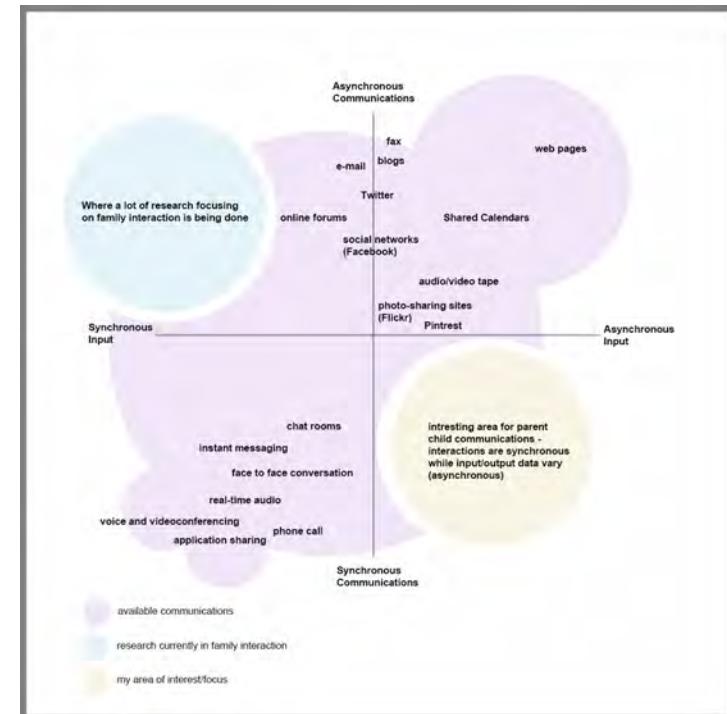


Figure 5. Researchers interpretation of asynchronous and synchronous communications & inputs

objects, as well as outlining and understanding the complex dynamics of the parent/child relationship.

It should also be noted that synchronous communications may not always be possible due to timings (work, school, time zones etc.) so asynchronous communications with asynchronous inputs will also become possible outputs.

While technological advances over the past 100 years have given us the ability to communicate (either virtually or physically) through phone, the internet and fast affordable travel, these advances have compromised the quality of the communication and perhaps diluted

the meaning and emotions behind certain interactions.

This research aims to re-introduce the need and importance for this type of emotive communication and highlight possible solutions and future research needed in the search for a connection that does not merely fulfill our need to pass on information but supports our emotional needs of connectedness too.

### **Research Outcomes**

This research will contribute to the empirical record exploring ways in which textile design and wearable technology interact, making connections through social media without the users having the knowledge to ordinarily access it.

Theoretically this research will advance how mobile technology is used in conjunction, and embedded within textile design and offer up questions and reasoning's for future research into the field. It will draw upon and contribute to scholarly literature that is concerned with remote communication devices for children.

It sets out an agenda for future research into the field of remote communication devices for children that will be explored further by the principal author in the forthcoming research project Smart Networked Toys.

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## High Tea at the Conviviality Cafe: Research Tool or Design Intervention?

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### Abstract

The FLEX project asked how we might age convivially at home. In response to concerns about an ageing British population, we looked at social factors of wellbeing in the ambient realm of neighbourhood encounters. We report on how we asked our research participants in Newcastle, north England, and Dundee, Scotland, about their understanding of conviviality, using a café environment to inspire a relaxed and friendly exchange of views over tea. We consider the way that questions were designed into the two courses of the meal and ask: is this perhaps a form of research-through-design for social contexts? Certainly, participants responded to the environment and subtle questioning style. And we draw a contrast between this form of designing - for use in research - and the more summative purpose of the exhibits that also came out of the project.

### Author Keywords

Ageing; social design; probes; questions; conviviality.

### Research Imperatives

*"Places make people. Thus when we ask questions such as, 'What kind of place do we want to maintain or bring about?', we are at the same time asking the question 'what kind of people do we want to be?'"* (Brook, 2012, p112)

An ageing population and spiraling costs of care suggest that a challenge is living well at home for longer. And with the loss of meeting places, there is a need to ask what a serendipitous social life now looks like for people as they retire and beyond. How might people adapt their homes and lifestyles to experience the wellbeing of staying in touch with the neighbourhood as other horizons shrink? What are the private/ public boundaries in sharing space and other resources? And what divides 'convivial' from 'invasive'?

The research reported here was set in the context of diminishing numbers of places for people to meet serendipitously, with the rise of online activity, the erosion of High Street meeting places and the loss of social facilities such as community centres, pubs and other informal spaces in which people have traditionally gathered. As Hickman (2010) describes it, the 'third places' of 'neighbourhood infrastructure' are disappearing.

To collect people's opinions about remedies to address this trend pointing towards social isolation, the *Connected Communities "Flexible Dwellings for Extended Living"* (FLEX) project, funded by the UK's Arts and Humanities Research Council, talked with ageing and housing experts and motivated members of the public in Newcastle and Dundee. We used the chance to learn how housing (and ways of living in and around it) might accommodate public, shared and private life, being modified to make dwellings more socially flexible for people as they age in place.



Figure 1. Participants choose their own moment to pick a question as they talk and eat sandwiches at the High Tea.



*Figure 2: Questions are stuck into sandwiches and cakes, hidden in saucers and placed under plates.*

## Probes and Questions

How does one enquire about such a topic without running long-term experiments? Wallace et al. (2013) describe how designed objects are used to elicit subtle and thoughtful responses from participants in 'cultural probe' studies (Gaver et al., 1999). These probes are one-off designs, prepared for a context, setting an agenda and anticipating types of response but not controlling them. Rather, probes are suggestive, given over to research participants to interpret.

But, in real-time situations, when participants in a study are brought together to investigate a relational phenomenon, how does one relinquish control of ideas while setting a context? Is it possible to relax the conditions of face-to-face encounters, work on atmosphere and move away from formal semi-structured interviewing to a shape of event which lets a conversation develop - designing ones stimuli accordingly to inspire the necessary reflection?

Interviewing is not often regarded as requiring design skills. Methodological textbooks - such as Kaplan (2004) and Tracy (2012) - show how constraints, opportunities, materials and traditions meet in the preparation of questions, just as in projects that set out to design more conspicuous tools. Quantitative and qualitative methods of data collection both use conventions built on considerable design work. But questions are principally used in disciplines that do not wish to emphasise the idiosyncrasy of each situation. Rather than play up novelty, as design tends to, qualitative research, to which the technique of questioning often belongs, stresses comparability of conditions. Too much creativity serves to undermine the perceived accuracy of interviews, thereby threatening the validity of the findings derived from them.

## Research Process

The FLEX team was engaged in research on social design. As part of planning the research, we asked if social design can take a

research-through-design approach without imposing on our participants. By this we meant that we did not plan to test out a full set of new living conditions on a group of people who had not yet reached the stage in life we were considering – it would have been a major (and possibly unethical) experiment and not guaranteed to reveal any more of their attitudes than a carefully staged set might elicit. So, we attempted to place people in a context that was suggestive of the atmosphere and issues we were considering.



*Figure 3: Rustic styling, mixed tea sets and a candle in a cup all add to the relaxed feeling at the discussion table, softening the impact of the digital recorder in the midst of the event.*

A decorated café and ingeniously positioned questions invoked the conviviality we wanted to discuss. In this sense, it was research-through-design, but there was no artifact as such, as designing

social process does not necessarily involve *things*. That said, our methods, like Wallace et al.'s (2013), were designed specifically to fit the question that FLEX posed.

We invited strangers with different housing experience to come to tea. We let participants self-select after inviting people to register through extensive mailing lists. We only stipulated they should be at least 40 years old. Our intention was to catch the generation that is beginning to consider retirement and empty nest possibilities, but has not yet reached the situation we were discussing. Do people plan ahead and what types of changes would be required to make social wellbeing part of the planning for getting older?

After the events in the two towns, we transcribed the recorded discussions (Fig. 3) and analyzed them for consistent and divergent themes and how these related to our core question about conviviality and crossing physical and social boundaries to increase ambient sociality.

As mentioned, to engage our participants, we designed a convivial space and, quite literally, flagged up our questions. We ran high tea events that sought to capture the qualities that we were investigating. We decorated a café and served up savoury and sweet tasty treats. We used flags in the food of the two courses to set the agenda (Fig. 1 and 2) so people could digest the questions and respond at their own pace. There were two groups of flagged questions – colour-coded by course, with each question a different shade to help people collect the set. The first, sandwich, course was concerned with *What do we and would we share?*, broken down into six sub-questions: *What do I share now? What could I share as I get older? What would I share? Where does sharing happen? How does sharing happen? How does sharing change as I age?* The second, cake/scones, course concerned *How do we live convivially as we age?* and the related discussion flags were: *What makes a home? What does it mean to live flexibly? What changes in living do I expect to make? What alternatives do I think should exist?* After each set of questions and a facilitated discussion by

team members, we joined up the tables for a plenary discussion so that participants could report to each other. We concluded each tea party by suggesting participants each take spare food away with them to share with others, continuing the spirit of the event.



Figure 4. Installation that picks up FLEX themes on display at Dundee.

### Research Outcome: Reflexive Environments

In one respect, this was a classic focus group – a diverse set of people being asked for their views over a finite time by researchers.



Figure 5: Detail of installation showing teacup.

In another, it could be considered research by design. We worked to make the encounters delightful and entertain our guests. We allowed people to stumble on questions and take them at their own pace, giving steerage without intrusion. This aspect of the work was rewarded when a participant, trying to explain how facilitated common spaces might work, waved her hand around her and said: '*Like we came in here today and there was an atmosphere with the candles on the tables, cakes and it invited you in and you wanted to come in. Some communal spaces are just dead.*' (participant comment, Newcastle event).

We can contrast the café environment used in the research with the installation shown at Dundee to share ideas that came out of the research and report back to participants (Figs 4 and 5). In the exhibition, we showed pictures from the tea parties on a screen mounted in a large installation. This installation demonstrated symbolically the idea of 'porous design', being a frame made of insulation material with iconic elements, such as a hanging light bulb and tea cup (Fig. 5) to represent aspects of home. *Porous design* was the name we gave the social and physical elements that can be introduced into a neighbourhood to promote conviviality and social wellbeing, such as sharing schemes (social) and porches (physical) that allow others' actions to be visible and accessible to those living with them. This porosity was captured in the exhibit as a way to intrigue spectators, but the exhibit was not used explicitly as part of the research process. If it posed questions in the minds of those gathered, we only heard these in a small amount of feedback. This was design in response to research: we created these artifacts as part of the FLEX process of reflection; no loop was closed by showing them. That said, we hope that we may be able to work with a stage set, echoing the installation, in the future, to create physical spaces for discussion that further embody some of our questions. This was a thought experiment in that direction.

At our session reporting back in Newcastle, we stayed with the more familiar format of a tea party while we presented ideas and

images from the research in a slide show to some of our participants and others concerned with ageing well. Again, we found we were bringing together strangers in an accessible fashion.

So, the tea party scenarios were more ambiguous. If we are designing to increase conviviality, then there is a degree of reflexivity in inviting people into a convivial environment as part of talking to them about what it means to them. Did it work convivially? We did not pose that question explicitly. In the same way that we used tangible questions (on coloured flags like other decorated cocktail sticks) so that these could be muted or hidden, allowing conversation to flow, we did not explicitly ask whether we had designed a convivial space of the kind that might encourage older people to gather. It was therefore all the more interesting to have the space acknowledged by a participant as exactly the kind of environment we were talking about. Thus, in staging the High Tea, we asked about the boundary between research tool and design intervention, even as we researched how to stay socially engaged as we age and the boundaries that people wished to maintain or break down in living together in the future.

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