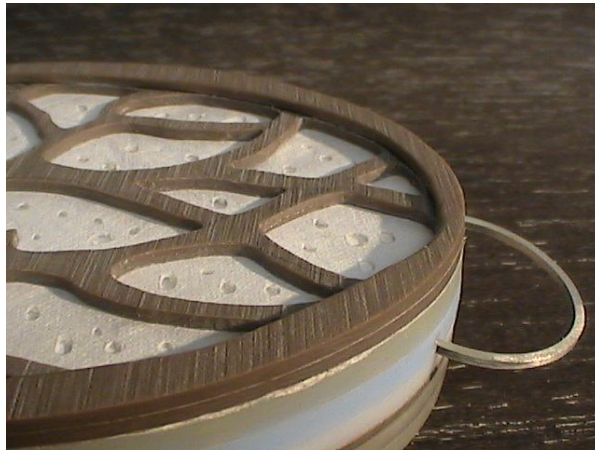


# CRAFTING THE WEARABLE COMPUTER

## DESIGN PROCESS AND USER EXPERIENCE



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of the Degree of Doctor of Philosophy  
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## Abstract

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The purpose of the research described in this thesis was to develop a design methodology for Wearable Computing concepts that could potentially embody authenticity. The Wearables community, still firmly rooted in the disciplines of engineering and ergonomics, had made clear its aspirations to the mainstream market (DeVaul et al 2001). However, at this point, there was a distinct lack of qualitative studies on user perceptions of Wearable products. A review of the market research literature revealed significant consumer demand for authenticity in goods and services, and it was this need that drove the program of research.

The researcher's experience as a contemporary jeweller led her to question the positivist design processes of Wearable Computers. The 'borg'-like aesthetics that had come to characterise these products reflected their origins in the laboratory, and implicit configurations of the user appeared to be acting as a barrier to wider adoption. The research therefore looked to Craft as a creative process with a fundamentally different working philosophy to begin building a new methodology for Wearables.

Literature reviews of authenticity and Craft were conducted to provide the theoretical framework necessary for a practice-led enquiry into the design process. Further empirical work was undertaken in the form of the comfortBlanket, a concept design project, and a small survey of makers to provide a set of protocols for craft informed design processes. Following this, a suite of wirelessly networked jewellery was designed for a friendship group of five retirement aged women, and built in collaboration with the Speckled Computing Consortium, Scotland.

The user centred methodology is informed by Actor Network Theory to account for the agency of the researcher and the event of task based analyses, and includes lifeworld analysis techniques drawn from a range of disciplines such as psychology and experimental Interaction Design. Three data sets collected over the course of two years were analysed using Grounded Theory, and a novel visualisation tool was developed to illustrate potential commitment to the novel concept designs. The methodology revealed a story of *what* the women made of the jewellery, *how* they enacted these understandings, and *where* this process took place. It was found that evaluating concept designs for the everyday and for authenticity require different approaches and that the design process does not end with the user, but with a reflexive analysis by the designer or researcher. In many respects the proposed methodology inverts standard design practices, presenting as many questions as it seeks to resolve.

The methodology is presented as a contribution to emerging communities of practice around Wearable Computing, and to those developers seeking to position their products in the everyday. It is a challenging process that embodies authenticity in its post-structural treatment of functionality, the user and evaluation. Finally, the implemented wireless jewellery network represented the first application of Speckled Computing, and it is anticipated that the theoretical frameworks arrived at will also be of interest to Interaction Design and Contemporary Craft.

## Acknowledgements

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I am forever indebted to Richard for his unfailing support and musical interludes, to Ben and Lucie who have never known any different, and to my mother who is constant.

Thank you to the School of Computing at Napier University for inviting a jeweller into their midst and for introducing me to Wearable Computing, to my supervisors Dr. Michael Smyth and Dr. Alison Crerar for years of fruitful discussion, and to Professor Jessie Kennedy for bringing us all together.

Finally, the work would have taken a very different course without the generosity of Professor D. K. Arvind of the Speckled Computing Consortium (Scotland), the indefatigable enthusiasm of Mr. Frank Greig at Napier University, and the kindness of Professor Dorothy Hogg, head of the Silversmithing & Jewellery department at Edinburgh College of Art.



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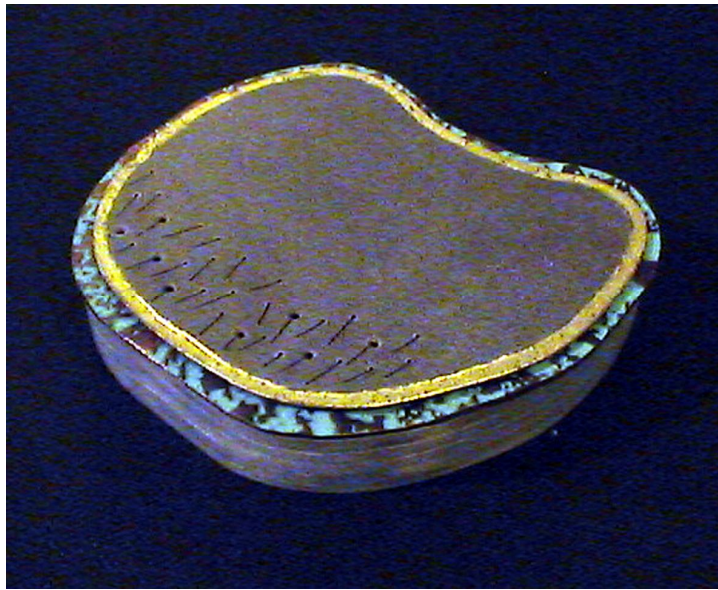
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**Chapter One****Introduction**

When this program of research began in 2002, Wearable Computing was a field beginning to emerge from the disciplines of electronic engineering and ergonomics. The previous year the community had issued a white paper to the effect that ‘the everyday’ constituted an exciting and logical design space which the paradigm should aim to address. With developers focused on the values of functionality and efficiency for the workplace however, no studies on the cultural adoption of such products were yet available. It was this need for a more considered approach to the potential metaphorical nature of wearables that motivated the work undertaken and described here.

The central aim of the research has been to evaluate Contemporary Craft as a novel methodology for the design of ‘authentic’ wearable computing artefacts for the everyday. This introductory section describes the key influences informing this goal, and traces the relevant research on wearables as cultural and aesthetic artefacts. It calls into question what the authors of the 2001 white paper meant by *the everyday*, and identifies a contemporary consumer demand for ‘authentic experience’ as an important driver for the research. The structure of the rest of the thesis is then given.

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**1.1 Emerging Issues in Wearable Computing****1.1.1 *The spectacle of the ‘borg’***

The researcher’s background in contemporary jewellery and to a lesser extent fashion design, informed her reactions to images of early wearable

computers. With an overriding aesthetic essentially indebted to the 'borg' and little attention being paid to "the human element" (O'Mahony 2002, p.96), these devices did not present themselves as particularly wearable (figure 1/1). They were rather the product of enquiring minds in engineering, most notably those individuals at the Massachusetts Institute of Technology who sited their experiments on their own bodies, enabling them to conduct longitudinal studies of what it meant to literally wear a computer, and they were a part of a particular representation of an exotic technological future (Chang 2005, Michael 2006, figure 1/1). O'Mahony points out that the first wave of wearable consumer products, hybrids of existing products such as the watch and the telephone, merely reflected "a penchant for science fiction films" (2002, p.106). The symbiotic relationship of dramatic narratives in the form of science fiction novels and films with the development of wearable technologies is undeniable and fascinating (the researcher in conversation was told how Starner and Rhodes were influenced by the novels of Philip K. Dick, while scientists regularly act as technology advisors on Hollywood releases such as *The Matrix*) (Rhodes 2002, Technovelgy 2004, Watier 2003).

Applications for these ultimate mobile devices were envisaged as including the military (naturally, as much of the research impetus resulted from DARPA originated funding), assistive technologies for the elderly and post-traumatic disorders, and for personal sports and health monitoring through the capture of physiological information, remembrance agents, augmented wayfinding, stock picking and retail, and assembly, production and maintenance processes, particularly in complex design situations.



figure 1/1

the MIT 'borgs' at the Wearable Computing research lab

The outstanding issues for wearable computing were listed as being power supply, cognitive load, interoperability and standards, control of privacy, and wearability (Martin 2001, Starner 2001a, 2001b, Starner & Rhodes 2002). The most relevant of these for this research, wearability, was generally treated as an issue concerning the optimal distribution of components across the body, and addressed through the measurement of comfort experienced by the user (Knight et al 2002, Gemperle et al 1998); sometimes it was addressed as an interaction problem, for example in siting interfaces for ease of use (Thomas et al 2002), or in the development of new ones that could be operated unobtrusively, such as the 'Twiddler', a 'chording' keyboard strapped to one hand (Clawson et al 2005, Lyons et al 2004, see figure 1/2). Any social aspects of wearability were understood to be solved by the thorough concealment of the



system, and this became an over-riding goal in placing devices on the body (DeVaul et al 2001, Dunne et al 2002, 2004, MIT 2003, Schwartz & Pentland 2000, Toney et al 2002). For example, “the Smart Vest must be comfortable to the wearer and as visually undetectable as possible to onlookers” (Schwartz & Pentland 2000, figure 1/2).



figure 1/2

concealment: MIT Media Lab Wearables project MIThril

In contrast, for Steve Mann, the interface was bound to be more or less visible to the observer, and as such, became the computer, phenomenologically speaking. That is, what was visible was seen to constitute the system and its role within the wearer’s psychological and physical space. This constituted an interesting implicit understanding of the user not as autonomous, but as aware of others’ gaze, that is, of a socially accountable wearer (Goffman 1959, 1963, Ihde 2002). Mann termed this perception of the wearer and system as a unified whole the

*existential computer* (1997). Like Weiser's vision of the disappearing computer (1993, 1994), the intention was that the once strange and therefore highly visible interface would become a part of the entirety of the perceived existential whole, familiar and thus no longer seen. His approach has been to make the most of shrinking component size and increasing memory and power capacity to build ever smaller and ever less detectable interfaces, fitted into existing familiar technologies about the body (for example, in glasses). Although Mann's research aims often remain critical, the resistance they offer occurs through invisibility rather than expression (1997, Daftcyborg 2007).

These examples illustrate an important operating philosophy within the domain, that is, Wearable Computing as a subset of Ubiquitous Computing, had inherited the seamless ideal of the unobtrusive contextually aware device, and although there are some comments regarding negative social perceptions of a person fiddling in a pocket, or seeming to talk to himself in the street (Rhodes 2002, Strom 2002), at this stage, no real differentiation was being made between concealment of the device (covert wearing) and concealment of use (covert interaction). Nor were there any attempts to deal with display as a human behaviour enacted through worn artefacts or other objects. The aim of this research, then, is to extend the notion of wearability to cover these wider cultural issues. Starner himself, one of the original MIT 'borgs', recognised that wearables represented an "unusual intersection of science, engineering, design and fashion" (2001b, p.60), and went so far as to suggest that an inverted design process, which placed form factors before functionality, may be appropriate (2001b). However, attempts to glamorise wearables by presenting them in fashion shows as in figure 1/3 were generating skeptical reviews (Businessweek 2002, Rettberg 2004).



figure 1/3

technology on the catwalk:  
 the KITTY keyboard independent touch typing system  
 and Charmed at Brave New Unwired World

This was the state of the art in Wearable Computing technically, sociologically and aesthetically when DeVaul, Schwartz and Pentland's white paper emerged, setting out the everyday as the "last frontier" for the paradigm (2001). To many, the researcher included, it was apparent that there was a desperate need for a far deeper awareness of the social practices and meanings of dress and adornment.

### *1.1.2 Computational Wearables*

Like the researcher, other individuals from similarly design oriented disciplines were becoming alarmed at the mainstream aspirations of Wearable Computing as it stood. As Michael put it, "many future bodies are spectacular (in the situationist sense)" (2006, p.57), and the difficulty for wearables in the everyday is overcoming the increasingly established spectacle of the borg. As such, the investigations described in this thesis must be read as a part of the developing discourse on the potential of wearables as culturally embedded artefacts (Sengers et al 2004, Watier

2003). Early signs of dissatisfaction with the aesthetics of wearables can be seen in Post and Orth (1997), Post et al (2000), Co (2000), Galbraith (2001) and Orth (2001). The research into eBroidery undertaken by Rehmi Post and Maggie Orth among others, was delivered at the first International Symposium for Wearable Computers in 1997, and continued in the doctoral work of Orth, all working at the Media Lab at MIT. This approach to the electrical properties of textiles and yarns allowed the authors to create flexible computational garments and toys, making use of embroidered fabric switches, fabric buses and conductive snaps to join layers of fabric to each other, or to circuitry and peripherals (Post et al 1997, Orth 2001).



figure 1/4

International Fashion Machines: Electric Plaid

Orth went on to co-found International Fashion Machines with Joanna Berzowska, developing her collaborative research into commercial products such as Electric Plaid (figure 1/4) and the Dynamic Double

Weave wall mounted textile, and recently, a series of pom-pom dimmer switches (International Fashion Machines 2007). Their contemporaries such as Elise Co, and successors, like Megan Galbraith, described themselves as developing ‘computational wearables’, differentiating their approach from that of the Wearable Technology Group in their emphasis on aesthetics as critical to how wearables might be configured by users (Galbraith 2001, Co 2000, figure 1/5).



figure 1/5

Elise Co: Puddlejumper

Megan Galbraith: Twirl

Joanna Berzowska, now Assistant Professor of design and computation art at Concordia University, recently described the intimacy, softness and slowness of much of her work as referencing and critiquing the fact that “technological development is largely focused on speed and hard edges” (Berzowska & Bromley 2007). Her prolific output and work with students has driven forward much of the textile research underpinning the computational wearables approach (see for example Berzowska 2005a, 2005b, Berzowska & Coehlo 2005, Hexagram 2007, XS Labs 2007), and more recently has been instrumental in extending the practices of Physical Computing in important new directions (reSkin 2007, Igoe & O’Sullivan 2004). Figure 1/6 illustrates Berzowska’s Constellation Dresses, one of a series of playful designs that address the concept of

power, both hegemonic and pragmatic: when snaps are used to connect two of the dresses together, constellations of LEDs light up on the garments (Berzowska 2007).



figure 1/6

Joanna Berzowska: Constellation Dresses

These researchers and makers, like the author, work on the premise that “objects have consequences” (Kwint 1999, p.4). The work presented in this thesis deals with the methodological implications of that assumption, unraveling the formal elements of craft objects, physical prototypes and implemented interactive systems through the lens of Actor Network Theory (Ellis 2004, Ihde 2002, Latour 1997, 2005). In the introduction to *Material Memories*, Kwint claims that objects have become mere props supporting a romantic tale of tradition, rather than performers in the here and now (1999, p.13); however, post structural frameworks emerging in Interaction Design reinstate the object as an agent in systems of meaning, whether these systems be concerned with the creation of



traditions or futures (see Chapter Two). In the meantime, commercially available wearable technology currently on the market may similarly be split along the lines of the functional and the expressive, not least because the key players already mentioned have been instrumental in the creation of leading spin-off companies. The positivist, functionality led market area is exemplified by Xybernaut and Charmed, headed up by Steve Mann and Thad Starner respectively, producing the Xybernaut MA series (figure 1/7) and the CharmIT, the commercial market's most established multi-purpose wearable products (Viseu 2005, Watier 2002, 2003).



figure 1/7

the developer's vision:  
Xybernaut Mobile Assistant promotional images

These are aimed at the telecommunications, healthcare, government, aerospace and military sectors (Xybernaut 2007a), although the CharmIT no longer enjoys a central position on the company's website, surpassed by the more specifically targeted CharmBadge for conference attendees (Charmed 2007). It has been noted that these companies do not perform well in financial terms (Lightman 2002, Watier 2002, 2003), and it is telling for the field that Xybernaut's newer product, the Atigo, is less a wearable than a hand held tablet (Xybernaut 2007b). On the other hand, International Fashion Machines, run by Orth, has developed affordable consumer products such as pom pom light switches and dimmers, and a Fuzzy Sensor Development Kit aimed at toy and fashion developers for \$99 (International Fashion Machines 2007). Elise Co works with another MIT alum, Nikita Pashenkov, on installations and wearable projects through their company Aeolab, focusing on interactive media and reactive spaces (Aeolab 2007). Joanna Berzowska researches and advises on the integration of textiles with specific electromechanical properties into existing production methods for the fashion and interiors markets, although "it is still difficult to imagine a production line where technological development occurs alongside garment design" (Berzowska 2005b). Explorations like German company Infineon's collaboration with fashion design students in Munich continue to be the most common working model, as tiny profit margins and increasing production speeds in fashion deter investment (Technology Media 2002, figure 1/10).

In the UK, Intelligent Textiles Ltd. has begun producing an enabling technology for truly flexible applications on the body (Swallow & Thompson 2005). This power conductor is spread evenly across a fabric structure, resulting in a high enough level of redundancy that it can be cut without interrupting data connections, and changes in resistance can be monitored to give sensing behaviour (figure 1/9). Swallow and Thompson have developed the technology to such an extent that they have supplied



SoftSwitch and Eleksen, resulting in commercial products for healthcare and sports applications being brought to market (Intelligent Textiles 2006, Swallow & Thompson 2005, figures 1/8 and 1/9).

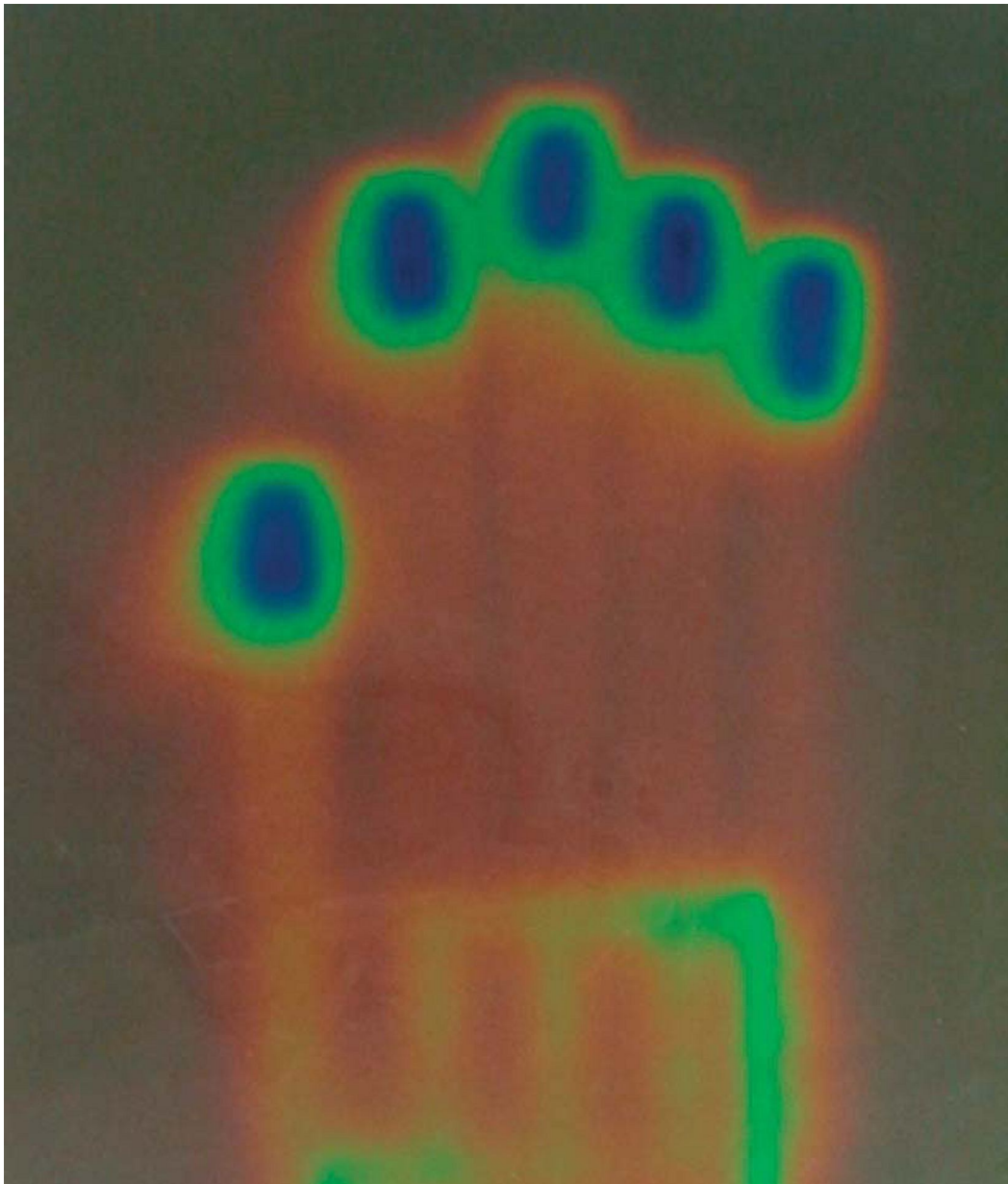


figure 1/8  
Intelligent Textiles: heated glove liner



figure 1/9

Intelligent Textiles: fabric keyboard

Mobile phones have increasingly been designed as fashion accessories with various levels of success: Siemens for example placed their short lived Xelibri range within the constructs of fashion, complete with seasonal collections and tongue in cheek glossy advertising (figure 1/11), and Nokia has experimented with different forms and materials to expand their range of products, working with design consultancies to understand the “DNA of design” (SeymourPowell 2006).

Nokia are also responsible for the luxury Vertu mobile, referencing the traditions of fine timepieces and craftsmanship through the use of ‘authentic’ materials such as platinum and steel (Murtazin 2002, Nokia 2002, Vertu 2006). Motorola has collaborated with Oakley (fashion eyewear) and Burton (skiwear), to produce Bluetooth enabled lifestyle products such as headsets for mobiles, stereo eyewear, and printed control panels on jackets (eCulture 2003, Walston 2005), while

telecommunications companies and ‘lifestyle’ companies, such as British Telecom and Philips, treat wearable technology as a part of their wider R&D remit (Chang 2005, Pearson 2005, Philips 2000). Philips in particular has released some of its lifestyle research in relation to wearables in *Nomadic Lifestyles*, creating each prototype around a ‘story’ (2000). Although these global companies have the resources, their early investigations into wearable technologies await the ‘killer app’, with some highly visible research labs, such as Philips’, being reintegrated into the larger R&D strategy. But Abowd and Mynatt hold that perhaps wearables are not about the killer application so much as the “killer existence” (2000, pp.31-32), and it is suggested here that the motivations, production processes and framing mechanisms of wearable products require a radical reconceptualisation to meet this challenge.



figure 1/10

Infineon: integrated fashion and technology



figure 1/11

framing the product: Siemens Xelibri -  
promotional campaign by fashion photographer  
David La Chapelle

User centred design processes are necessary in wearables development, and have been widely applied by the developers of products for the workplace. However, these have largely been quantitative and geared primarily towards the technological and functional issues as discussed in section 1.1. It is only very recently that interest in ‘soft functionality’ and qualitative methods have started to gather critical mass – one of the signs of a maturing field (Maxwell 2002). An excellent example can be found in CuteCircuit’s approach. This is a small company in the UK specializing in wearable interfaces for telecommunication, founded in 2004 by two Ivrea Interaction Design Institute graduates. Using Interaction Design methodologies to focus on user experience, they aim to create products that are “economically sustainable, technologically feasible and emotionally desirable” (CuteCircuit 2007, figure 1/12). As an explicit



design process, however, these are still early days, and there remains very little in the way of academic research into what end users make of wearables (as opposed to a client such as a telecommunications company implementing a mobile workforce strategy); what there is, has generally focused on workplace contexts (Viseu 2005, Watier 2003). These, and others, have found serious disjoints between the visions of the major developers and actual experiences in use (Boehner et al 2005, Dunne et al 2005, Watier 2003, Viseu 2005).



figure 1/12

signs of a maturing discipline: Cutecircuit's Hug Shirt

## 1.2 Jewellery as a specific area of interest

A potential contribution was identified in this lack of studies and as a starting point, contemporary jewellery seemed to offer the researcher a rich field for investigation, with all its implications for social visibility and communication (see figure 1/13). It seemed particularly suitable as a tool for thinking about the ways in which people adorn themselves to negotiate the multiple spaces of their social worlds, and would also sidestep some of the consumer issues with 'smart' textiles, such as the tension between the demands of fashion and everyday dress. Consistent concerns include the washability of circuitry and the apparent need to wear the same jacket everyday in order to listen to music (Watier 2003). Jewellery has the obvious advantage of being transferable to different outfits and does not need washing. The choice of jewellery as an approach is also supported by the fashion literature, which offers an account of the contemporary performance of dress as being restricted by increasingly homogenized global systems of provision (Brassett 2005, Briggs 2005, Hill 2005, Designing for the 21<sup>st</sup> Century n/d, Sawchuk 1987, Wilson 2005). In looking for ways to nuance their appearance, consumers turn to customization, unique or hard to find products, and the accessory, which moves from a supporting to a central role in the dress act as a result (Durschei 2005, Fox 2004, Marchetti 2005, Polhemus 2005, Sledziewski 2005). To use an Interaction Design metaphor, jewellery is at once an internal and an external interface, standing for the private body as well as the extending the dramatic reach of the public one, and embodying the 'body one' and 'body two' that Mann acknowledged (Ihde 2002, Mann 1997, Sandino 2003). It also embodies an interesting temporal paradox for interaction in the passing nature of the accessory with the permanence of the crafted jewel (Lehmann 2000).



figure 1/13

communication and display: talking about D-Day  
at a gallery opening, Edinburgh

Contemporary jewellery in particular offers “an opportunity for creative exploration of the physical and psychological space of the body” (Game 2003, p.6), and gathers importance as opportunities to wear traditional, value-based pieces shrink or become obsolete in today’s increasingly casual culture (Hogg 2004). Jewellery as a cultural construct of course, marks time and celebrates events, and for those who claim not to wear it, Mah Rana’s *Jewellery Is Life* project is a revelation. Focusing on jewellery encountered in the everyday, Rana conducted workshops to unearth embodied memories and narratives of the self and others (Rana 2004, 2006). Australian jeweller Susan Cohn similarly finds the New Jewellery (a term coined in the 1960’s to describe the contemporary movement) over concerned with material and formal issues (Cohn 2007a). Her work is based on keen social observation, and through making she asks the question “What does technology look like?” (Cohn 2007b). Using a range of manufacturing techniques and materials she questions the established conceptual frames of consumption (Kennedy 1999, Watkins 1999, p.100).

While jewellery has been referenced in the past in the wearable computing domain, this practice has more often than not been “opportunistic” (Wallace 2004, Wallace & Press 2004, see figure 1/14), taking little or no account of the ways in which jewellery is brought into play socially and culturally. Until a couple of years ago, jewellery forms tended to be listed merely as potential sites for the housing of components (Starner et al 2000). However, artists and interaction designers at the fringes of the wearables community have been engaging with these implications, and there are a handful of jewellers who are currently engaging directly with technology to interrogate the implicitly deterministic values of the classic wearable computer (Kettley 2007c, Wallace et al 2005, White & Steel 2007). Three contemporaries of the researcher are introduced in the following section.



figure 1/14

opportunism in design: IDEO concept designs

### 1.2.1 *Related work*

As the work progressed, the researcher came into contact with others in the same field, and was able to refine her goals in relation to the



emerging field. While there has been explosive growth in this area over the past five years, due in part to the increased visibility of works in progress as well as finished concepts documented on individuals' weblogs, these three UK based makers shared common ground with the researcher in their beliefs and backgrounds, and in the early stages of their research.



figure 1/15

Jayne Wallace: Only Once

Jayne Wallace focuses on the fragility of human attachment by inverting expectations of reliability and repeatability in technology, her flower pin for example blooming “only once” (figure 1/15) , and her memory-laden pendant sending images to local screens “only sometimes” (Kettley 2007c, Wallace 2004). Ulli Oberlack collaborates with a dance company to explore histories and meanings of light on the body (Kettley 2007c, Oberlack 2005, Partington 2004, figure 1/16); and the body is implicated in explicit ways by Hazel White, whose work frequently lays bare the intimate body as discussed by Sandino (2003, and White 2004, figures 1/17 and 3/4). Recently White has begun working with a programmer to investigate the ways in which animations associated with physical pieces evoke feelings of ownership in people, taking on an unexpected materiality. This work is being continued to investigate scenarios for

digital jewellery requirements (White & Steel 2007). The research undertaken by the author adds to this field in its focus on the active role of jewellery within a social group, that is, in its focus on the external interface of the worn object and in its treatment as a distributed network.



figure 1/16

Ulli Oberlack: emissive jewellery



figure 1/17

Hazel White: Permanent Fixture wedding ring

Further, much of the discourse on dress and jewellery takes a semiotic stance, treating the expressiveness of dress acts as language (Barnard 1996, Lurie 1981, Polhemus 2005). In contrast, this research seeks to return to a concern with materiality evident in the recent fashion literature and in critiques of post-modernity (Entwistle 2000, Entwistle & Wilson 2001, Foster 1996, Galloway 2004a, 2004b, Mazanti 2006, Sandywell 2004). In this view, the jewellery is intended to act as a site of ambiguity rather than of specific narratives, inviting embodied understanding and meaning making on the part of the wearer as well as the viewer. This objective is further explained in the following section on authentic experience, before contemporary craft is proposed as the basis of the experimental design methodology for the work.

### **1.3 A growing demand for authenticity**

In thinking about the everyday as a collectively enacted experience, the researcher began looking for shared consumer attitudes which might be designed for. What emerged was a significant demand for the authentic found across the board in market research and trends analysis (Boyle 2003, Cagan & Vogel 2002, Datamonitor 2002a, 2002b, 2007, Ind 2003, Lewis & Bridger 2000). A significant cultural shift in attitudes to consumption was claimed to be underway (Lewis & Bridger 2000), characterized by the rise of the 'New Consumer':

Living in economies where their basic needs are quickly and easily satisfied, New Consumers are far more concerned with satisfying their wants, which frequently focus on original, innovative and distinctive products and services. As a result they tend to reject mass-produced and mass-marketed commodities in favour of products and services that can claim to be in some way authentic.

Lewis & Bridger 2000, p.4

The State of the U.S. Consumer Report 2002 identified authenticity as a 'comfort value' in a time of uncertainty, and pointed to growth in areas such as organic foods and ecological packaging (Stark 2002). The same report cited other market research as identifying two meanings of authenticity: the original, or traceable product, that is, a product with a distinct narrative or point of origin; and the substantive, or "things that are honest, that are what they say they are" (Stark 2002). Other terms used were 'reliable', 'integrity', and 'trustworthy', while in a different section, the report stated that there was increasing concern that businesses act "ethically and with integrity". Datamonitor, a British market research group, also noted the trend: "Consumers have a growing perception that mass-marketed goods distributed through national chain retailers are often bland and uninteresting" (2002b) and "consumers are increasingly purchasing goods based upon their values and ethics" (Datamonitor 2002a, p.1). A growing need for meaningful connections is also evident in the Slow Movement and the Long Now Foundation (Brand 2000, Honoré 2004), and has been identified as an inevitable return to "hippy values" by Pearson & DiDuca (2005).

### **1.4 The Experiential in Interaction Design**

The research also seeks to contribute to Interaction Design's interest in the experiential. This is a long-standing concern in design in general, and has seen new roles emerging over the past few years in multidisciplinary teams to support the application of new understanding; these include User Experience designer, User Experience Researcher and Experience Modeler (Forlizzi & Battarbee 2004). However, there is still a need to better understand how to put theories into action. This research hopes to contribute to the development of such tools, methods and processes towards this aim, and reports on a methodology grounded in the Craft

discipline of Contemporary Jewellery. The importance of striving to “extend beyond mere laboratory prototypes” (Davies & Gellersen 2002) when trying to design for the everyday became increasingly evident throughout the formulation of the research questions over the course of the first year of the doctoral program, and the subsequent interdisciplinary investigations form an important part of the thesis. At the heart of this work is an agreement with Hallnäs and Redström’s enquiries into the fundamental nature of experience and the ‘wicked’ hermeneutic circles of the design process (Hallnäs & Redström 2002, 2006, Redström 2006). By this, they mean that nothing given is fixed or guaranteed, and so the designer cannot ever fully know or predict the user of their product, the form of the product, the uses to which it will be put, and the motivations that will lead to its being put into use in the first place. This is something of a radical departure from the positivist product-centred, user-centred and even interaction-centred approaches described by Forlizzi and Battarbee (2004). It is an important distinction to make because the central proposition is that Craft deliberately keeps those hermeneutic gaps open, and that it is this working philosophy that makes it a model for future Interaction Design (see Chapter Three).

## 1.5 Towards craft as a methodology

The primacy of explicit information in Interaction Design and HCI, which Coyne identified as only one of several possible approaches to computational media (1995) has recently been joined by well argued cases for complementary methodologies and end goals (Kettley 2005a, 2005f). These include Coyne’s own addition of critical and radical approaches to more familiar conservative and pragmatic philosophies (Coyne 1995); the investigation of *seamfulness*, as opposed to Mark Weiser’s *seamlessness* (Chalmers et al 2003); the “rhythms of reflection

and transparency” as advocated by Bolter & Gromala (2003); and the concept of ambiguity as presented by Gaver et al (2003). It seemed to the author that the materiality of craft, its unique position encompassing the everyday and the event, and its multivalency at the level of both the object and of cultural placement, could well have something valuable to bring to this emerging creative environment (Kettley 2005e, Mazanti 2003, 2004; Dewey 1934, in McCarthy & Wright 2003), and that making should therefore form an integral part of the research methodology.

An early exploration of these ideas was developed through the concept design of a reactive comfort blanket for very young children (Kettley & Smyth 2004a, 2004b). This project explored the role of the prototype in user centred design processes for wearables in their broadest definition, presenting parents of young children with a set of concept design boards and a physical ‘look and feel’ mock up of the product (see figures 3/8 to 3/10). Using patchworking as the traditional craft technique and favourite used children’s clothing as a familiar material already invested with personal meaning, the design concept enjoyed a very positive response. However, closer analysis of participants’ comments revealed that the blanket was a symbolically loaded design, but not fundamentally authentic. For example, it referenced other cultures without being of those cultures, and used craft as a signifier of the “gift of time” without being craft as is understood by today’s practitioners (Kälviäinen 2000). This revealed the need for far deeper reflection on what it is that constitutes craft for contemporary practitioners, and this investigation is developed in Chapter Three.

## 1.6 Summary of motivations; research aims and objectives

To summarize the contributing motivations for the program of research, it seemed that Wearable Computing's aspirations towards the mainstream and the everyday were unlikely to be fulfilled as long as social and cultural behaviours remained unconsidered. Growing consumer demand for authenticity suggested increasing market interest in craft; jewellery appeared to answer some of the wearability issues with early commercially available wearable computer products, and more importantly, constituted a rich cultural context which remained largely unexplored within wearables research. The combination of these factors suggested the central aim of the research:

- **to reflexively assess contemporary craft practice as a design methodology for delivering authenticity.**

The main objectives in working towards this were to create a crafted wearable concept and to analyse participants' configurations of it in the context of their lifeworlds. In doing so, the following research questions would be addressed:

- a) what is authenticity, and how might it inform the design process?
- b) how does contemporary craft exhibit authenticity?
- c) what is the everyday, and what user centred methods might come close to it?

The following section gives a short summary of each of the seven chapters in the thesis; the literature reviews on authenticity and craft provide a theoretical basis for the work undertaken, but might be missed

by those interested only in the case study, although the positions taken on each of these topics are relatively novel in their own fields, and constitute contributions to Wearable Computing and Interaction Design. Three chapters then cover the design, implementation and evaluation of a suite of networked jewellery, realised in collaboration with the Speckled Computing Consortium, Scotland, and include a novel technique for evaluating conceptual products in relation to users' lifeworlds. The final chapter reflects on the implications of designing for the everyday and designing for authenticity, and presents further questions and avenues for research concerning the issues with borrowing from Craft for Design.

### **1.7 Structure of the thesis**

*Chapter One* has given the reader the background to the research and explained the motivations that informed the aims and objectives. The structure of the rest of the thesis is as follows:

*Chapter Two* presents the literature review of authentic experience and authenticity, providing context and criteria for the research objectives. The outcomes of this review had a significant impact on how the participating user group was defined, and on the design of the system of wearables, and the thinking behind these decisions will be described here.

In *Chapter Three*, Contemporary Craft is critically reconsidered in light of the findings of the comfortBlanket project. A small survey of contemporary jewellers is discussed in relation to the literature, revealing current motivations and belief systems within the discipline. This results in the proposal of a set of preliminary design protocols for craft as a design resource.



*Chapter Four* deals with the everyday through a consideration of the lifeworld. With reference to Actor Network Theory, novel objects such as wearables are treated as potential actors open to configuration by existing socio-technical networks. The need for such a network for evaluation of a concept design, and for enquiry into the contexts and processes of authentic experience is reiterated. The friendship group enrolled for the main body of the research is introduced, and their lifeworld is described through a collection of methods from a broad range of fields, including Interaction Design and Psychology.

In *Chapter Five*, the design process of the 'Speckled' jewellery is then discussed based on the craft design protocols given in chapter three. The iterative development of the networked jewellery is described, and the rationale behind formal and functional specifications is outlined with reference to the friendship group and to the goal of authentic experience.

*Chapter Six*, the largest, describes the design of its evaluation, and Grounded Theory is introduced as the method used to analyse the audio visual data of the participants engaging with the jewellery. Axial coding is used to create a research narrative composed of *what* the participants made of the jewellery, *how* they arrived at their understandings, and the *contexts* in which the activities took place. A novel technique for plotting data against notional lifeworld distances is presented.

*Chapter Seven* reflects on Contemporary Craft as a design resource for authenticity and draws together the strands of the proposed methodology. This forms the main contribution to Wearable Computing as it seeks to engage with the everyday. Finally, the course taken by the research is critically reflected upon and promising directions for further work are discussed.

The aim of the research is to evaluate Contemporary Craft as a novel methodology for the design of wearable computing artefacts that create a context for 'authentic experience'. This introduction demonstrated how the initial motivations for the work informed that aim, and outlined the research questions and potential contributions. Chapter Two begins the literature review with a consideration of what authenticity and authentic experience might look like.

**Chapter Two****Authenticity**

One of the motivations for the research identified in the introduction was growing consumer demand for authenticity. This chapter presents a literature review of the concept of authenticity, drawing on a wide range of sources including market research, pedagogy, cultural theory and philosophy. The objective is to investigate differences between authenticity and authentic experience, and to arrive at a working definition of authentic experience for the purposes of design and evaluation in the research. Finally, the impact this review had on the choice of user group and on the design of the networked jewellery is discussed.

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**2.1 What it says it is – objective authenticity**

Authenticity is deeply entwined with notions of truth (Ohlin 2007, de Sousa 2007); its definition in the Cambridge Dictionary is as “real, true, or what people say it is” (Cambridge 2006), and “to thine own self be true” has become a favourite maxim of self-help gurus and brand marketers (Guignon 2004, Ind 2003, Moore 2002). It is especially implicated in truth as expressed spontaneously in the creation of the self, spontaneity being unable to hide falsity (Coupland 2003, Montgomery 2001, cited in Carpentier & Hannot 2007, p.11). The authentic hero is often written as one who would transcend social predicaments, acting on their own authority to become “faithful to scripts they have written for themselves” (Barnhart 1988, p.65, Golomb 1995, p.3). This autonomy treats authenticity as an essence, inherent in human beings and objects to a greater or lesser degree, and synonymous with the sublime (Stewart 1999, p.26). Much western philosophy has been concerned with how to maintain an authentic life, while trying to identify what it is about certain

works of art that make them “great” (Golomb 1995, Young 2001). In its often simplistic references to craft, market research would seem to suggest that this configuration of authenticity is the simplest to implement as a strategy for market success (Datamonitor 2002a, 2002b). What things are made of, and the techniques and conditions of their production undoubtedly carry cultural meaning. The following section discusses materials in more depth, while other ‘intrinsic’ elements of authenticity are covered in the next chapter on craft.

## **2.2 Authenticity and material**

Certain materials are considered to be “noble” (Innes 1997, Jordan 2000), “honest” and “natural” (Baudrillard 1968), “familiar” or “contemptible” (Cardwell et al 1997) or “authentic”. Verbeek and Kockelkoren (1997) talk about the ability of previously living, growing materials such as wood or leather to cope with aging gracefully, while Kälviäinen (2000) states that materials carry “strong associations relating to warmth, strength and natural or artificial production”. Ashby and Johnson (2002, pp.73-75) talk about “honesty” and “integrity” in materials that are habitually associated with craftsmanship, such as wood and metal, and point out that polymers, in their plasticity and natural propensity to imitate, appear inherently “cheap”. It is by this very fact that plastics embody a post-modern authenticity; instead of pretension to be something more culturally valuable, plastics have become the material of the everyday, “prosaic” as “artifice aims at something common” (Barthes 1968, p.98): the artificial becomes our authentic condition (Fry 1994, p.79). Such a situation challenges the essentialist view of authenticity that led to modernism’s origins in the crafts, and its maxims of ‘truth to material’ and ‘form follows function’ (Brett 2005, Findeli 1999), and this is taken up further in Chapter Three.

Pre-industrial materials have become ineluctably associated with a particular kind of 'raw' form or of a particular kind of finished work: the 'intrinsic' values of materials is culturally constructed. Pye (1968) points out that when a material such as gold is mentioned, the mental image formed is not that of the material in its natural state as a seam in the earth's crust, but as an ingot, a ring or other familiar form. It has been worked, and the value attributed to it is due to that change wrought by the human hand, by the workmanship applied to it (Blais 1999).

High levels of engagement in making are cited by Dougherty for the popular rise of cultures of DIY and crafting (2006, p.48). Importantly, he also refers to the role of narrative, not in the sense that these individuals are "writing their own script", although that may be the case, but rather that a story emerges for the maker in the creative process, and is told in some way through the object. Narrative, synonymous with reflection, was seen as inherently inauthentic in the early essentialist model, Rousseau's "wound of reflection" being authenticity's downfall in its destruction of spontaneity (Coupland 2003, p.424).

Of course these narratives and culturally constructed meanings of materials are not the whole story – materials and touch enable phenomenological experience with objects. This poses a basic problem for the authentic wearable in its inherited desire for disappearance, as in craft "the medium never becomes invisible" and is "not just a means to make some particular point, but is always part of the point" (Koplos 2002, p.82). Craft's philosophical engagement with the sensuous and the corresponding tendency for makers to focus on a single material throughout a lifetime's work suggest an intimacy and depth that may be mirrored in the experience of the user (Koplos 2002), that "aspect of the real or imagined making in which our fascination is haptic and tactile" (Brett 2005, p.78).

### 2.3 The lure of immediacy – the authentic subject

A turn towards the subject in Twentieth Century western thinking viewed authenticity and experience as being located in the viewer rather than the object, emphasizing presence over abstraction (McCullough 2004, Sandywell 2004, Wilson 2000, p.66). Phenomenology saw the mundane (the things of this world, presupposed by scientific knowledge), as offering up truth in its non-theoretical and pre-technical state (Wilson 2000, p.67). This commonsensical world of ‘coping’ was contrasted with realms of meaning, such as philosophy itself, the sciences, art and literature (Sandywell 2004, Coyne 1995). Characterised by unreflexive thinking, authenticity was conflated with the “methodic work of ordinariness” (Sandywell 2004, p.164). The two major concepts arising from phenomenology of particular relevance here are *disappearance* and *tacit knowledge*. Heidegger’s account of engagement (Young 2001, p.37), in which both actor and tool disappear in the moment of action, has been highly influential in the domains of Human Computer Interaction, early Interaction Design, Ubiquitous Computing and Wearable Computing (Bolter & Gromala 2003, Weiser 1991, Chalmers et al 2003, Norman 1998). Disappearance is still largely held to be the ultimate state of the usable interface, with tasks accomplished through the transparent medium of the computer, which should disappear either phenomenologically or literally as it becomes embedded in everyday worlds and environments (Nielsen 2000, Norman 1998). In this view, tacit knowledge offers a framework for understanding the mechanisms of expertise and familiarity (Turner et al 2004). Tacit knowledge is also significant in craft discourse: the domain took to its heart the romantic notion of integrity and the implicit connection with the natural world conflated with tacit knowledge, and found itself simultaneously depicted as dumb and unreflexive by other creative practices (Gates 2007, Harper 2007, Hickey 1997, Pye 1968).

## 2.4 Subjective authenticity - authentic experience

The individual quest for authentic experience seems always to infer struggle although there is a potential trap in overstating the case for technological primitivism: Wilson says of Heidegger's treatment of the peasant woman in *Origins of the Work of Art*, that "[he] did not seem to realize that serfdom is not truth and existence – authenticity – itself, but a political condition of deprivation" (2000, p.77-78, and Krell 1993, p.160). Figure 2/1 shows the peasant boots painted by van Gogh that Heidegger famously took inspiration from (Krell 1993, pp.158-161, Young 2001, p.22).

Bearing in mind the stereotype of Luddism, trends such as downsizing, Craftivism, the Slow Movement and DIY cultures can yet be seen to indicate a growing emphasis on active personal engagement and commitment in reaction to the perceived in-authenticity of modern life (Brand 2005, Brett 2005, Bursch & Black 2007, Dougherty 2006). Subversion of manufacturing paradigms such as 'fast fashion' through individual and small scale processes of modification, personalization and reclamation have taken on a renewed political intent and can be seen as a means of reintroducing space for self-determination and "tactical moments of resistance" (de Certeau 1984, Marshall 2004, p.40).

Most philosophical conceptions of authenticity involve an unattainable state of ideal being, which should yet be striven towards; "we should still try for in trying we are succeeding" (Golomb 1995, p.204). The main difference between earlier and later attempts at writing a philosophy of authenticity seems broadly speaking to be an attitude to socialization – an individual either removes himself from society to remain pure, and struggle towards the ideal on his own, or tries reflexively to conduct himself within society in a way that allows himself and others to act

towards authenticity (Golomb 1995, Guignon 2004). This humanistic form of authenticity involves notions such as reciprocity, generosity, and gratuitousness, actions more or less attainable in everyday life (Golomb 1995, p.163).



figure 2/1

romanticising technological primitivism

Van Gogh: Boots with Laces 1886

In common with the examples of active engagement above, both of these broadly painted conceptions entail an originating environment of difficulty, ambiguity, hybridity, disconnection (Guignon 2004, Clothier 2005). Both Heidegger and Nietzsche saw artworks as the necessary disruptions that allow us to view ourselves as if from a distance, thereby seeing ‘truth’. Clothier, in a study of hybrid cultures across Pitcairn and Norfolk Islands, found that such mergers are not simply additive, but instead “generate a so-called ‘third space’ of their own authenticity” (Clothier 2005, p.45).



Where each culture was authentic before merger, the outcome is one of authentic engagement; in other words, authenticity and hybridity cyclically regenerate each other, and “hybridity produces new forms of authenticity” (Clothier 2005, p.47). Seamfulness, a pragmatic reading of conditions that might otherwise be characterized as breakdown in Ubiquitous Computing, seeks to redirect the disconnections inherent in technologies to present users with contexts for creative use and engagement, revealing the infrastructure of the otherwise phenomenologically concealed technology (Chalmers 2005, Galloway 2004, 2006).

## **2.5 Beyond dichotomy**

Phenomenology has, however, been criticized for its valorisation of the immediate, and for being just as much a product of tenacious mind/body dualisms as the breed of modernism it sought to critique (Sandywell 2004, Stewart 1999), and thinkers are working towards a new heterological model of authenticity (Coupland 2003, p.425, Carpentier & Hannot 2007). This account of authenticity is a pragmatic one, including narrative in its acknowledgement of the “heightened reflexivity” of today’s world, and seeing the spontaneous creation of the self not as inherently authentic, but as “a performance option” in itself (Coupland 2003, p.426). Finally, recent accounts agree that authenticity is no longer purely metaphysical, but to be found in the humanistic processes of commitment and reciprocity (Brett 2005, p78). Authenticity is shown to be a cultural construct much like any other, without meaning if there is no-one else present to confer authentic status upon one’s actions.

## 2.6 Post-structural frameworks in Interaction Design

Without necessarily explicitly referencing the “tenacious dichotomies” being negotiated by philosophy (Sandywell 2004), theorists in New Media and Interaction Design have also recently begun working towards more heterological models of experience. The frameworks of Distributed Cognition and Social Network Analysis, for example, address the dichotomies of subject/object and individual/social by identifying the site of meaning making as dispersed across networks of individuals (Dourish 2001, Hutchins 1995). Related frameworks of distribution such as Actor Network Theory break open a further dichotomy of human/non-human, including objects, institutions and ideas in these ‘assemblages’ or sites (Ihde 2002, Latour 1997, 2005). Embodied Interaction is a view of experience which places humanity and world on an ontological level; the environment is no longer apart from us, but “a part of our being” (Lakoff & Johnson 1999 p.566), and Dourish in *Where The Action Is*, presents a comprehensive framework of embodiment which seeks to overcome the dualities of mind/body and real/virtual (2001). McCarthy and Wright have returned to the work of John Dewey to construct a model of experience which has “in its primary integrity no division between act and material, subject and object, but contains them both in an un-analyzable totality” (Dewey 1929, pp.10-11, in McCarthy & Wright 2004, p.54), Dewey’s model of action being intended to “restore the continuity between refined and intensified forms of experience” (McCarthy & Wright 2004, p.55, 2006). Finally, the digital object is directly accounted for by Bolter and Gromala (2003), who hold that “interfaces should oscillate in a controlled way between states of transparency and reflectivity” (p.68), thereby allowing users to act through the computer some of the time, and providing mechanisms for awareness at other times. This can serve the goals of both usability (for example, in facilitating users’ organization of workflow through multiple open windows on a screen), and art, in

redirecting attention to the impact of the technology or medium on practice and culture.

## 2.7 Towards methods – authentic processes

Authenticity becomes problematic for design when it is configured as a problem solving activity. Understood as agentive meaning-making or creative resourcefulness in the face of breakdowns, authenticity can be seen in the very work-arounds that the participatory design process seeks to 'solve' (Burns 2003). Such solutions in turn take time to become established within the lifeworld of the user, resulting in new hybridities of behaviour and meaning (Clothier 2005). In solving functional problems, standard design processes characterize the creative work done by the user as negative, and rarely seek to replace it with alternative sites for meaning-making (Hummels 2000, Hummels et al 2001, Redström 2006). In seeking a way to design meaningfully visible products, the designer still needs to engage sensitively with social contexts (Hallnäs & Redström 2002, Margolin 1997), but towards a different end. This section outlines three important lines of enquiry that went on to inform the methods used in this research: the lifeworld (Agre & Horswill 1997, Kettley & Smyth 2006, Sandywell 2004, Hallnäs & Redström 2002, Redström 2006); sites of ambiguity (Gaver et al 2003, Kettley 2005a); and pedagogical approaches to authentic learning and teaching experiences (Tochon 2000). The first of these, *the lifeworld*, gives the designer a way of thinking about the 'everyday', and about the user as a part of a larger dynamic field of actors constituted by and engaged in systems of meaning making. The second, *sites of ambiguity*, allows the designer to approach the product as a collection of elements which direct experience through a tension between provocation and familiarity, as an object whose meaning will be changed by its cultural framing and presentation,

and as a site which the user must make an imaginative leap to place within her own (Gaver et al 2003, Kettley 2005a). The third, *pedagogical approaches* to authenticity, present the designer with methods to create authentic situations for engagement, and the tools to evaluate what happens when they are employed.

### 2.7.1 *Lifeworlds*

In keeping with the holistic configuration of authenticity, the thesis takes a post-structural view of the lifeworld, generally described as everything that a person or group comes into contact with in the course of their everyday lives. Instead of characterizing it as a pre-existing space for action, in this view the lifeworld is understood to be constituted by action as it constitutes those who act within it (Campbell 2005, Carpentier & Hannot 2007, Coupland 2003).

The lifeworld is often conflated with the everyday, and Hallnäs and Redström define it for what it is not – it is not the military, nor is it the office, nor even health (2002), all normative sites for technology design. Instead, lifeworlds are “sites of increasing complexity” (Coupland 2003, p.426), in which networks are given and created in action (Campbell 2005). In fact, echoing de Certeau’s account of the everyday, Roberts describes the lifeworld as the site where “critical action and thinking begin” (in Carpentier & Hannot 2007, p.6). The contingent nature of the lifeworld is confirmed in Coupland’s analysis of it as project, rather than as a spontaneously expressed situation (2003), and in Carpentier and Hannot’s investigation into the (in)authenticity of reality television shows (2007). Their reflexive account of the everyday challenges the configuration of ‘ordinary people’ as a “static collective”, and the dichotomous configurations of an unknowledgeable-but-authentic

everyman, and inauthentic-but-experienced expert (Carpentier & Hannot 2007). This is more than reminiscent of people being configured as a collection of 'factors' in HCI, or as naive and passive users of given technologies. Redström argues that Participatory Design, with the best intentions, can result in a pre-configuring and even over-designing of people's lifeworlds, no matter how good the fit of product to need (2006). In fact, he argues, the better that fit, the less room there is for appropriation and creative meaning making on the part of the user (Redström 2006). It is this model of the lifeworld that seems closest to the aims and objectives of the research, in that the space it seeks to leave for meaningful appropriation is understood as a necessary site for authentic experience.

### 2.7.2 Sites for ambiguity

The primacy of explicit information in interaction design has recently been joined by alternative and complementary methodologies and end goals. These include Coyne's framework of conservative, pragmatic, critical and radical approaches (1995); *seamfulness*, as opposed to Mark Weiser's *seamlessness* (Chalmers et al 2003); the "rhythm of reflection and transparency" advocated by Bolter and Gromala (2003, p.148), and the concept of ambiguity as presented by Gaver et al (2003). Occurring at different points in the interpretive relationship between viewer and object, ambiguity has been shown to be an important resource for interaction design and HCI (Gaver et al 2003). The framework suggests three different types of ambiguity: *of information*, in which a visual output, normally explicit, is blurred or scrambled; *of context*, in which a recognizable object with strong connotations is replaced within a new context, thus highlighting how we read objects through their framing; and *of relationship*, in which the viewer is asked to imagine their own

extended interaction with the work in some way. The following section summarises an analysis of approaches taken by craft practitioners after Gaver et al (2003) (Kettley 2005a, 2005b). Layers of these different types of ambiguity can act as spaces for meaning making within an object, creating complex contexts for authenticity.

### 2.7.2 (i) *Types of ambiguity*

For example, *ambiguity of information* can be found in the textiles of the Play Research Studio, which focus on such expressive qualities as vagueness and unpredictability (Landin & Worbin 2004). Using heat responsive threads and inks, woven and printed textiles are constructed to embody three layers of semiotic meaning – the first static in the standard construction of the textile, the next a dynamic woven layer, and the third a responsive ink based display. A single textile piece can thus give multi-layered dynamic information, and the granularity of spatial and temporal resolution can be controlled to create ‘slow’ technology with rich, blurry information (figure 2/2).

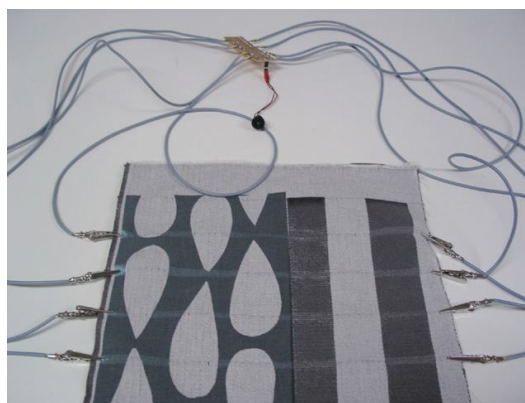


figure 2/2

ambiguity of information: Play Research Studio

*Ambiguity of context* occurs in more than one way in wearables. It may be apparent in the treatment of the body itself as site for commentary, or may occur in the framing, or presentation of wearable concepts. The forms of functional wearable computing developed by companies such as Xybernaut (2005) and Charmed (2006), are commercial products, but the irony of wearable computing as a domain is that it has been inadvertently rendered radical by those who would promote it for its use values. The narrative of the cyborg has gained such cultural currency that the original research 'borgs' have themselves created a barrier to a social appropriation of their technological advances (MIT 2003, 2006). So attempts at crossing the 'last frontier' (deVaul et al 2001) of daily life for wearable computing can often appear provocative in the manner of conceptual art, and the viewer of its promotional material consequently feels free to question its validity as a social paradigm.



figure 2/3

ambiguity of context and relationship

Norman Cherry: angiogenetic body adornment

The ambiguity of context in metalsmith Ira Sherman's work, which exhibits well-defined social functions, occurs in the contrast of an aggressively mechanistic aesthetic with the vulnerability of its human inhabitants. *The Arbitrator*, for example, sits over the head and shoulders of two protagonists, and is released only when they have reached agreement (Kettley 2005a). Jeweller Norman Cherry, meanwhile, currently presents on the theme of the feasible and imminent practice of angiogenetic body adornment – the growing of human skin, bone and cartilage for aesthetic reasons (Cherry 2004, figure 2/3). Disseminated through academic channels, the realism of the Photoshop-ed designs is compelling in this context. There is also a strong element of ambiguity of relationship at play in both these works, which results from both their aesthetic and their function.



figure 2/4  
ambiguity of relationship  
Lucy Orta: Refugewear



*Ambiguity of relationship* is evident in the work of Freddie Robbins and Lucy Orta, but the work is framed in different ways. Robbins' conceptual knitwear is presented in a gallery environment, and plays on the gallery's remove from the everyday world in order to increase the impact on the viewer when their assumptions, based on historical and gender roles of the material and process of knitting, are inverted (Royal College of Art 2006). Robbins deftly manipulates materials and processes with inherent cultural identities to introduce ambiguity at the point of relationship. Her series of gloves, meanwhile, play on the normative experience we take for granted of the hand, and its translation into a given form of clothing. In doing so, Robbins presents us with more or less digits than expected, or shows us stigmata and burnt fingers (Pavey 1999). The pieces remain ambiguous in their unwearability, provoking questions regarding our perception of normality, rather than of how they might fit into a viewer's own reality. Lucy Orta, another textile artist, creates politically motivated dwellings that blur the boundaries between functionally personal clothing and social spaces for survival (figure 2/4). Her work is documented in public events in which volunteers inhabit and interact with the structures (Bourriaud 2003). In Orta's case, a possible reality is made explicit, but like the discomfiting *Bais-ô-Drôme* by Van Lieshout cited in Gaver et al (2003), the circumstances under which a viewer might want to inhabit it are challenging (figure 2/4 and 2/5).



figure 2/5

ambiguity of relationship

Van Lieshout: *Bais-ô-Drôme*

Layers of ambiguity, then, can act as a rich resource for subjective meaning making within an artefact, and can lead to a relationship of significance between owner and object. Initial subjective responses become a part of an extended social narrative as patterns of consumption implicate 'face', and the individual becomes a hybrid network of him or herself, plus the objects he/she is associated with (Goffman 1963). Art regularly makes use of ambiguity through multivalency (Kettley 2005c, Kettley 2005e), but more directly relevant to the development of rich interactive artefacts, particularly for the 'everyday', is the ability of the craft object to straddle the functional and the conceptual, the domestic and the provocative (Mazanti 2003, 2004). The ambiguity of the contemporary craft product is thus especially interesting in allowing interaction designers to consider frameworks for the mixing of spatial and temporal aspects of their designs, and for combining functionality, conceptual goals and sensual expression within a single system.

### 2.7.2 (ii) *Ontology and authentic decoration*

Material and its relation to form can also be seen as embodying authenticity. Architecture has given design the concept of *ontological decoration*, in which pattern and form follow on from the use of materials for their own sake. An example is a woven cloth, in which a motif results from the physical structuring of the threads, or in laid brickwork, which forms patterns through its laid courses "and nothing more" (Brett 2005, p.220). *Representational decoration*, conversely, describes the use of a material to support a motif that wouldn't occur naturally through its formal arrangement, usually in imitation of a more expensive or culturally valued material or process (Pye 1968, Baudrillard 1968, Hallnäs & Redström 2006, Brett 2005). In particular, human commitment can appear to be compromised however ingenious the imitation may be, and a sense of

inauthenticity is felt by the viewer. Ontological use of material embodies the romantic and essentialist view of authenticity in its direct correlation between the internal and external, in its spontaneous collapsing of expression and content: the only way to represent a knitted structure is by a knitted structure (Eckert 2005). Therefore, the use that material is put to with regards structure and display is read in terms of inherent levels of authenticity, and there is a direct relation to perceived human commitment. Where material is used 'for its own sake', and commitment is apparent as a result, authenticity is understood to be present in the object.

### *2.7.3 Pedagogy – authentic learning experiences*

Pedagogy offers “quasi-authenticity” as a particular view of authentic experience, in which the dominant issues have arisen as a result of the idealization of the ‘authentic situation’ (Baccarini 2004, Stein et al 2001, Tochon 2000). In trying to recreate life situations in the learning environment, pedagogy has found itself grappling with pragmatic as well as philosophical problems for learning and teaching. Tochon (2000) studied the manner in which authentic experiences diverged from planned activities in the classroom, and used the data from his observations of groups of 9 year olds to suggest that authentic experience was characterized by the innovative conceptual relations that in their very nature were “difficult to set criteria for” (Tochon 2000, p.331). In this work Tochon creates a useful model for locating authentic experience at the intersection of an axis of knowledge linked to prior experience (biographic) with that of present-moment knowledge (pragmatic) in which the student tries to make sense of the meaning of his or her experience. The potential is created for multiple associations that ‘hook into’ the learner’s experience, and because of this engagement

with lived experience, they can be described as 'authentic' (Tochon 2000, p.333). Tochon's methods in particular informed the development of a novel technique for the analysis of captured verbal protocols in the author's research (Kettley & Smyth 2006).

## **2.8 Towards a working model**

The research therefore treats authenticity and authentic experience as intertwined: authenticity is approached as the potential of an object or situation as a site of contention; and authentic experience is deemed to be that process of engagement with authenticity in which new meaning is forged. It is a model of oscillation between dualisms and a dissolving of dichotomies, an iterative system in which "authentic processes produce authentic situations" (Clothier 2005).

The three lines of enquiry considered above, where authenticity might be evident, suggest a possible approach for design process and hence evaluation:

- Lifeworld gives us an environment known and inhabited (enacted) by the user, equating with context
- Sites of ambiguity can be thought of as nodes in a lifeworld – instances, objects, people, ideas, situations, with openings for meaning making, equating with practice, and
- Pedagogy gives us tools for designing and evaluating, equating with reflection, especially in simulated situations of 'quasi-authenticity'

Authenticity itself may be revealed by the following phenomena:

- active engagement between actors resulting in new meaning
- processes of interrogation
- negotiation of hybridity
- the dissolution of dichotomies
  - object/subject, inside/outside, individual/social, essence/appearance, form/content, reflection/disappearance, theoria/praxis, abstract/concrete, cognitive/pragmatic, universal/particular, viewing/performing, active/passive, thinking/doing
- situated outcomes of interrogation

## **2.9 Impact on the research**

The model of authenticity employed in this research then, is one of oscillation on several levels: between internal attributes of the object, and external attributes to be found in the user's lifeworld (although the terms internal and external imply an object-biased view of the world); between immediacy and narrative, favouring neither a romantic idealization of sensory experience nor a view of the rational as 'truth'; and between the enactive micro level of the individual user and the structuring macro level of cultural organization. Thus, it is a model of undecidability and contingency that favours emergent processes. In practical terms, this informed the research in four crucial ways:

- First, it led the author to think about the user in a different way. Instead of identifying a user group along traditional demographic lines, it became increasingly important to identify a group of people who were actively involved with each other as a system of

meaning making. At the same time, the focus was on the everyday, that is, non-work environments or 'third spaces' (Clothier 2005), and it was decided that a friendship group could be reflexively analysed as such a context.

- Secondly, the very notion of use was called into question. Rather than trying to design for functional need, the emphasis was on appropriation of the objects for existential roles within a lifeworld. Therefore, it was decided that the use-function of the objects should be as undecidable and ambiguous as possible in order to present a space for meaning making.
- Thirdly, it confirmed the author's intuition that Craft may offer more than just a niche market for Wearable Computing, and that it warranted far deeper investigation as a resource for authenticity in design. The expression of the objects being made for evaluation should embody ambiguity and spaces for interpretation as much as the functionality, above.
- And fourth, it resulted in a holistic approach to evaluation, in which it was important to reduce the space between the user/participant and designer/researcher, breaking down the dualism of inauthentic expert and authentic but perennially naive user.

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Chapter Two presented a literature review which led to the configuration of authenticity as a situation of oscillation, and as undecidable and contingent. The notions of lifeworld, sites for authenticity, and the pedagogical concept of quasi-authenticity were discussed, and lines of

enquiry for design practice and evaluation were sketched out. The impact on the course of the research was outlined. Chapter Three now goes on to present a literature review and empirical research into Contemporary Craft as a potential resource for authenticity in design.

**Chapter Three****Authenticity and Craft**

Chapter Two led to a stance on authenticity and authentic experience; this chapter now considers the ways in which craft is understood to embody authenticity. The first section sketches the paradigmatic shift of the late Twentieth Century that resulted in New Craft, and considers the ways in which both traditional and new models of craft embody authenticity. Undecidability is then proposed as craft's key contemporary characteristic in relation to authenticity and to calls for hybrid experience in Interaction Design. A third section outlines the comfortBlanket, a practice-led piece of empirical research into users' perceptions of authenticity in craft objects, and this is complemented by a survey of makers' understandings of value on their processes. These enquiries lead to a set of protocols for craft as a design strategy and an emergent design philosophy predicated on the iterative nature of authenticity found to be especially present in craft processes and outputs.

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**3.1 The question of craft**

If the discussion on authenticity and authentic experience needed some untangling, craft is no simpler. Like design, craft is a value-driven activity (Press & Cooper 2003) and has undergone large ideological shifts since the mid nineteenth century, but in contrast, has suffered from a lack of a coherent historiography (Greenhalgh 2003, Veiteberg 2005). To borrow Edmund de Waal's comments on pottery, craft has at times been an "anxious field", and its anxiety "has often made it strident, even cross". (1998, p.71, and see also Evans 1998, p.31). Spanish curator Monica



Gaspar claims that “we are still allergic to the word craft” (2006), and there certainly exists a feeling that it is a perennially misunderstood field of endeavour:

Craft can be a confusing word. When you use it there is a strong possibility that the other person is thinking about something quite different to you. One person imagines handmade one-off pieces while another thinks of stencilled furniture and stamps. And it doesn't get any easier when you get beyond the word craft to a specific discipline such as glass or textiles, as again everyone will imagine something different.

Cochrane 2007

In Dormer's seminal *The Culture of Craft*, the introduction states that the term has “floundered between many partially formed definitions”, becoming the “epitome of confusion” (1997, p.ix). This difficulty in defining craft, however, is the starting point for a particular model of creativity, that is, of craft as undecidable. Far from being a negative characteristic, this thesis proposes that it is this very aspect which makes craft a valuable model of authenticity for other design professions in the early twenty-first century. The following sections present two views of craft – the ‘traditional’ and the ‘new’. The scope of the thesis means they are presented somewhat simplistically, (although they may therefore reflect common assumptions about craft). These lead into a fuller account of a contemporary theory of craft, drawing on the recent writings of Danish theorist Louise Mazanti in particular, and referencing the literature review on authenticity from the previous chapter.

### 3.1.1 Tradition

In the traditional view of craft, the object is predominantly hand made, and those technologies that are in use have been an integral part of

specific techniques for hundreds of years: witness the jeweller's saw frame and workbench, found in illustrations of 16<sup>th</sup> Century workshops (and earlier). The engravings in figure 3/1 by Etienne Delaune of Augsburg show silversmiths' workshops, and include a draw plate for lengthening and decreasing the section of wire (The British Museum n/d). A romanticised vernacular vision, this version of craft is often portrayed as somehow closer to or representative of some utopian ideal (Greenhalgh 1997). In this vision objects and people have identifiable roles in society and authenticity springs from the reliable performance of those roles (Guignon 2004): Benjamin's aura of authenticity, for example, found the unique value of a work of art to have its basis in ritual (Arendt 1973, cited in Harrison & Wood 2003, p.522, Houston & Williamson 1998, p.22). The process of craft by extension was ritualistic and practiced by an anonymous everyman (Greenhalgh 1997, figure 3/2). The tacit knowledge of the expert gained through years of experience with his material became celebrated in its own right as something special, a sublime familiarity and a black box to art's clarity and logic. At the same time it was a function of the prosaic flow of mundanity, standing in opposition to art's spectacle.

The sensuality of the process of hand making was matched by the "dazzling of the senses" that a well crafted object could bring about (Dormer 1997, p.5). Its explicit signifier, the 'mark of the maker', has become a cliché that can be seen in many mass produced objects today, introduced separately after the production process to indicate some kind of ethnicity, an inauthentic "elsewhere or elsewhen" (Kälviäinen 2000). Dormer describes the ability of the machine to mimic craft's "randomness, quirks and less-than-perfect condition" as a Turing test for craft – if we cannot tell what was made by hand and what produced by machine, then this undermines one of traditional craft's central identifying philosophies, as what was once a reliable expression of a particular culturally charged

process is thus no longer necessarily connected with it in any way (see also the comfortBlanket in section 3.3).

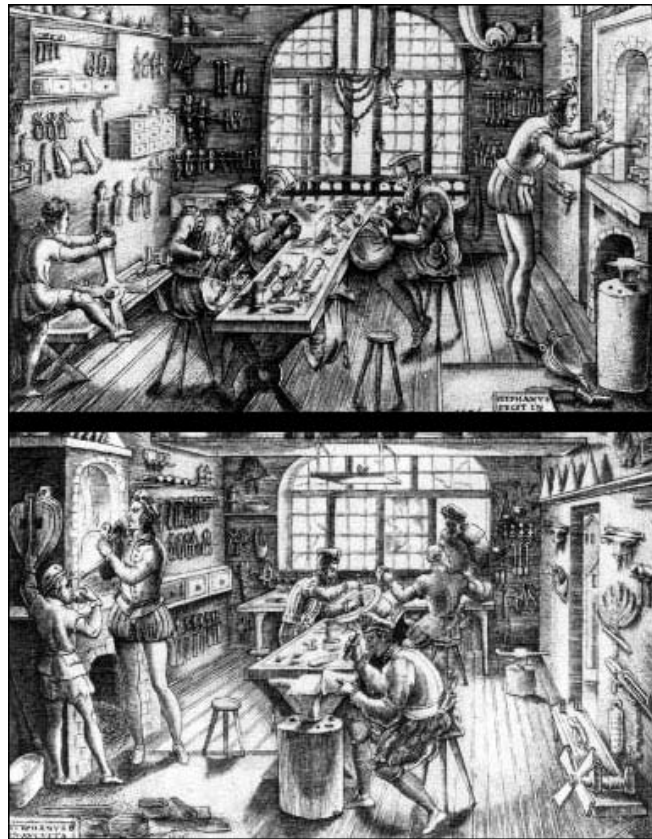


figure 3/1

engravings by Etienne Delaune of Augsburg dated 1576

Textiles offer a rich field for this concern: the fashion designer Issey Miyake for example has stated that he deliberately introduces flaws into an otherwise perfectly rendered fabric by interfering with the program creating it, and collaborates with textile technicians to combine traditional Japanese craft techniques with new technologies (Braddock & O'Mahony 1998, pp.115-118). However, Miyake is an example of how technology may be used creatively, rather than in-authentically, and so helps to reveal that the test is wrong. That we cannot discern where the hand has

taken over from the machine, or vice versa, is not an issue when work is judged by other criteria, but it remains for us to say what those criteria might be.

These criteria have habitually included tacit knowledge; the embodied unthinking understanding arrived at through making. This “secret knowledge” (Dormer 1997, p.50) has been consistently fetishised in the marketing of craft objects and in the presentation of craft as an idyllic counter culture at one with nature. The Arts and Craft movement for example, promoted authenticity in the preferable political situation of the worker during the upheavals of industrialisation (Greenhalgh 1997a, p.106, Veiteberg 2005, p.19), but has been criticised for the valorisation of the (poor) working man when its progenitors were affluent and educated (Thompson 1997, p.44). For Pye, writing of workmanship in terms of certainty and risk (1968), there was no such thing as a fully hand made object; tools of all sorts were implicated in all methods of production. What differed was the extent to which systems of such tools were set up to pre-determine results (Pye 1978). The reliability and clean visual lines of modernism have been a result of high levels of pre-determination, and in a market predicated on consistency, such systems have proven invaluable – in fact it could be argued that they have even created that demand.

Tacit knowledge is situated in the individual, and those practitioners who do not pass on their tacit knowledge take it with them. The corollary in the educational process is the apprenticeship model, and the process of learning has been described as “akin to the original invention” process (MacKenzie & Spinardi 1995, cited in Dormer 1997, p.148). Some go so far as to claim that “the things that matter most cannot be taught”, having receded “out of reach of the conscious mind” (Glassie 1999, p.100).



figure 3/2  
lace for sale in Baile Herculaine  
Romania 2005

This aspect of traditional craft is also revisited in the empirical investigation into jewellers' practices discussed in section 3/3, and it is identified as a site of particular metaphorical value. The identification of craft in tacit knowledge allows many disciplines to claim their processes as craft: McCullough has found craft in coding and digital image manipulation (1998), while products such as beer are sold to us daily as hand crafted from 100% natural ingredients. Such embodied knowledge allows the subjective experience, especially when it is affirmed by a community of practitioners and ratified by institutional structures, to become objective fact or "connoisseurship" (Dormer 1997).

### 3.1.2 *New Craft*

New Craft, as distinct from the traditional model, emerged as a paradigmatic shift in Western culture in the 1960's (Dormer 1997, Greenhalgh 2003, Veiteberg 2005). In this cultural system, craft objects aspire to be Art after the Kantian model. At its most extreme, the body is regarded as being inferior to the mind, and 'Art' must be experienced in a spirit of asceticism, in which the necessary 'disinterested delight' is attainable by the viewer. Kant's distinction between *free* and *dependant* beauty separates the art object from the world, an event outside of the mundane flow of everyday life (Dewey 1934, Knuth 1974, Veiteberg 2005). That is, art's only purpose is to bring about this state, and is free or autonomous from the quotidian. Those objects which exhibit functionality cannot be free in such a way and so cannot be described as art. It is not hard to see that craft's inherent problems with approaching autonomy as a modern form of authenticity have been its heritage of hand making (too bodily), its roots in the utilitarian (dependant beauty), and its engagement with the material (too worldly), those very characteristics which have defined the field for so long. Its close ties with such social and cultural institutions as the kitchen (hearth), the church, and the state have meant it could never be seen as a free, unbound or utopian space, as art is in Foucault's terminology (de Waal 1998, Mathieu 1994). Some communities of practice have evolved as sites for critical discourse and resistance as a direct result of the modernist project, romanticising the more traditional aspects of craft - see for example, Craftivism and the huge Make community (de Certeau 1984, Craftivism n/d, Greer 2004, Make 2007, Veiteberg 2005). However, these kinds of movement are regarded with, at best, ambivalence by New Craft, which sees its role as one of critical engagement with theory, and which takes its responsibility towards quality control very seriously (Evans 2002, Harrod & Bateman 1998); Greenhalgh articulated a deep-seated fear when he stated that the

“amateur sphere in craft has come to symbolise the whole” (2003, p.6). ‘Studio craft’ assiduously maintained that craft was “an artistic practice equal to all others” (Tober, cited in Mazanti 2006, p.1), and argued for “parity between pots and paintings” (Metcalf 2002, p.16). This status was, and continues to be, engineered through a number of key strategies: framing mechanisms, such as critical discourse and display cultures, a rejection of functionality and the domestic, or a rejection of material itself. Expressions of individuality took the place of craft’s traditional user-centredness and work was produced in studios by individuals who made the explicit decision to be in control of both conception and realisation of their works: Game and Goring (1998, p.5) make the interesting point that this individualism was extended to the experience and consumption of craft objects. Calls for craft objects to be displayed with space around them, rejecting domestic associations are a function of these aspirations to autonomy (Attiwill 2004, Cochrane 2007, de Waal 1998, Sutton 1998). Pottery, that most somatic of crafts, has produced new work at the “sculptural frontline”, differentiating between “expressive and ethical versions of the clay object” and abandoning functionality (Britton 1998, p.35, Mathieu 1994). Jewellery has seen an incredible democratisation of materials since the ‘New Jewellery’ movement began (Astfalck 2005, Broadhead 2005, Derrez 2005, Drutt-English & Dormer 1995, Evans 2002, Mazanti 2003, 2004, Press & Cooper 2003, Veiteberg 2005, Watkins 1999). The status and monetary worth of fine jewels and precious metals, and the metaphorical nobility of ‘natural’ materials have been supplemented, challenged and replaced by a wide range of found objects, reclaimed pieces, distressed finishes and man made materials with low cultural worth (Game & Goring 1998, Kettley 2006, Murray 2005). Jennifer Haston (figure 3/3) for example, uses plaster to create her rigorous architectural forms. In Watkins’ and Lechtzin’s cases, jewellery has become completely dematerialized (Dormer 1997, Drutt & English 1995).

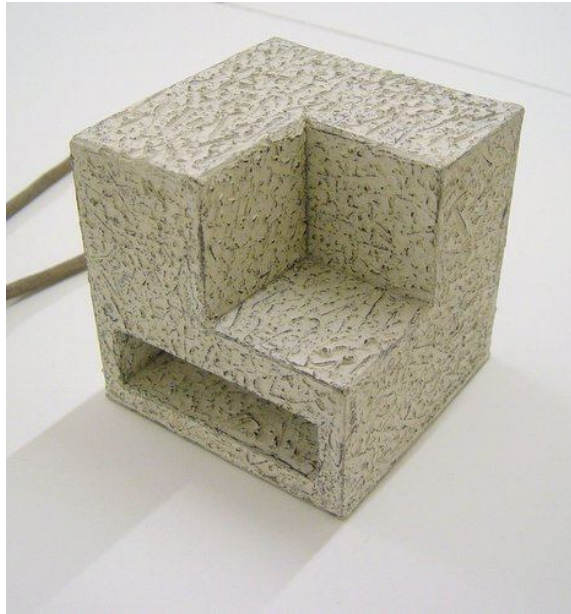


figure 3/3

democratisation of materials: Jennifer Haston 2005

However, these views are, as stated at the outset, simplistically put, for the most part because this is how they become distilled – their nuances and qualifications are worn down in media representation; craft is aware that it invites caricature (Palmer 2002). Nuance is often lost also in the exchanges between craft practitioners themselves: as Rahilly says, authenticity is often accompanied by expressions of intensity and hyperbole, in the attempt to express the ineffable (1993). Mazanti has pointed out that “the Arts and Crafts movement started out as an oppositional response to the art/life dichotomy” (2006, p.2); Bruce Metcalf reminds us that Ruskin “challenged ... the whole concept of the autonomous art object” even before the modern movement had taken hold (2002, p.16). The Bauhaus tradition was predicated on a unification of fine arts and craft (Findeli 1999, p.29), and ethnographic study, still rare in the crafts, shows that craft work “brings personal integration”, “when physical, emotional and intellectual capacities fuse in



concentration” (Glassie 1999, p.86). Conversely, New Craft has not been able to identify itself as craft without retaining references to at least one of the traditional model’s characteristics – unusable pots are still recognisably pots, sometimes even “amazingly exact sculptural representations of useful pottery” (Glassie 1999, p.34). Ragnhildur Mogensen’s piece *Conversation with Grandma*, in figure 3/4, combines the traditional and the contemporary in its inclusion of a cross stitched sample fitted into the silver box. Ragnhildur Mogensen speaks for many contemporary makers when she says that her own piece is not nearly as intriguing as some of those that her grandmother made (2007).



figure 3/4

Helga Ragnhildur Mogensen

*Conversation with Grandma* - jewellery object 2007

There seem then to be “inherent limits” to craft (Metcalf 2002, p.21): despite its claims to parity with fine art, craft cannot choose freely to be just anything at all – it cannot break the boundaries of its own culture without becoming defined by another cultural frame altogether. But to

characterise craft as entirely about the hand made, the domestic object or tacit knowledge as in the case of the traditional stance, or as entirely conceptual, as in the modernist view, is to take an incomplete approach. The next section gives an account of current contemporary practice, which seeks to hybridise the dichotomies inherent in these positions, laying out the thesis' core argument for Contemporary Craft as a site of authenticity, and thus as a resource for the design of meaningful wearable artefacts.

### **3.2 Contemporary practice and authenticity**

In design terms, craft has been traditionally user centred, but has become more interested in the designer-as-expert model. But craft's relatively short modernist phase is already being overtaken by a raft of makers and thinkers who situate it in relation not to art, but to material culture (Mazanti 2006). Makers show objects and two dimensional work across a range of cultural frames – the gallery, the museum, the craft fair and the domestic site (White 2004, figure 3/5).

Drawing on White (2004), the author proposes that this is due in part to a unique characteristic of craft: its undecidability. In this view, craft has never been entirely functional, even at its most traditional, nor will it ever be entirely autonomous, even at its most modern. Craft is an object focused discipline, yet the craft object is never an end in and of itself – craft objects are also means to ends. Even at their most rarefied, in their leanings towards autonomy and aspirations to the event, they retain vestiges of functionality, domesticity and flow. They remain craft as long as there is that embodiment of humanity resulting from process (the much maligned mark of the maker), or evident in references to potential or historical functionality. Similarly, the functional craft object is never

entirely transparent, nor does it intend to be. It is always available for contemplation. The crafted bowl is as available to the mantelpiece as to the kitchen cupboard, as appropriate in the gallery as in the ethnographic museum (Hida 1998, de Waal 1998). In use it passes through moments of presence and disappearance, and also, importantly, has the ability to create an experiential space that blends these in a special kind of awareness, whether that is pleasure in use or a more critical approach. See for example Chris Knight's shot glasses in silver, which draw attention to the dangerous act of drinking tequila (figure 3/6, Knight 2003). Craft then never only takes part in life but also represents it, and conversely, never only represents life but takes part in it (after Mathieu 1994). Rather, it hybridises end goals, cultural placement and experience.

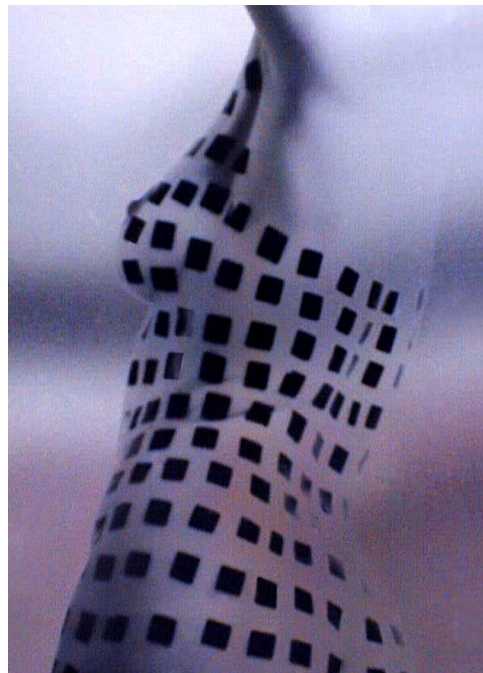


figure 3/5  
cultural undecidability in framing craft  
Hazel White: virtual frock



figure 3/6

awareness in action

Chris Knight: silver shot glasses

The theoretical claim here is that craft objects have the capacity (and have always had the capacity) to segue between transparency and reflection, as argued for by Bolter and Gromala (2003); they have always occupied, even constituted a unique place between art and life, available for the authentic aesthetic experience, yet part of the ongoing flow of authentic pragmatic action. They are rhythmical in their cultural configuration as well as in their internal formal organisation. They retain elements of the traditional model and of the modern, combining somatic and narrative experience in a smeared simultaneity (Kettley 2005c). Contemporary craft as it is engaged with the world around it, social, formal and political, can thus be dynamically configured as its traditional romantic self, in its modern guise as art, and as experimental intervention: figure 3/7 shows a recent exhibit at New Craft-Future Voices, which sought to “explore the objects’ value and function” by focusing on physical intimacy with everyday things (Ionascu 2007, p.74). More than this, these identities are not fixed – one work can be any of these things at any time, and will shift among them, combining them in different ratios according to audience, user and context of gaze and use.

In particular instances, experiences with craft objects might be described as an oscillation between the near (the familiar and the domestic) and the far (the strange and the esoteric), between disappearance and contemplation, between sensual and critical appreciation, while at a macro level, Craft as a discipline can be said to occupy a position of semi-autonomy, “essential in contemporary culture” (Mazanti 2006, p.3).

This model of craft is exciting also because it echoes so clearly the terminology and characteristics of authenticity and authentic experience. Craft objects allow a context for “moving in and out of the experience” (Rahilly 1993, p.62) and for a heightened awareness of somatic experience, as Rahilly found to be constituents of authentic experience (1993). Their undecidability encourages openness to experience and engenders processes of meaning making rather than presenting predetermined significations, two qualities Rogers found in authenticity (1965, cited in Rahilly 1993). And importantly, the processes of craft, craft objects and their modes of consumption, are unified by a dissolution of dichotomies (useful/aesthetic, reflective/transparent, flow/event), that is identified by, among others, Maslow, Sandywell, and Benjamin as being key to authenticity (Arendt 1973 in Harrison & Wood 2003, p.522, Foster 1996, p.219, Houston & Williamson 1998, p.22, Maslow 1971, Rahilly 1993, Sandywell 2004). The use of such terminology as *flow and event*, after Dewey (1934), and *reflection and transparency*, after Bolter and Gromala (2003), should also leave the reader in no doubt that this contemporary form of craft offers a very promising model indeed for the development of tangible computational products that seek to be metaphorically meaningful as well as useful; one of the “earliest interactive art forms”, craft indubitably offers us a unique opportunity to shape our new technologies (Bachmann 2002, p.48); the question remains – how?

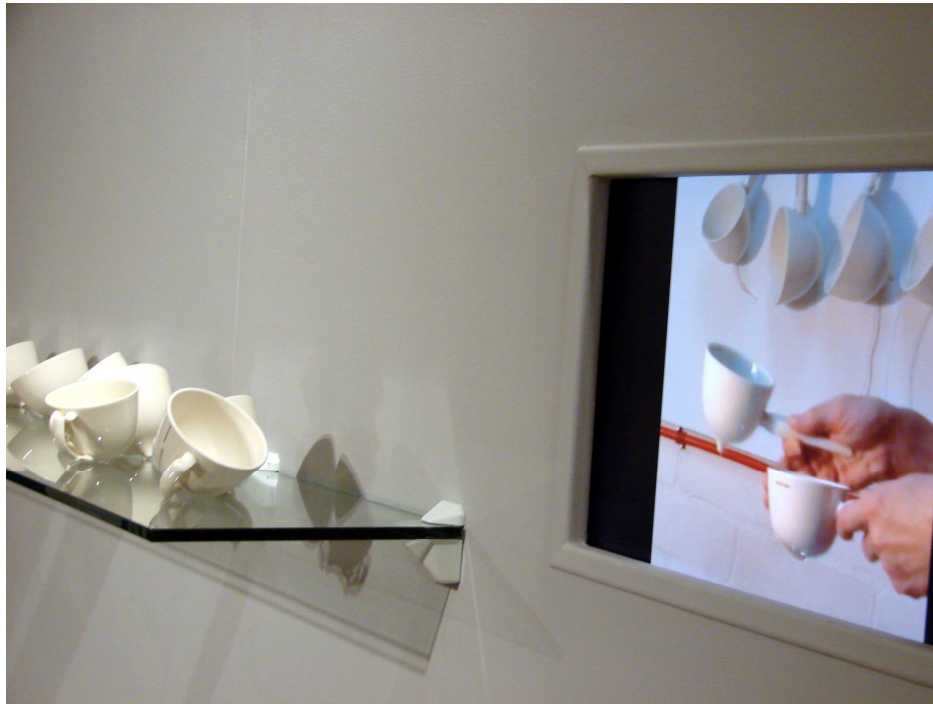


figure 3/7

Adriana Ionascu: ceramic installation  
New Craft-Future Voices June 2007

Having established some theoretical basis for craft as a potential approach to the design of wearable computers which would not aspire to simply disappear, but to have some presence in people's lives, it remained to investigate methods and guidelines that might be usefully translated across design disciplines. The researcher undertook to reflect on her own preconceptions of craft through engaging with the consumers and producers involved. The following section describes the first project, a reflexive investigation into methods for understanding users' perceptions and processes of authenticity through the use of crafted conceptual prototypes. It must be noted here that this investigation initially addressed notions of familiarity and materiality, terms closely related to authenticity but not entirely synonymous with it; authenticity emerged more strongly as the core concept for the research as a result of

reflection on both the ongoing literature reviews and on the outcomes of the sub-projects described below. In this account of the comfortBlanket, *materiality* has been replaced by *authenticity*. The original account can be seen in Kettley and Smyth (2004a & 2004b).

### 3.3 Consumption - the comfortBlanket

The comfortBlanket was an attempt to understand the perception of authenticity and meaning in the relationship between user and product. It sought to discover something about the nature of craft within this process, in terms of both process and artefact. Authentic objects were understood to be those that could offer both resolved meanings and openings for new meaning through elements of familiarity and provocation, and would be revealed in the processes of meaning making by the participants.



figure 3/8

Design Board 1: Product Specification



The aims of the comfortBlanket as a solution to a design problem were to help a defined user 'make the transition from sleeping to waking up and back to sleep again' (D&AD Nesta 2003). The key research questions were:

- Is authenticity embodied in its use of craft techniques?
- Does it embody a potential for personal meaning?

The comfortBlanket used recycled favourite children's clothes and patchworking to combine familiar materials already imbued with personal meaning, and a crafts process with particularly domestic associations, with what were assumed to be less familiar technological components, which might cause concern for health or safety. The central strategy for the promotion of meaning making took the form of patchworking. It was intended that the many small images in the patchwork would encourage the co-creation of narrative between parent and child. Three design boards presented the product as a set of specifications, as part of a user scenario, and as a background design concept respectively. Figures 3/8 to 3/10 illustrate these.

Pairs of mothers with their young children were recruited through self-selection in the Edinburgh area (UK) to evaluate the concept after a pilot test with a childcare group proved too chaotic to structure and analyse. The boards were displayed first, and a word association activity, similar to card sorting and inspired by IDEO's methods cards (figure 3/11, IDEO 2003, Information and Design 2006) was used to elicit a wide range of affective responses. This was followed by a rationalisation session in which the participant could talk through their decisions, exposing different readings of terms that had been pre-supplied, and providing a rich verbal protocol. Once this stage had been completed, the physical look and feel prototype, a handmade patchwork blanket and bumper, was brought out.



This 'out of the box' technique delivered immediate affective reactions of a different kind to that of the boards, and again, a verbal protocol was captured.

**Familiarity** in cutting edge technology

A unique service from the National Childcare Trust. Send your favourite used children's clothes to us and we will create a beautiful patchworked blanket utilising sophisticated sensing technology to help you and your child sleep soundly at night.



**How the blanket and bumper help soothe your child**

**Sound** - White noise, your voice - simulates sounds heard in the womb, while the mother's voice indicates safety. Use the preset recordings or make your own to be played through the hidden speakers in the bumper.

**Touch** - skin on skin contact has been shown to be important for newborns, and later recalls feeding contact with the mother. Stroke the fingerpads on the monitor to reassure your baby in her cot.

**Sight** - Soft night lights are set into the bumper, and glow on when the baby moves. No need to be afraid of the dark.



**Safe** - The low power working parts are embedded within a sandwiched layer of fabric, and are safe for you and your child.

**Practical** - Because the technology is part of the fabric structure itself, the blanket can be washed as normal.

**Aware** - We think it is important in today's world to encourage sustainable product consumption. This service plays a part in keeping craft practices alive and uses 90% recycled materials. It continues the age old tradition of patchworking.



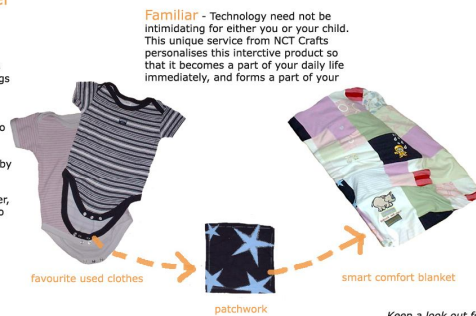
**How your mind is set at rest by the mobile monitor**

**Temperature** - An ambient display lets you know if your child's temperature is at the right level for sleep.

**Heartrate** - Your baby's hear beat is translated into regular pulses felt through the palm area on the monitor.

**Sound** - You can choose to hear your child through the intercomm.

**Rest** - Sleep deprivation has been shown to play a large part in parental stress and depression. The comfortBlanket helps break the habit of waking in the night.



**Familiar** - Technology need not be intimidating for either you or your child. This unique service from NCT Crafts personalises this interactive product so that it becomes a part of your daily life immediately, and forms a part of your

Keep a look out for future craft and technology products from NCT.

**comfortBLANKET**

figure 3/9

comfortBlanket: background design

Overall, responses to the concept and the physicality of the prototype were very positive, and the blanket appeared to work as a product design; emotional responses were positive, and there was a strong perceived need for the proposed functionality. In terms of the research questions, the blanket succeeded in suggesting potential for personal meaning. However, when analysed for perceptions of authenticity, the participants' responses revealed some complexity, often accompanied by qualifying or even contradictory statements. One particular response

indicated fairly unequivocally that craft can have negative as well as positive associations – that amateur sphere that Greenhalgh identified (2003). This led to a reconsideration of the other protocols, and an important realisation for those employing craft in the service of design, that is, that craft is something more than merely a signifier.



# comfortBLANKET

figure 3/9

comfortBlanket storyboard

The key result of the comfortBlanket research was the realisation that the participants were to a great extent reading the design semiotically, and that they did not experience it as an authentic object in its own right. The blanket was a symbolically loaded design, but it was not authentic. It used craft as a signifier of what Kälviäinen called “the gift of time” (2000), but it was not craft as is understood by today’s contemporary practitioners. Similarly, it was a successful piece of product design, but not a

successful craft object, and the difference is key in understanding and designing for authenticity.



figure 3/11

comfortBlanket: word association

In Kettley and Smyth (2004b), this important difference was found in the craftperson's approach to visual language. This view has since been greatly extended, but for the sake of continuity in the telling, this section concentrates on this aspect, and the more complete framework is given towards the end of the chapter.

The product designer skilfully manipulates existing symbolic visual language to create a message readable by the consumer. In HCI, this has become important in usability studies, and informs the understanding of affordance underpinning ease of use. The contemporary craftsman in

contrast, does his best to steer away from established representations, instead aiming to build a personal visual vocabulary through direct manipulation of materials in response to experienced phenomena. The intense engagement of the contemporary craftsman with a phenomenon through primary research activities such as drawing and modelling, together with his direct involvement with material further informing expression, means the artefacts created are physical objectifications of a very subjective world-view; they embody the moment to moment risk worked through by the maker. Indeed, the craft object can be seen as a meeting place in that it mediates between viewer and maker and is a locus for the co-creation of meaning (Greenhalgh 2003). In contrast, when existing languages are employed, meaning has already largely been arrived at and the viewer remains essentially passive.

There is at the heart of this enquiry a fundamental challenge to Interaction Design and HCI, and to the design processes that have been drawn from engineering, systems and product design. Emergence as a design process is an exploratory strategy at odds with the culture of risk aversion common in business, and difficult to square with rational or even pragmatic philosophies of design, which seek to measure fitness of purpose in some way. The reason for its importance to these fields now is that definitions of products and design are shifting to include the existential and metaphoric, even beyond the experiential and emotional (Hallnäs & Redström 2002, 2006, Redström 2006). The emergent process is a key element of craft practice however, not only in the workshop and studio, but also in the consumption of craft, where it becomes a synonymous with human agency.

The comfortBlanket uncovered the researcher's own assumption that craft would always equal quality, as well as the implicit belief that quality equals authenticity. It revealed that authenticity in crafted objects lies in

an approach to process, just as in psychology and philosophy (Rogers 1965, cited in Rahilly 1973, p.68). To develop this theme, the author turned from the consumer to the maker, and a set of interviews with practitioners was devised to look for instances of this philosophy in practice and reflection. To help the reader to see how the iterative themes of the research became implicated in action, a chronological table has been drawn up reading, publications and research activity in *appendix ii*.

### 3.3.1 Process

The comfortBlanket project revealed some cautionary pointers to employing craft in the service of design. In fact, craft has at times been defended as unknowable, a practice destroyed in some profound way by critical investigation – indeed this is the very strong legacy of Peter Dormer, of one its most important theorists (1997, Harper 2007, Mazanti 2006). It has also been emphatically claimed as a creative practice fundamentally different from design, and much of the new craft movement was concerned with wresting it away from its configuration as the artisanal servant of a more cerebral process (Harrod 1998). Craft has been described as being “without design” (Wilson 2004), and yet as essential to design for the knowledge of materials and processes it provides, in its understanding of “how to find quality in matter” (Press 1996). Can these positions be squared? Is there any way of learning from craft without destroying some essential mystery, and without re-considering it to some inferior, merely supportive role? How can contemporary craft be represented to other interested creative fields without compromising its fundamental character? In answer, the author proposes that by shifting the critical gaze away from individual instances of craft – that is, from the meanings of specific pots, or the intricacies of unarticulated thought in an individual practice - and by instead taking a

broader view, that it is possible to provide a framework that describes the ways craft's concerns are embedded within its processes.

The literature review earlier in this chapter demonstrated that authenticity is deeply implicated in craft processes and objects, and the empirical comfortBlanket project showed that authenticity was not necessarily to be found in even the most well-intended significations of craft processes; instead it was necessary to turn to craft process itself. To this end, a set of semi structured interviews with practitioners was conducted around two questions:

- Please describe your working process?
- What kind of values do you feel is embodied in these processes?

These interviews were confined to the author's own genre of contemporary jewellery as jewellery had been identified as being the wearable form being investigated; most of the participants had graduated in the previous three years, and were at the time of interview involved in post-graduate diplomas, masters degrees and artist's residencies. Four were graduates of Edinburgh College of Art's Silversmithing and Jewellery department, and one responded via email from the Birmingham Institute of Art and Design. Edinburgh's S&J department in particular is noted for a mature brand of graduate, with well developed personal formal language, and an understanding of what it is that raises their work above formulaic processes (Swann 2007). The makers interviewed, then, were well able to articulate their way of working, and also able to relate that to wider frameworks of consumption and economic structure. Their responses were combined with talks given by more established makers (Cousens 2004, Cunningham 2005, Lamb 2005, Peters 2005, Roberts 2005). Three major themes emerged from this small survey: the role of visual research, the integral nature of material, and an inherent value in

the embodied nature of the process. These are discussed more fully here.

### *3.3.2 Visual Research and Material*

Although craft may be described simplistically as a three step process - a period of visual research, followed by the development of that material into a final design and the final realization of that design - successful contemporary craft achieves something more than this, and it is this element that distinguishes it from good design. In common with the testimonies of other well established makers the respondents cited drawing as a primary source of information. College was characterised as an opportunity to build a pool of resources from which to draw for a period of time after graduation. Significantly, most of the interviewees did not take the step between the visual research and the finished design literally. Instead, drawing was seen as a way of engaging deeply with source material, and the drawing or collected source objects were kept around the workspace and referred to frequently for their essence. Those who had tried explicitly to develop drawings as a discrete step found that they sacrificed spontaneity, introducing distance between themselves and the source material, and between themselves and the material being manipulated. Most found in this instance that they relied on existing visual language, instead of growing personal expression, and all found it more successful to allow influences to permeate their thinking, and for these to then emerge “through their hands”.



figure 3/12

geodes, making material and internalisation

Ruudt Peters: Iosis series 2002

Ruudt Peters rather more graphically said that he “eats knowledge, then burns the books and forgets it, then shits out the work” (2005). In any case, the struggle encountered in both stages of this process was seen as essential both for successful, idiomatic expression as well as for a metaphorical value related to that of transformation. This can be described as a process of internalisation, or the absorption of influence in contrast to a “copying of surface strategies”, in which the drawing as an object is not the important outcome (see figure 3/12). Instead drawing is a technique for entering into a particular embodied ontological relationship, or synthesis, with the world (Oxlade 2001, Wilson 2004).

### 3.3.3 *Material*

For some, the research stage was spent almost entirely with the material being manipulated to form the final object (raises further research questions as to the practice of modeling with alternative materials). This



was seen to impart a particular tacit spatial awareness only to be gained in “playing about with things three dimensionally”. For one respondent, the work was explicitly about “keeping things in the finished piece that normally people make an effort to get rid of”. She described this as “like having the sketchbook and the finished product all in one”, and the “honesty” of making the process accessible in this way can be found in other important contemporary work (Cross 2001, ten Hompel 2002, figure 3/13). Material was also seen to be the source of what has been described as the metaphor and myth of transformation (Kälviäinen 2000), where the agentic power felt by the maker is mirrored in the experience of the owner through the knowledge of the transformation of “a useless lump of metal, or a piece of plastic” into “something beautiful, wearable, useful...” (figure 3/14).



figure 3/13

integrity in making - Simone ten Hompel: spoons

### *3.3.4 Value in an embodied process*

The challenge and exploration embodied by the craftsperson engaged in making a new work was seen by all respondents as the “strongest point of craft”, its “greatest benefit”. Market forces and the need to supply many similar items were seen to erode this, as the need to identify and solve

successive problems was diminished. This was felt to the extent that one practitioner said she would “rather make my money some other way”, than become involved with what is often known by galleries as “production jewellery”. Finally, the ability to challenge thinking, and to take risks, was felt to be a key responsibility of the craftsperson.

It can be seen that emergence was understood by the makers functionally, as a method for the necessary transition from shallow visual referencing to a deeper transformation of source material into original work. It was also understood to have its own metaphorical meanings, embodying risk and personal commitment to the work. Where source material and the material of the final work were one and the same, with the emergent process explicitly allowed to show through, there was an approach to honesty that chimes with at least one of modernism’s modes of authenticity. An example given by Brett, is the emergence of decorative aspects from structure as seen in laid brickwork. Such ontological decoration “follows from the use of the materials in question for their own sake”, and Brett (after Frampton) compares this to representational decoration, in which material “is used in imitation of another material/process” (2005, p.20, and also Blais 1999, p.52). In the words of Chupin, “the design is operated within the matter itself” (1999, p.130). What craft often recognises however, is that material is the first stage of human design. Architectural theory provides us with a useful view of material:

...matter and material are different things: matter is a mere substance, whereas the term material represents the aptitude that the artist recognizes in matter to be assembled in construction. A material is always thought of in terms of construction, and the artist invents materials, as a synthesis between the matter of which it is constituted and the specific culture that gives it meaning in construction

Blais 1999, p.50

Blais also says that “turning matter into material is the very first artistic and creative gesture (1999, p.50), and it has been pointed out that we tend to think of material first and foremost in its prepared state (Baudrillard 1968, Pye 1968), or in a finished state in iconic objects: “only to name precious materials like marble, silver, ivory, ebony, is to evoke a picture of thrones and treasures” (Pye 1968, p.18). Baudrillard asks how any material can be less authentic than another, demonstrating that the meanings given to materials are a product of cultural ideology (1968), just as Cardwell, Cather and Groak talk about (un)familiar and “contemptible” materials in the context of engineering and architecture (1997). The appropriation of found objects and existing materials with explicitly embedded use contexts, particularly in the new jewellery movement, was a means to reclaiming that agency and a way of talking about materials as emblematic of cultural aspirations based on acquisition, wealth and status (Drutt-English & Dormer 1995). An alternative approach to the “first creative gesture” can be found in contemporary jewellery’s treatment of that most post-modern of materials, plastic, “the very idea of infinite transformation”, in which the modernist’s ethic of truth to materials can no longer apply (Barthes 1993, p.97, Brett 2005). Dutch jeweller Ruudt Peters engages with alchemy in response to the feeling that anything can now be created, and pursues metaphorical associations in his work “away from real designed forms” (Peters 2005, and Astfalck 2005). In the series *losis*, for example, images of the colour red in meaningful contexts (such as prayer knots in Tibetan monasteries), inform the creation of “geodes” of resins, which are cut open to present the insides, rather than the outside forms (see figure 3/12). And British maker Adam Paxon reinvents the material of acrylic sheet by thermoforming laminated layers. In deliberately using industrial coloured acrylic sheet, he is able to show how far from its original associations and expression a material can be brought (Kettley & Smyth 2004a & 2004b, Paxon 2001, 2003). Sarah Lindsay uses discarded pieces of acrylic, filing them to create a new

material, coloured dusts, which she then uses to form luminescent new composites “reminiscent of agate slices” (Lindsay 2005, figure 3/14).



figure 3/14

making material - Sarah Lindsay: acrylic jewellery

### 3.4 Towards a methodology of craft

This set of principles brings together the important elements that have been discussed throughout the chapter, and distils them into a preliminary protocol for craft. A new principle is added after Mazanti’s important analysis of the craft object as uniquely positioned in cultural terms, and one of the original principles is removed to this chapter’s conclusion for its presentation as an outcome of the research, and as a

contribution to both craft and interaction design. The original version of the protocol can be found in Kettley (2005a) and (2005b).

- the risky non-predetermined process results in original visual language, seen to embody particular political and metaphorical values
- 'material' may include traditional materials, technologies, processes and methods, each having their own affordances and constraints
- internalization of material – both source material and the material being worked – is essential for the development of original visual language
- this internalization is achieved through action – techniques include drawing, direct manipulation of material, and repeated exposure to the material
- control over formal expressive elements at diverse effective ranges is dependant on an embodied understanding of the process of production
- signifiers of craft are not to be confused with the original visual language which emerges only from the internalization of material
- craft practice, objects and consumption are characterised by an undecidability of purpose and cultural placement. As such, they are unfixed and occupy a unique space between art and life.

As was stated in the original papers, this list is intended as a loose framework to enable other creative fields to approach craft as a serious discipline with the potential to inform new practice (Kettley 2005a, 2005b). It goes beyond the common conceptions of craft as a thing well done, and even beyond its relationship with material to open up craft as a process with particular underlying philosophies. The focus here on craft as a discipline does not preclude others finding craft and craftsmanship in their own fields, far from it; rather the author seeks to provide a tool for the recognition and development of craft, and for its explicit encouragement in any context.

### **3.5 Conclusion – the authenticity of craft**

The conclusion takes the form of an argument for the final principle of craft as being a continuation of embodied commitment to the co-creation of meaning in everyday life. It is perhaps a common assumption, or more likely an ill articulated hope, that craft objects ‘speak’ to their audience. It is proposed here that the embodied nature of the making process invites an embodied response from the viewer, that is, both are exploratory, and both create meaning through action. The commitment of the maker to the work is an invitation to the viewer to reciprocate with a similar level of commitment. The oscillation of experience of the maker between usefulness and beauty, between transparency and reflection, is embodied in the object as a site of undecidability, generating, when successful, a similar oscillation in the experience of the viewer (or owner). Experience here is meant not as a specific emotion or affects being communicated through formal characteristics, but specifically that level of commitment to meaning – thus the issue of authorship and ‘automatic’ work may still be covered by the claim, in that they seek to draw attention to profound intellectual concepts. In Clothier’s terminology, the authentic situation (the

embodied design process) leads to hybridity (in the resulting craft object), which iteratively leads to authentic experience (co-creation of meaning) (2005). Contemporary display strategies sometimes make this continuation and connection explicit, demonstrating physically the closeness of the viewer's experience to that of the maker, such as in Ruudt Peters' work (2005), but as Mazanti has articulated so effectively, craft has always held an especially hybrid position in culture and personal experience (2003, 2004, 2006). It is only recently that contemporary practice has sought to make this the subject of its work, as a result of new reflection within the field, and understanding gained through discourse outside of it (de Waal 2006).

This is a new configuration for craft in that it deliberately aims to provide any principles at all. It resonates with Mazanti's recent analysis of craft objects as semi-autonomous, but extends it to provide a framework of connectivity between producer and consumer, and between processes of development and experiences of appropriation; it therefore has implications for theories of the configuration of the user in all areas of design. Peter Dormer said that "no amount of writing can reverse a cultural trend", and described it as "a bonus" if others should peep in from time to time and "discover an idea or two" (1997, p.15). The researcher disagrees with this "honourable tradition of silence in the crafts" (Harper 2007), and believes this chapter has demonstrated that craft is increasingly about both talk and practice, and that this is no longer an anachronism (Gates 2007, Jönsson 2006, Park 2005). Given that Interaction Design practice is evolving now to include the tangible and the physical, and of course, the necessary direct engagement of Computational Wearables Design with it, it is hoped that this discussion clarifies the motivations and tools to approach Craft as far more than a narrative strategy (Harrod 2006, Jönsson 2006). Rather it is hoped that it will contribute to a groundswell of opinion, "an authentic discourse"

(Harper 2007) and a critical mass of interest in craft as a process and a philosophy.

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Chapter Three gave a description of the current state of Contemporary Craft as a discipline newly engaged with critical discourse, and found that in its history, processes, products and cultural framing, craft offers a model for contemporary authenticity and authentic experience. It presented empirical research undertaken through the comfortBlanket and a survey of contemporary jewellery practitioners, and proposed a set of craft derived design protocols for Wearable Computing, Interaction Design and other creative fields. Finally, it was proposed that it is craft's constant dissolution of dichotomies that renders it undeniably authentic, and that it presents a case for the analysis of development processes, configuration of users, and user experiences as inextricably linked. The next chapter considers the everyday context of the craft object, introducing user centred goals to the emergent methodology.



## Chapter Four

### Designing for the everyday: the lifeworld of a friendship group

The literature reviews in the previous chapters have revealed the beginnings of a possible methodology for authenticity in design consisting of three main parts – the object, the lifeworld and the processes of their inter-connection. The first, the craft object, was considered in the previous chapter as a site for authentic experience. This chapter continues with the lifeworld in relation to the design process, as an approach to the problems of describing the complex textures of the everyday environment into which such authentic objects might be introduced. Actor Network Theory is introduced as a conceptual framework and the methods used to sketch the lifeworld of a female friendship group recruited to the research are described.

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#### 4.1 Metaphorical presence

The work of Lars Hallnäs, Johan Redström and others at the Interactive Institute, PLAY Research Studio in Gothenburg has been an important influence in the direction of this research, in particular their approach to ubiquitous technologies in terms of “what it means for something to be present in someone’s life” at a metaphorical level, as opposed to through definitions of use (Hallnäs & Redström 2002, p.106, Redström 2006). In their work *use* and *presence* are presented as two different perspectives on what things are and what they can be, characterising use definitions as abstract descriptions of what an artefact can do or be used for, whereas presence is defined by more existential descriptions that often

relate artefacts in terms of their personal associations and histories. How a thing is accepted and invited into a lifeworld is of great interest to this research, and there is a fundamental difference between artefacts being designed to fit a space in someone's life, fulfilling a perceived need, and their being made space for by that person. A similar view can be found in Agre and Horswill, who claim that without a specific use, objects are interchangeable until the lifeworld finds some way of "marking them" (1997, p.114). Baudrillard differentiates between tools and objects, which are defined by their metaphorical presence, present to their owners at a cognitive level, and which include art works, furniture valued for its design, or artefacts valued for their sentimental meaning. They may have useful functions, but it is not necessary to their being valued as objects (Baudrillard 1968). Hungarian psychologist Csikszentmihalyi conducted research into how meaning is attributed to domestic objects, and found that function played a part, but more importantly, that the connections between individuals, and between individual and aspiration, were stronger and more common. Again function, and even quality, was not critical to the perceived value to the owner:

It was a tacky specimen, with thick seams and blurred features. With some hesitancy the interviewer asked the woman why the statue was so special to her? She answered with great enthusiasm that the statue had been given to her by a Tupperware regional sales manager as a prize for the quantity of merchandise she had sold. Whenever she looked at the Venus de Milo, she didn't see the cheap goddess, but an image of herself as a capable, successful business person.

Csikszentmihalyi 1995, p.118

A move away from the purely pragmatic view of lifeworld, which implicates objects as tools, is crucial for understanding the roles of products such as fashion, where need has obviously moved from the

pragmatic lower levels of Maslow's model to the higher psychological motivations for consumption (Jordan 2000, Maslow 1998, Maxwell 2002, Rahilly 1993). Jewellery presents a particularly extreme case of such a product, where that psychological need has always been predicated on the semiotic and existential rather than on the pragmatic. In fact introducing hard functionality to jewellery has been identified as a potentially tricky conceptual problem for the discipline, raising questions not only of what technology looks like, but of what jewellery is and does (Cohn 2007a, 2007b, Evans 1998). This would imply that an evaluation process should look for evidence of users 'finding place' as well as acknowledging usefulness in novel products: "As information technology pervades everyday life, computational artefacts also become a part of our lives: we can say that we let some of these artefacts enter our lifeworld" (Hallnäs & Redström 2002, p.109).

### **4.2 The phenomenological lifeworld**

Hallnäs and Redström however fail to explicitly define lifeworld beyond an association of a particular object with a particular person (2002, p.109), and so a brief consideration of what lifeworld means is appropriate here. Commonly, the concept is attributed to the philosopher Husserl, although his and others' subsequent definitions have been criticized for not shaking off the "tenacious dichotomies" of the world as a priori fact (Rogers 1998, Sandywell 2004). While it might be easier to view the lifeworld as a kind of frame, it is important to remember that it is constituted by human action as much as it constitutes us, and that "we are objects but also subjects with respect to the lifeworld" (Rogers 1998, p.2). Much as craft is undecidable, being continually reframed in action and contemplation, the lifeworld is continually acted upon by humans as it acts upon them.

In his later writings, Merleau-Ponty was working towards the body as 'chiasm', in which subjective experience and objective existence were combined (Baldwin 2004, Tripathi 2004). Baldwin says this stance "shows us the ambiguous status of our bodies as both subject and object" (2004, p.248), while Quigley tells us that Merleau-Ponty believed the world of human experience to be "filled with ambiguity", and that "reality as we know it, is ambiguous to the core" (1996, p.3). This thesis proposes that any creative act that seeks to split the objective and the subjective is therefore at very least incomplete, and at worst, inauthentic and contends that the autonomous goals of modern forms of art, and the focus on emotion and experience for their own sake in much contemporary design, are examples of this. Conversely, it is proposed that craft has always held an ambiguous place in the world, and that as such, it offers a creative model for an authentic design process. A truly in depth exposition of this position would require another thesis to unravel, but it is suggested that the starting points are there to be found in the writings of for example, Petitot et al (1999), Polanyi (1998), Lakoff and Johnson (1999), Dennett (1991) and Merleau-Ponty (1968, and Baldwin 2004).

In the meantime, the researcher is in agreement with Rogers in her critique of phenomenological approaches as ignoring the agency of the lifeworld, and giving primacy to the consciousness of the human beings within it – thereby objectifying the lifeworld as something other, an a priori fact, a space, the horizon (1998). This characterization of the lifeworld as pre-existing gives rise to a reduction of the meaning of life to an individual's independent, as opposed to social, "achievement of an authenticity", which the review in Chapter Two also found to be an autonomy based on dualisms (Guignon 2004, Golomb 1995, Sandywell 2004). In accordance with the thesis' stance on what it means to be authentic, Rogers concludes that to speak of life, there needs to be an acknowledgement of "the mutual and reciprocal activity of living beings

and world” and an extension of “intentions, designs and activities” to objects and affairs, as well as to human actors (1998, p.2, p.6). This view of lifeworld leads naturally to Actor Network Theory (ANT) as a framework for approaching how objects impact on the meanings of socially enacted spaces. Further, ANT has been shown to be useful in the descriptive project not only at the institutional and individual levels, but also when dealing with objects as composites of effective formal elements occurring at diverse ranges (Ellis 2004, Pye 1968). Ellis engaged ANT to refute the elimination or diminution of necessary craft processes from art works: “A network is a chain of indispensable actors which transform an idea into an object to become *the network* - *the network* is an entity, *the network* is craft” (2004), and like Ellis, the author is encouraged by Latour’s verification of craft in the production of science (1986, cited in Ellis 2004).

Actor Network Theory therefore seems a useful starting point from which to understand how art and craft objects exert a multivalent influence on a range of lifeworlds, and their ability to shift between states of visibility and hidden-ness. As craft objects are undecideable, yet composed of layers of physical expression, ANT seems particularly appropriate for their analysis with reference to experience. It is difficult to describe the everyday world without abstracting from it, thereby reducing its contingent texture (Costelloe 1996), but ANT may well offer a solution in its emphasis on restoring a balance between the human and non-human actor (Latour 2005).

### **4.3 Actor Network Theory**

Actor Network Theory (ANT) is a framework that cannot be applied so much as it offers a way of thinking about the influences that come to bear upon systems of meaning (Latour 1997). Included in those systems are

both human and non-human *actors*, actors being those things that contribute to the makings of meaning: hybrid systems with some level of definition (such as an institution or a social club for example), are called *assemblages*. The term actor does not refer to that entity's ability to make sense, but rather to effect it – Latour does not claim that objects are in any way conscious of their effects, but that they have a crucial part to play in the meanings that emerge dynamically from associations, suggestion and use (2005 and Oudshoorn & Pinch 2003). He also presents ANT as able to deal with the “oscillation” of “both continuity and discontinuity among modes of action” (2005, p.77). By this he means that action is achieved through and with objects as it is through and with other humans, but that there is no way of pinning down rules for such emergent patterns of behaviour: ANT is “an object-oriented sociology for object-oriented humans” (Latour 2005, p.74). De Michelis has also talked about the ‘extended object’, whereby the physical thing itself gives rise to different representations of itself throughout culture, affecting many networks in new and different places through media dissemination (2005). The study of such assemblages calls for an “agnosticism” as to what constitutes the object of study. Michael gives the example of technoscience, which must first put aside what it understands to constitute science (2006, p.30), similar to the process of bracketing in phenomenological research, wherein the researcher attempts to put aside her own presuppositions of a subject (Bednall 2006, Rahilly 1993). In the case of this research, it represents agnosticism as to what counts as craft and what counts as device. To study hybrid crafted networked objects as they are configured by user-participants, these are the contributing genres that must be bracketed. Further, ANT is itself mixed and impure, as the products of technoscience typically collapse ontological and political distinctions (Michael 2006, p.31), and in answering the problem of the evaluation event itself being performed by users, Actor Network Theory also helps the researcher to see the observed entity as something

concrete rather than abstract, and thus to account for the world of the surveilling as well as the surveilled (Michael 2006, p.68).

The Actor Network Theory approach is one of description then, rather than top down analysis. It does not presuppose structures and answers, but studies the answers co-created by the actors as they arise in the networks in question. This point had a strong bearing on the analytical tools used to approach the texture of the lifeworld: Grounded Theory and a post-structural form of Discourse Analysis were both influential in the way themes were allowed to emerge from the collected data, and in the way these themes were allowed to change through the course of the analysis itself. These are dealt with in Chapters Six and Seven of the thesis.

#### **4.4 Design and the lifeworld**

Hallnäs and Redström find that the usual premise of designing computational artefacts as effective means to ends valorizes one aspect of phenomenological experience, that is, disappearance, and they question the assumption that this is the only way to design such products (Hallnäs & Redström 2002). In order to design for presence, as became clear in the discussion on craft, products must also be designed as ends in themselves (see also Csikszentmihalyi & Rochberg-Halton 1981). In other words, they need to embody a context for experience as well as use, and allow an oscillation of reflection and transparency (Bolter & Gromala 2003). In effect, the object is a site for repeated visitations, increasing its materiality (presence), and deepening its meaning through increased connections (Kettley & Smyth 2004a & 2004b, Michael 2006, p.120). The object becomes place, as it in turn marks place (Greenhalgh 2003, Kokkinos 2005). This multivalency points to a treatment of function

and aesthetic as ontologically level, opening up or closing down valency for meaning (Kettley & Smyth 2004a & 2004b, Kettley 2005e, Michael 2006, p.138). As a result, it became important in the research to treat function as expressive in the same way that materials at the workbench are, and in view of the goal of authentic experience, that expression would have to be undecideable and ambiguous (Kettley 2005a). In Evans' words, the work should seek to overcome "our present day lack of sensibility – our competence to join beauty with practicality", and so bypass the notion of craft as nostalgic (1998, p.46), creating instead instruments "made for hands by hands" (1998, p.53). However, this presents the designer with a problem:

Given a well defined notion of intended use, the user test will relate design choices to usability....if we instead turn to artefacts as they are defined in terms of their place and role in everyday life...the situation is quite different. There is no longer a well-defined general notion of use.

Hallnäs & Redström 2002, p.111

This thesis proposes that some of the difficulties in designing for presence as opposed to function can be overcome through a combination of the protocols on craft practice with Hallnäs and Redström's approach:

If we think about the material that forms the expressions of computational things, it is clear that it is a combination of computations and interaction surfaces. Clearly, 'aesthetical design' of computational things is not to give a computer a new and more colourful shell.

Hallnäs & Redström 2002, p.117



Just as the protocols suggested, material becomes extended to include the behavioural aspects of a system towards an aesthetic understanding of interaction (Hummels et al 2001, Petersen et al 2004). The colourful box is complicated by the extreme de-coupling of form and function in most computational systems, whereby the design of an interface cannot be led entirely by a single application or use (Winograd 2001a). The tectonic principles of authentic expression, where the surface qualities of a form are dictated by its internal structure, cannot apply to such open, ambiguous systems, nor to highly complex systems usable for many different tasks. So although authenticity is still seen in the modernist imperative of form follows function, the form of an ambiguous system can at best only be ambiguous. Further, the drive towards revealing mechanisms as a form of truth, and as a metaphor if not an actual way of returning opportunities for individual control to users, currently far outstrips calls for the 'black box' as enchanting or magical and therefore desirable (Greasley 2007). Exhorting users to take individual control of technological systems suggests that designers need to take control of those technologies first in order to understand what is being delivered or asked. To do this however, puts designers, working within considerable commercial constraints, in the near impossible position of becoming experts in numerous hardware and software systems. One solution is for the designer to engage with the effects of perceived system behaviour through her own and others' observed reactions, in collaboration with systems experts; another is to work to reveal systems again through collaborative design processes. Another is to engage with technology through the processes of craft, with the aim of shifting some of the frames of design and moving towards a reciprocation of commitment to engagement between designer and user. This is the approach found in Physical Computing, a direct engagement with the electro-mechanical properties of materials to build components at human scales, which also results in divergence, thus able to reinstate a closer relationship between

the form of an artefact and its potential use (see for example Berzowska & Bromley 2007, Buechley 2006, and Make 2007).

#### **4.5 Problematisation of the design space**

In summary, the major outcome of the reviews on authenticity, craft and the lifeworld has been a radical problematisation of the design space. Authenticity and the lifeworld have shown us that it will not be sufficient to design for an individual, and craft and the lifeworld have combined to remove the certainty of functionality. Where more usually design begins with a definition of a user and a need, these identities and definitions have now been scattered, blurred beyond recognition.

At the same time, the site of interaction has been distributed, falling outwith and in between the more familiar sites of the domestic and work environments. The imperative to design for the everyday has led to a 'third space', constituted in inter-action rather than as a result of demographic category or top-down organisation, and it is no longer a simple matter to define a meaningful context or user group. Weigert points to the different social arenas within which inhabitants enact various phases of their daily lives – the office, the domestic setting, clubs or associations, and now online; in the pluralism of the city, he says, "the basis for concrete and stable meaning must now be found in the very structure and routines of everyday life" (1981, p.271). According to Lefebvre, this facticity, or social space, emerges from a set of relations, corresponding to different social and productive arrangements (Ethington 1997, Lefebvre 2002). It does not seem to make sense then, to design for one setting only, nor does it seem to make sense to design for one person in the manner of the craft commission, when meaning and society are intersubjectively performed. Increasingly, it became necessary to

identify such a mechanism already in action, and so the researcher recruited a group of female friends to the design process.

#### **4.6 Welcome to our lifeworld – introducing the friendship group**

The social space in this research is that of a group of five women who were chosen initially for their membership of the same exercise class, and for their declaration of friendship with each other. Paralleling the problems with the everyday, using demographics such as age, class or gender as the sole basis for the analysis of friendship, has been found too coarse and inadequate an approach (Allan 1989, 1996). Therefore, although the five women did share many characteristics, it was their understanding of themselves as a particular grouping that was key in their selection. The daily interactions and distances that constitute and represent these women's experiences of their friendship were investigated as a means of describing the 'shape' of the group, initially with a view to describing any change in it as a result of the introduction of the new medium for communication, the networked jewellery (Kettley 2005b). Social Network Analysis was considered as a possible method for visualising this description over time, particularly as it also allows for objects and 'affairs' to be treated as actors in a network. However this approach was rejected as the second iteration of the jewellery began, as it became clear that the required levels of robustness in the prototypes would not be attainable within the scope of the research. This is not a trivial problem, and has been identified by user experience designers at Nokia, for example, as a major barrier to longitudinal studies (Anttila 2006). In addition, the strength of Social Network Analysis lies in its ability to make visible complex relationships of local and global patterns, and it is best used with larger networks than the one under study here. These two factors indicated that there would most likely be no discernable

change in communication patterns over the period of the research, given the time needed for prototyping and the relatively coarse granularity of the analysis tool. Several methods inspired by Probology (Gaver et al 1999, 2004a) were implemented before this decision was made, and indeed, the results of the self-monitoring analyses (Gangestad & Snyder 2000) supported the move away from SNA as a method and towards Actor Network Theory as a conceptual framework (Latour 1997, 2005). This section briefly reviews the theory on friendship groups, before the early 'probes' used to describe the texture of this world are discussed. ANT then makes a re-appearance in the summary description of the women's friendship group at the end of the chapter.

#### **4.7 Friendship relations and female friends**

It is indeed difficult to get a picture of the importance of friendship in women's lives in western society today.

O'Connor 1992, p.14

Writing in 1992, O'Connor found friendship to be still seen as frivolous, "reflecting a concern with the emotional, the tangential" (1992, p.1). Reasons for emerging interest in the topic can be traced to the beginnings of the Women's Movement of the mid 1960s, to the scientific interest in relationships as psychological constructs, to cross-cultural anthropological work, and to an interest in discourse as constitutive of society (O'Connor 1992, van Dijk 1997). The development and maintenance of standard behaviour is often central to the interactions of a community of friends and neighbours in their reflection on and reinforcement of each other's views of the world (O'Connor 1992). According to Jerrome, these norms create and reinforce social solidarity

and apply to, among other categories, material values, conversational content and dress codes (1984). Paradoxically, it is this structure of support that allows for the exploration of “alternative ideas” and “new understandings” (Coates 1996 p.282), and can be seen by members as a “collaborative tool for exploring our world” (p.285). Coates specifically studied a network of female friends as an arena for the exploration of new understandings of social worlds, and in her description of the friendship group as valid in and of itself, the notions of equality, acceptance and free play were central in describing how understandings are shared and produced (1996, p.282). Women’s friendships in particular have been described as radical in their provision of freedom to try out alternative selves, discourses and versions of reality; dominant or emerging discourses can be challenged safely here, and new understandings nurtured (Coates 1996, O’Connor 1992).

#### **4.8 A post-structural view**

The emphasis on internal needs and motivations underlying much work that characterizes friendship as a form of attachment, is found to be inappropriate given the shifting nature of the relationship across time and geographical location (O’Connor 1992). As a culturally constructed form, friendship necessarily varies both historically and cross-culturally, and so requires a more flexible approach in its analysis, leading back to a post-structural view of friendship relations, which is supported by recent work in Discourse Analysis (Coates 1996, van Dijk 1997), Social Network Analysis (Kilduff & Tsai 2003), and Actor Network Theory (Latour 2005). Simmel’s identification of growing tensions between the increasing formalisation of social structures and the ongoing flow of life (Ethington 1997) has given rise to the suggestion that the friendship relation, in its very fluidity, may represent “the relational genre of the future” (O’Connor

1992, pp.8-9). Female friendships in particular have been shown, in their emphasis on communication, to exhibit particular characteristics in their enactment that offer a collaborative and distributed model of interaction (Coates 1996, Helgeson et al 1987, Wright 1982). The *collaborative floor*, for example, is a common form of group discussion amongst female friends, in which all speakers are understood to hold the floor simultaneously, as opposed to the more formal model of turn taking. It is quantitatively and qualitatively different from the single floor because it is shared between equals and what is said is accomplished mutually, spoken with the voice of the group as a whole (Coates 1996).

In the meantime, in the interests of setting the scene, some common mechanisms of friendship networks are enumerated, before the focus of the research on a specific friendship network as a site of meaning production is described. This short account has critical relevance here because the group in question is not normally considered in depth in technology studies, being female and of retirement age (Turner et al 2004, Oudshoorn & Pinch 2003).

#### **4.9 Mechanisms**

In general, friendships in Western societies are understood to be voluntary and intimate, offering individuals networks of support and companionship, and based on reciprocal arrangements between equals exhibiting prosocial behaviour (O'Connor 1992, Silk 2003, van Dijk 1997). Since the mid 1980's, various issues have been identified in the maintenance and termination of friendships. These include "managing dissimilarity, reclassifying friendships, balancing autonomy and connection, openness and closedness, and predictability and novelty", although as O'Connor points out, empirical work is scarce (1992, p.49).

Much work on the friendship relationship is predicated by the internal balancing of perceived costs and rewards (Berndt 2002, Hartup & Stevens 1999, Silk 2003, Stronks et al 2002, van de Bunt et al 1999), while Jerrome's work on the nature of friendship and the changing shapes of friendship networks for very old people displays a recognition of the complexity of the issue (Jerrome & Wenger 1999, O'Connor 1992). The age range of this group, the relative synchronization of their major life events, and the women's geographic proximity to each other, mean that certain features of friendship networks are particularly relevant here. Just by living in the same area, these women automatically meet many of the criteria by which potential relations are judged, and through which homophily in such groups can arise; examples would be "cultural background, social position, economic status, intelligence, age, and mode of dress and grooming" (Gouldner & Symons Strong 1987, cited in O'Connor 1992, p.39). (Although the group exhibited homophily, these commonalities were not the basis of its selection for participation in the research).

Embeddedness in daily routines has also been shown to play an important part in the maintenance of friendship relations, either metaphorically in emotional attachment, or more prosaically, through "trivial interconnections and presence in one another's spheres of life" (Duck 1988, p.100, Ethington 1997, O'Connor 1992). Resources play an important role in facilitating these mechanisms, and public spaces are often implicated in the status of women's relations in particular (O'Connor 1992, p.46, Coakley 2002). The domesticity of the home has become a byword for the containment of the female identity, and as a site of paradoxical, localized power.

Primary ties and self-identity are central concepts for the friendship group in question. In considering older women (which can cover from fifty to

ninety odd years of age, a sweeping category), major life events are common, and include retirement, changes in marital status, and widowhood, as well as the life events of close others experienced empathically, such as in the birth of grandchildren. Primary ties, that is, intimate relationships typically within the family, are at risk in this stage of life, as daily interactions with irreplaceable individuals are lost through geographic distance, or through illness and bereavement. Compensatory views of friendship relations see friends in this life stage as being there for the individual when significant others are lost in this way, and view these as offering new roles for the individual (Blieszner 1988, Cantor 1979, Crohan & Antonucci 1989). Conversely, marriage ties have been shown to become more important in the alleviation of loneliness when older people do not perceive their friendship ties to be close (Hall-Elston & Mullins 1999).

### **4.10 Discovering this lifeworld**

#### *4.10.1 In preparation*

The primary objective in approaching the lifeworld of the five women was to survey the landscape into which a collection of novel networked pieces of jewellery was to be introduced. In the early stages of a design process this can inform the generation of possible requirements, and reveal potential modes of interaction. It may also inform the development of formal characteristics such as colourways, although it is noticeable in the apparel and fashion industries that direct contact with users is rare beyond the 'muse', heuristic business-to-business methods and accounts of the marketplace (see for example Hammond 2002 and Infomat 2007). An interesting exception is to be found in a study of users' preferences for Bodymedia's Sensewear Armband, in which mood boards were



presented directly to users (Forlizzi & McCormack 2000). Importantly, the relevant (f)actors in the socio-technical network may be made apparent to the researcher, including ideologies and resources as well as the human actors, those ‘affairs’ that Rogers referred to (Latour 2005, Rogers 1998). Some of the techniques described here, such as the social space questionnaire, were implemented before a shift away from Social Network Analysis towards Actor Network Theory, and were intended to map the network before and after introduction of the jewellery, thus revealing its roles within it. The results of these continued to have relevance as they pertained to contingent actors in the lifeworld. In addition to these methods, the researcher had started working towards a visual language, engaging with materials in the studio and rethinking her practice as a jeweller in light of the ongoing literature reviews. This work was supported by a visiting residency at the department of Silversmithing and Jewellery at Edinburgh College of Art, and acted as a means of validation for the work as craft and as a way for personal visual language to inform computational concepts in a meaningful way. In the early stages, it was also unclear as to whether actually implementing a wireless network would be necessary (the comfortBlanket project soon suggested it was), and early prototypes made in this way were developed to support the research in a number of ways:

- pieces could be handled and appraised for their material and formal qualities, and potentially serve as a comparison to later computational prototypes
- formal aspects such as material, colour and weight would elicit reactions from the women revealing their expressive preferences
- it would validate the approach through making the work available for critique within the craft community itself
- it would position the researcher as a craftsperson in the eyes of the participants

Pieces such the one illustrated in figure 4/1 also served to give the research agenda visibility across domains, an important element in interdisciplinary work (Mitchell et al 2003, Valentine 2005), and *appendix i* lists outputs including exhibitions. At the same time, potential technologies were researched and concepts combining their functions and formal attributes were devised (figure 4/2). *Appendix ii* lays out the chronologies of literature reviews and research activities.



figure 4/1

early visual development – ‘East Coast’  
brooch in Formica, 18ct gold, silver and pigments  
exhibited at the Royal Scottish Academy 2004

User centred design, while rooted in the most worthwhile political values, is beginning to be questioned for its effectiveness (Shedroff 2007, Wypijewski 1999). This research aims to combine the commitment of the maker (visual language, authorship) with the world of the user (tastes and functionality). It explicitly aims to approach the metaphorical needs of users, and to reflect on methods for the design of objects as contexts for meaning making. In contrast with Participative Design, for example, it deliberately reinstates the artist or researcher as author, because it is believed that identifiable authorship is an important aspect of authentic commitment, as discussed in Chapter Two, and so plays a key role in the

co-creation of metaphorical presence. In keeping with this concern, the research has not made use of such techniques as scenarios and personas, for example, as they are understood to abstract from the richness and contingency of the everyday, reducing it according to prescribed agendas.

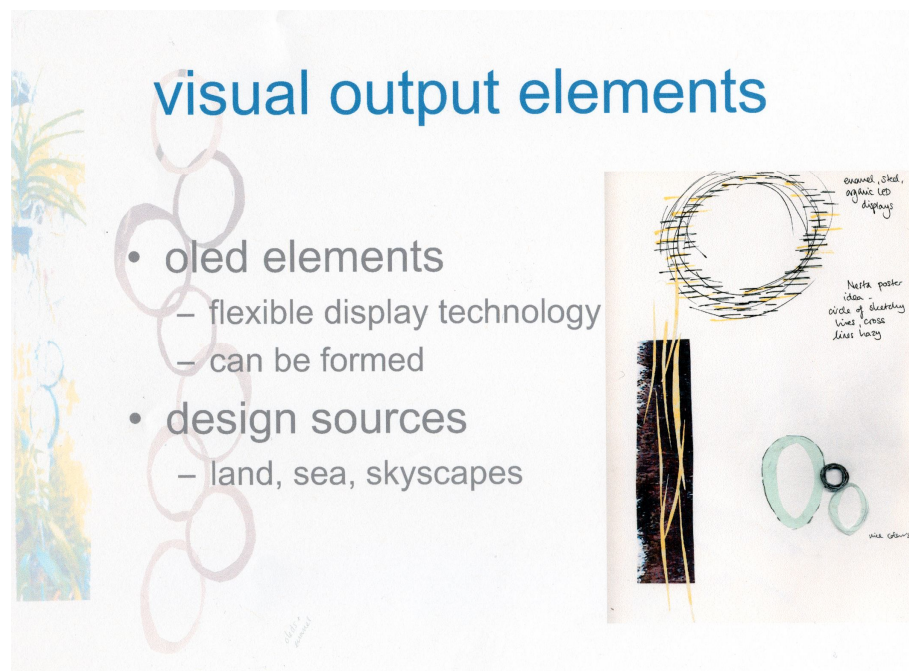


figure 4/2

combining visual research with emerging technologies

#### 4.10.2 Introductory meeting

On 14<sup>th</sup> January 2004, a preliminary meeting was held at the home of one of the women, GMc, after the group's exercise class. A short introduction by the author to the research was given, and four current enamel prototypes, similar to the piece *East Coast* above, were handed round (see figure 4/3). In effect, this provided the first instance of data in an 'out-

of-the-box' evaluation, but because this was the first meeting at which the women were being asked to join the research process, no recording was made, and the researcher instead took notes by hand immediately after the event. Even so, these notes bore witness to a strong affective response to the jewellery through comments on their aesthetic and associations with the night sky and the dawn. Other observations included a broad range of abilities and comfort levels with technology: "I love texting", and "I'm hopeless at emailing". All of the women present agreed to take part in the research over the forthcoming two years, and are referred to by the letters JP, J, P, Ch and GMc: figure 6/1 in section 6.3.4 lays these out with reference to the transcriptions of verbal protocols collected throughout the course of the research.

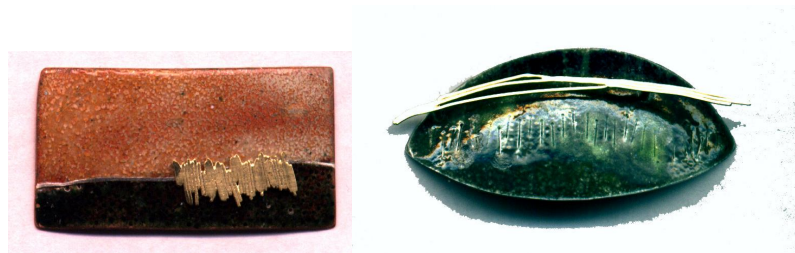


figure 4/3  
introductory meeting  
enamel sample and brooch

#### 4.11 Discovering this lifeworld – methods

Following the initial recruitment meeting, a series of methods was implemented to sketch out the group's existing lifeworld. These were:

- a *collage activity* designed to investigate significance in owned artefacts (March 2004)

- a *drama game* to reveal the habitual proxemics of greetings (June 2004)
- a *questionnaire and interview* to gather information on the geometric and perceptual characteristics of the network (October 2004)
- a *self-monitoring analysis* to gauge the frequency, pace and rationales by which the women might alter their personal expressions (December 2004)

In addition to the explicit objectives for each of these, the methods were seen by the researcher as motivations for gathering, and as provocations for discussion. They generated data in their own right but also offered a valuable frame for observations of how less directed, everyday conversation was conducted, and provided plausible contexts which might reveal the ways in which meanings were negotiated and co-constructed by the group.

#### *4.11.1 Collage activity*

This was the first attempt at a 'probe' into the lifeworld of the group. IDEO's collage activity method was used to find characteristics of some of the women's attitudes to existing possessions and common activities (IDEO 2003). Each participant was given a disposable camera for a week, and asked to photograph a number of items of personal significance to them. The researcher had the films developed, and the group met again to physically cut and paste images into individual collages while talking aloud about each object's significance. Examples of the boards produced are shown in figure 4/4. Four of the five women were present at this activity. The talk aloud protocols were captured on audio tape and transcribed to reveal commonalities and differences in

individuals' understandings of meaning and ownership, in their consumption of craft objects and in their attitudes to self adornment.



figure 4/4

collage boards: Ch and JP

*reproduced with permission*

In general, results showed that the highest levels of significance arose from external associations with primary tie relationships, for example, in the receiving of a gift from a spouse or very close friend:

JP: I just realized there is actually a theme to it, because it's all memories...um, and you know the garden, and plants and gifts and things – and friendship – that's what it is, I've just realized looking at it...

GMc: ...in the middle I have my family...my daughter and my grandchildren and my son-in-law, the most important things but I didn't take a picture of my son, so that's terrible...right..(laughter)...and then I have pictures of things that remind me of my mother...and my husband...

Two of the women specifically mentioned colour and texture as being important to them:

GMc: ...so it's family, memories, garden and colours, colour is actually really really important...em if the colour's wrong, everything's wrong....

Ch: ...I love wooden things...I love feeling, you know, tactile things, just wonderful...

When combined with data from the other methods, for example on occupation, hobbies and self perception, these contributed to notional levels of visual awareness and motivation: Ch and GMc came to be described as highly visually aware and motivated, JP as being visually aware, and J and P as being not very visually motivated.

#### *4.11.2 Proxemics of greetings*

In generating possible functions for the networked jewellery, it seemed that the fragmented nature of the group's interactions might be creatively supported by an ambiguous approach to providing identity and proximity information, and this activity was an attempt to find out at what varying

distances the women would greet each other. Improvisation games were devised inspired by Johnstone (1989, 1999), in which a given status acts as a motivating factor in deciding how and when to greet another individual. These were played out in JP's living room in June 2004, and were followed up with a discussion to identify typical greetings scenarios in the participants' real lives, including gestures and relative distances of greetings. Three distances were defined as being of interest: these were *intimate* (below 30cm), *social* (between 30cm and 1 metre), and *distant* (over 1 metre). Subsequently, it was found that these had a remarkable precedence in Proxemics, the work of Edward T. Hall, whose subject group had been very similar to this one (Brown 2007, Charlesworth 2005, Hall 1966). Much more information on the contingent nature of greetings also emerged. For example, levels of body language were seen to be greatly affected by a range of factors, including the intimacy of the relationship, how recently the other individual had been met, and whether there was an occasion such as a birthday that would warrant special attention. Importantly for the conceptualization of a particular network as a lifeworld, the women also agreed that they used different codes of greeting for different groups of friends, within which quite different rituals could have developed, and they understood this to be a means of differentiating between those groups to a certain extent. This was observed further by the researcher in an interaction in 'real life': two of the women (JP and J) were attending a private view in a gallery context; an acquaintance who had been seen recently was kissed on the cheek and touched on the arm, while another, less well known ("oh, she probably won't remember me"), was approached more tentatively until she changed the tenor of the encounter by saying "Oh, but X and I were talking about you just last night!" – at this point, the greeted acquaintance kissed JP and touched her on the arm. All of these results point to a more contingent meaning for the proxemics of greeting than simply indicating a level of pleasure in the encounter. There is a danger, however, in



positivist approaches to design, which in their attempt to cover every eventuality come to destroy the delicacy of what is already a sophisticated social performance. In trying to get away, and indeed critique such over design, such observed subtleties suggested instead that a relatively simple set of information would be all that was required to enable creative use of the jewellery. To this end, all that was taken from the collected data was a focus on distance as an important parameter in the jewellery system; how this informed the interaction and display is detailed further in Chapter Five.

#### *4.11.3 Social space questionnaire*

Following on from the notion that proximate communities have a particular resource for maintenance of social groupings (Coakley 2002), a questionnaire was devised to elicit some of the geometric relationships involved in the enactment of this particular friendship network (see *appendix iii*). This was based very loosely on the Bogardus Social Distance Scale, first used in 1926 in a study of attitudes to race (Ethington 1997). However, as Ethington points out, in the original scale the response items, while describing explicit social distance (“would marry” for example), in effect become proxies for the feeling of social distance. In trying to get at the actual geometries and resources of the group’s self-maintenance, the redesigned scale was themed around media, typology and frequency of interactions, and awareness of non-verbal expression with regards others in the network (see *appendix iv*). In the process, the list of items extended enormously from seven to sixty, with space for the respondents’ own comments. The items were presented as “I regularly....”, and included options that reflected pre-arranged and contingent encounters, and spontaneous interactions, such as “bump into in the street” (contingent), “attend a club with” (pre-

arranged), and “enjoy recommendations for events by” (spontaneous). In addition, some items were concerned with ideological and expressive closeness, for example, “lend books to” and, more emotively, “admire the taste of”. Interviews in the women’s homes were then held to generate subjective accounts of the frequency, intention, and media of communications with other members of the group. Again, SNA was still being considered as a tool for analysis, and the results of this questionnaire were translated into Social Network Diagrams to describe the weighted shape of the group, showing positions and roles according to actual frequencies and perceptions of encounters. These are included in *appendix v*, but no longer have any bearing on the analysis of the women’s attitudes towards the novel jewellery, SNA being found to be something of a sledgehammer to this network’s nut.

#### *4.11.4 Self-monitoring analysis*

One of the suspicions of the researcher was that, as mature individuals, the women in the friendship group may feel little need to modify their expressions to fit in with each other at the level of adornment. Originally the research had hoped to discover dialogical aspects of dress as a form of non-linguistic communication, albeit understanding that this would most likely be a slow exchange compared to other channels such as the choreography of body language, or the adoption of linguistic codes (Aaker 1999, Charlesworth 2005, Fox 2004, Gangestad & Snyder 2000). Self-monitoring is a theory of expressive control, which commonly uses the Self-Monitoring Scale. While there is considerable debate over the both the central construct of self-monitoring, and the method of the scale (Snyder & Gangestad 1986, Gangestad & Snyder 2000), this was enlisted by the researcher as a prompt for guided discussion with the women, over and above any results the scale itself might provide. The

scale used was an 18 item true-false measure, which includes statements such as “I guess I put on a show to impress or entertain others”, and “I have trouble changing my behaviour to suit different people and different situations”. Low self-monitors are presumed to express their “own inner attitudes, emotions and dispositions”, while those who score highly on the scale “may be highly responsive to social and interpersonal cues of situationally appropriate performances” (Gangestad & Snyder 2000 pp. 530-531). The researcher joined the five women at GMC’s house to complete the measure in December 2004. Scores ranged from 5, up to 12, out of 18, with an average for the friends of 8.4 (the researcher scored 6). If the measure is reliable, those women scoring below 9 can be characterized as low self-monitors, and those above it as high. However, even in this experimental usage of the measure, as a prompt to verbalization around the topic itself rather than as a quantitative tool, serious misgivings soon surfaced. Responding to the statements quickly, as is directed, was found to be hindered by the structure of the statements themselves and the true-false nature of the response: “that’s true, I don’t do this” was found to be a non-intuitive response in its inherent contradiction of the positive and negative. This aside, the women quickly ascertained that self-perception may not be the same as situated action, and that in all cases, “it depends”, with awareness not necessarily equating with action. Added to this was the dispiriting perception that there was no possible positive outcome; those who found themselves categorized as low self-monitors immediately felt like “frumps”, while those that had been categorized high, equated this with “shallowness”.

This activity threw up some interesting points regarding authenticity and self- presentation. Fashion and authenticity have been described as being antithetical (Golomb 1995, p.5, Lehmann 2000), the first concerned with surface appearances, consumed or contrived expression and a fickle changeability (Barnard 1996), and the second predicated on a causal

relationship between the inner emotions and intentions of a subject and their spontaneous expression; authentic personality and integrity were understood as a function of consistent behaviour, as discussed in Chapter Two. These accounts see authenticity as autonomous, and view any relativity in expression as deeply suspicious. In fashion this equates with descriptive terms such as 'classic', 'timeless' and 'style', an expression of identifiable individuality at the one extreme, or some constant ideal relationship between formal elements that may be subscribed to at the other. As in other (modern) systems of authenticity, options for personal performance become polarized – frumpy or shallow.

A second point to note is the whether the perception of a relationship between clothing or adornment and the self is there at all. Fashion is also presented as a system of signification, and those that participate in it therefore subscribe to a belief that something is being signified (Barnard 1996, Lurie 1981). In contrast, some of the women in the group were skeptical about this relationship, and one remained deeply uncomfortable with it.

While these are very interesting departures, their investigation lies outside the scope of the thesis, and so they remain pointers to future work. The results of the exercise, meanwhile, suggested that the women were generally not likely to noticeably modify their expressions through adornment. This finding was compelling enough to support a significant change of focus in the research, and observation of the dialogical nature of expression was dropped in favour of an analysis of the processes of acceptance of novel objects into a lifeworld.

## 4.12 Sketching the friendship group

### 4.12.1 *Intimacy, neighbourhood and the everyday*

While modern life and indeed narratives of ubiquitous computing place community beyond specific geographically defined locales, this particular friendship group was found to be strongly characterized by the stability of their geographical situation. Indeed as one of the women waits to move house across the river, the whole group is in preparation for her change in status, and she has effectively closed down social ties with all but one other member to facilitate this process. Given the central role geographic distance can play in the maintenance of friendship groups, this is an important point. Four of the five women have lived over the past three years on the same street of houses in a suburb of Edinburgh in the UK, and are largely within walking distance of each other, an acceptable distance for making spontaneous house calls on each other (acceptable in that the caller is not seen to be ‘making a fuss’ by going out of their way to call). This has been the case for over twenty years for most of the women, who became friends when they were taking their young children to school in the area. (The exception to this is GMc, who moved into the street three years ago, and “has never made so many new friends so quickly”). At the same time, there is a clear effect on ad-hoc and spontaneous encounters as a result of the spatial characteristics of the neighbourhood. None of the actors appears to use the local shops, and there is no community perceived as being centred around them. This may be due to the main road in the area being a busy route out of Edinburgh to the west and the airport, and to large shopping malls two miles away offering destination shopping for both everyday and larger purchases. Ch’s place in the group is also constrained by her living further away from the others, and she expends energy maintaining an intimate relationship with her most established friend, JP, while others cannot develop

naturally, that is, without effort, because of the lack of opportunity for ad-hoc encounters.

Each of the women are also members of other social groupings, some of which overlap with this one, and also have valuable friendships which are maintained over long distances, forming an important part of their emotional lives. However, it was the aim to describe how this group was enacted, and how it made sense of new products, rather than to look for pre-defined types or strengths of association. It was important not to pre-configure the group, but rather to see it as a type of network that exists as a constituent part in the organization of society: the researcher must try to bracket her preconceptions of what constitutes a friendship group and exercise a certain level of agnosticism (Michael 2006).

#### *4.12.2 Occupation and consumption of art*

The women were all financially well enough provided for to be living in substantial properties in one of Edinburgh's more desirable residential suburbs. Some of this status might be said to have been 'borrowed' from the marriage relationship (O'Connor 1992), but all of the women had held jobs before retirement, and two were still engaged in part time or freelance work in their original fields. Another was writing up her own doctoral thesis during the study. Occupations included musician, dancer, science teacher, radiographer, and PA at the Scottish Office. The women exhibited different values in their consumption of art and in their interest in dress in its own right. P, in particular, with strong church associations, felt uncomfortable with the idea of adornment as meaningful at all, while those working in the arts saw it as a given that codes of dress, and even decoration within the home, would act to communicate something about the individual, no matter their intention. Others were passive consumers

of art objects, receiving them as gifts, or inheriting them from others, and focusing on extrinsic associational meaning rather than on inherent properties of the objects themselves.

#### *4.12.3 Support for roles*

While there is some evidence that points to differences in patterns of friendship between single, married, widowed and separated women, very few studies have looked at groups composed of a mixture of these statuses (O'Connor 1992). In this group, two of the women had been through the loss of a partner, and a third was dealing with her husband's struggles to live with a gradually debilitating illness. It can be assumed that widowhood is always a potential status for women in such a friendship group, and that the performance of coping that the bereaved women enact, forms an important aspect of mutually supportive relationships. In their relationships with other family members, children and parents, the women were also in various emotionally demanding situations, finding themselves occasionally excluded from, or forcefully included in, the lives of grandchildren and elderly mothers-in-law. Certainly, widowhood should not be the only factor in consideration when studying older groups of women. Further, this research views the friendship relations of its participants as offering strategies for dealing with changing primary ties not only in a compensatory way, but as offering a common ground for the redefinition, construction and interrogation of individual identities. This is accomplished through shared reflection on difficult emotional experiences and through the collaborative building of narratives of desirable future personas, roles, and situations. As representatives of a particular life stage, this group demonstrates the importance of not painting all users with the same brush. This is particularly true of 'the elderly', which these women would normally be

classified as, and which can encompass as much as a forty year span (O'Connor 1992).

The women's comments on the contingent nature of the network are valuable, as they allow the researcher to identify presuppositions associated with the term 'friendship group'; for example, Coates' subjects (1996) were all habitually close, and it would be understandable to define such a group on the basis of intimacy or long term regular association. To do so would miss the strength of Actor Network Theory though – instead the question should not be so much whether these friends fit the researcher's assumptions about what a friendship group should look like, but rather, what kind of friendship group is it?

In this case, the group exhibits some core associations enacted over very long periods (as long as thirty years in the case of JP and Ch), and some older ties are slowly fading while newer ties are made. It includes different subjective views on the strength and importance of some of those associations and is effectively held in place by a very busy central actor (JP). Longer-term friends seemed to have a more realistic, or more balanced perception of the number of their associations: GMc perceived herself as having many associations with all of the others, but their perception reciprocated about two thirds this number. Ch, whose relations were constrained rather than supported by geographic contingencies, was the most accurate in assessing her own associations compared to the view of the rest of the group.

This type of group is important in accounting for the everyday precisely because it resists easy definition, illustrating the interconnectedness of such groups with others of varying significance to its actors. It challenges marketing because it does not exhibit a well defined 'lifestyle', nor does it confirm the stereotypical features of any given demographic (least of all



old age or gender based), which would facilitate branding. Despite this almost perverse heterogeneity, the women continue to act as a site for meaning making, and as such, this thesis argues for this co-creation of meaning as a defining factor of 'the friendship group' in future research.

#### **4.13 Towards finding place – a summary of the design space**

Having approached the everyday through an account of these friends' lifeworld, it is now necessary to bring back together the relevant findings in a summary of the design space:

- maintenance of the group's meta-goal of connectedness should be a key high level function
- to this end, identity information will be important to allow the flexible management of personal ties
- and distance information will allow the actors to control and convey power relationships, intimacy and contingent external factors
- the visual language should be informed by the out of the box session allowing the craft process to become semi-autonomous

This leads to further consideration of criteria for the successful design of an authentic wearable system, and the evaluation should look for evidence of:

- multivalency in the objects' formal characteristics
- actual or potential invitations for integration of the jewellery into the lifeworld
- blurring of hard and soft functionality – understandings of the work as 'craft' as well as 'tech' – and particularly, new figurations that resolve these as a single entity

- potential external associations for the pieces
  - immediate affective responses as well as narrativised placement of pieces or the system with regards the lifeworld
  - co-production of meaning in addition to individual meanings
- 

This chapter focused on the lifeworld as a co-created site of meaning and as place in which novel technological artefacts may exhibit presence. As such it presented the second part in an emerging framework for the design of authentic wearable systems, the first being craft as a site for authenticity. A specific lifeworld of five retirement aged women was described through a collection of methods drawn from psychology and interaction design, and the design space was delineated. The next chapter details the next steps in the design process, before the third part of the proposed methodology falls into place in the evaluation of the jewellery.

**Chapter Five****A Speckled Jewellery Network**

Chapter Four established how the ‘user group’ was reconfigured in line with the outcomes of the literature reviews, referencing problems of the everyday, and informed by Actor Network Theory. This chapter now describes the implementation of a suite of *Speckled Jewellery* for the friendship group’s lifeworld. Two design iterations of the jewellery are given, with an out-of-the-box evaluation after each.

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**5.1 First iteration**

Even at eighteen months into the research, when the design boards in Chapter Four were developed, there were no real expectations with regards implementation. The following month however, the researcher submitted a proposal to use Speckled Computing. The Speckled Computing Research Consortium Scotland, consists of five Scottish universities, including Napier University, which contributes HCI and emergent computing expertise. ‘Smart Dust’ had been considered in the sketchbook work for the development of the wearables concept, but the Berkeley project had come to an end, and like many emerging technologies, despite a promissory web presence, the ‘motes’ were not available commercially (University of California at Berkeley 2001). Speckled Computing represented an opportunity for the researcher to develop an interdisciplinary practice in collaboration with a piece of research, the aims of which were no less than to design and produce the generic building block of the Ubiquitous Computing revolution (Arvind 2005). The analogue circuitry may be changed, and the ProSpeckz

reprogrammed over the air, across 'zones' within a 'Specknet' (Arvind 2004, Arvind 2005, Leach & Benyon 2005). The vision is for an autonomous one millimetre cube, which can self-organise when scattered with hundreds, maybe thousands of others, across a surface or in a solution, and return contextual data to the researcher. Programmable Specks over Zigbee Radio, or 'ProSpeckz', differ from the Smart Dust motes in their reconfigurability 'on the fly' (Arvind & Wong 2004, Mann 2004). The project is currently entering its third year and has secured funding until 2010, and work underway includes the '5Cube', a 5mm cubed Speck, combining sensing, processing and wireless network capabilities (Leather & Ling 2005).

The proposal was accepted and through attending technical meetings and brainstorming sessions to generate potential applications, the researcher began to build an understanding of the special characteristics of this new technology. Through meetings with Frank Greig, an embedded systems engineer at Napier University, and Steven Wong, a doctoral student in communications technology at Edinburgh University, a team began to evolve that would see the realization of the networked jewellery as the first application to be implemented using prototypical Speckled technology. Meetings with Frank Greig in particular had an interdisciplinary flavour in the sharing of ideas and expertise, and it was Frank's tenacity in mediating between the vision of the research and the limitations of an unproven system that made the work a reality. The version used in the first iteration of the jewellery, the ProSpeckzII, is illustrated in figure 5/1.

Applications envisioned for the technology include internal medical monitoring and drug delivery, safety critical devices such as fire alarms which light up the safest escape route, environmental data collection, such as levels of pollution or wind and earth movement, full scale mixed

reality gaming, and Art (Arvind & Wong 2004, Wong et al 2005). Art as an application area was not originally part of the funding proposal of the Consortium, but has grown out of individual collaborations such as this one, and has found a strong resonance with Interaction Design's growing interest in the 'ludic' user experience (Carroll 2004, Gaver 2002, Gaver et al 2004b, Speckled Computing Arts Network 2005, Wong et al 2005, Wright & McCarthy 2003), in which "play...is not just a matter of entertainment or wasting time, but is also a means by which we develop new ideas, and explore new ethical and aesthetic standpoints" (Gaver et al 2005, p.1). As a result, the Consortium is now engaged in seeking funding for a dedicated arts technician to support critical and aesthetic practice based on the capabilities and issues of the Speckled prototypes as they emerge. This is an example of transdisciplinarity, rather than multi, or even interdisciplinarity: instead of disciplines working alongside each other to produce a result, transdisciplinary work opens each contributing field up to change and growth, modifying end goals as well as methods (Mitchell et al 2003, Valentine 2005). The researcher, having begun with an avowal against 'techno-wow', the spectacle of technology and its established aesthetics, has come to a more pragmatic understanding of the craftsperson's urge to enquire into new materials and the treatment of the computation as a material (Berzowska & Bromley 2007, Hallnäs & Redström 2002, Hallnäs & Redström 2006, Orth 2001). Such an explicit engagement with the technology comes naturally to craft, but recent discussions with the related design and art communities have revealed it as an issue for their common working philosophy of transparency (Brown 2006, Creative Entrepreneurs Network 2005, Designing for the 21<sup>st</sup> Century 2005, Miller 2006). The difference lies in an ontological relationship between concept and material; while design strives for an optimum functional, psychological and emotional fit of product to user, and art elevates the conceptual above the tools and media used in its representation (Brown 2006, Miller 2006), the craftsperson may start with

either, and may allow concepts to emerge and develop throughout the making process (European Initiative for the Applied Arts 2006, Kettley 2005d, Mazanti 2004).

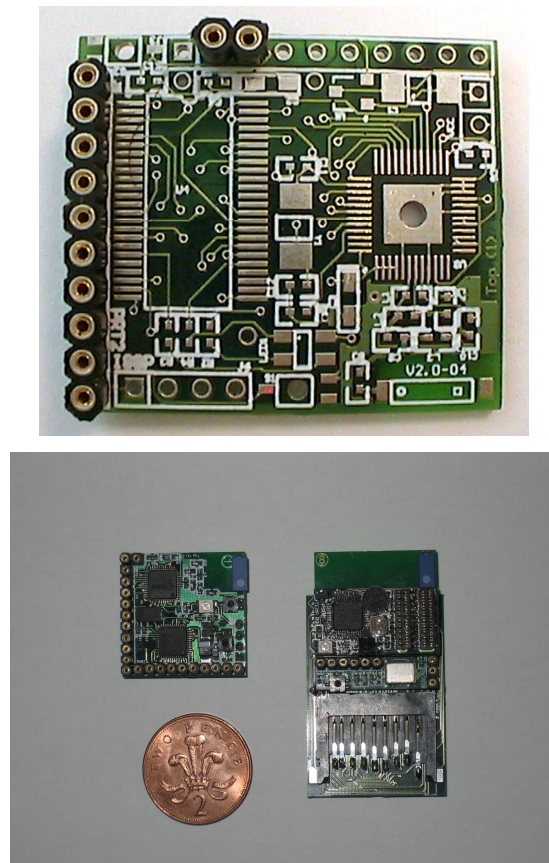


figure 5/1

ProSpeckzII prototype Speck 2004

This is the rationale for design that Hallnäs and Redström identify as being fundamentally problematic for interaction design (2006): in accepting that people are changed as they act through and with artefacts, the interaction designer must also accept that those acts cannot be foreseen any more than the user can. Imagined users, acts and uses remain a conceptual part of the design process, but are ultimately replaced by actual individuals and instances of use, whose contexts and

motivations also cannot be predicted (Hallnäs & Redström 2006). It is suggested here that craft's undecidability opens these hermeneutic gaps in design rather than trying to close them through its ambivalent relationship with concept and functionality (Kettley 2005d).

### *5.1.1 Approaching Specification*

Hallnäs and Redström's problematisation of the design space for interaction is one of openings, gaps (2006). Suddenly, users and their needs are no longer so easy to define. However, to build something, decisions have to be made. To build things as contexts for metaphorical meaning requires commitment, that is, a recognition of accountability, from the artist as well as some kind of starting point with the user. In approaching Speckled Computing as a material that could inform the concept, the author pursued its characteristic of distribution, generalisable to Ubiquitous Computing as a paradigm. The distributed nature of the Speckled architecture allowed a concept of distributed experience to emerge throughout the research program, resonating with the distributed nature of authenticity and the everyday. Formally, the jewellery also became distributed, just as the user had, and just as the creative and user experience would come to be understood (Kettley 2007a & 2007b).

From the theoretical enquiry into the everyday and authenticity as a user experience, it was apparent that the pieces should offer multivalency for meaning making both metaphorically (finding a place in the pragmatic and cultural lifeworld), and formally (arrangements of formal elements such as texture, weight, colour and form). These should include temporal as well as spatial elements, that is, the behaviour and the interaction potential of the devices should be open to interpretation to the same extent as the visual and tactile characteristics. Bearing in mind the social

aspects of wearables, it would be useful for the computational jewellery to form a part of a larger collection, or family, of pieces, from which the women would be able to choose. From the empirical work with the friendship group, there appeared to be potential functionality in the support of those contingencies that both contributed to and constrained the women's maintenance of the group. It was decided that in order to offer such an undecidable space for action, that the jewellery would ambiguously map identity and proximity, based on the three social distances found in the discovery stages of the design process (Chapter Four, section 4.11.2, proxemics of greetings). Materials were dictated by the wireless communication of the Specknet; it was assumed that the metals of the early look and feel enamel prototypes would interfere with radio communication, particularly at the crucial shorter distances, and so the researcher turned to non-precious materials, including Perspex and Formica for the main bodies of the pieces (Kettley 2007c). The next section gives a brief account of the early stages of development of the visual language of the work.

### *5.1.2 Visual language development and collaborative craft working*

Throughout the early stages of the research, questions of implementation were paramount, and it was seen as essential, whether or not a computational design could be built, that the researcher should continue her practice as a craftsperson. This would then provide a living form of research through making, through which a visual language might be developed, which would then inform any computational concepts in a meaningful way (Cooper 2000, Rust et al 2000). Given the researcher's lack of hands-on knowledge of potential interactive materials at this stage, the resulting jewellery pieces would serve to support the enquiry in a number of ways: first, formal aspects such as material, colour and



weight would elicit reactions from the women revealing their own expressive preferences; second, they would validate the approach through making the work available for critique within the craft community itself; and third, it would position the researcher herself as a craftsperson in the eyes of the participants. This last aspect became particularly relevant when Actor Network Theory was employed as a framework for the analysis of the women's figurations of the pieces (see Chapter Four; section 4.3 and Chapter Six). During this time, potential technologies were researched online, and concepts as a result of their functions and formal attributes were devised in combination with the jeweller's more traditional form of visual research (figures 5/2 and 5/3).

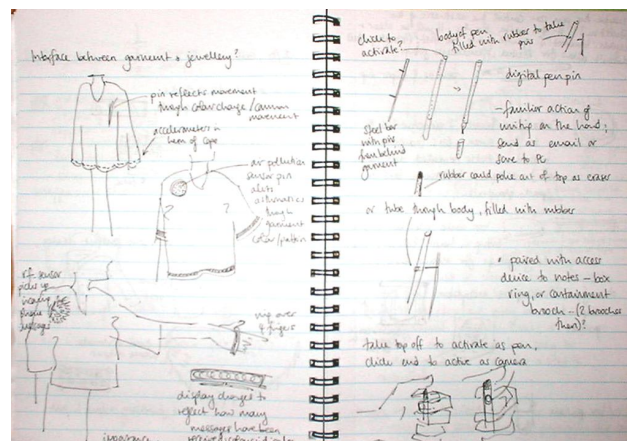
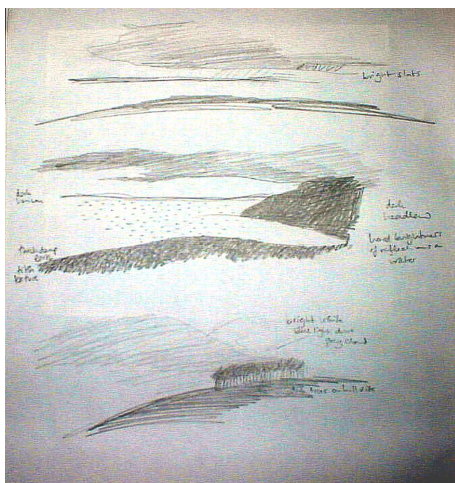


figure 5/2  
combining visual research with emerging technologies  
sketchbooks

This approach to validation of the work as of being of an acceptable level of quality as craft objects was judged successful, with resulting pieces being featured in group exhibitions in the UK and abroad, represented in

catalogues and other publications, and attracting awards (see *appendix i* for a list of these outputs).

Originally trained as a jeweller, the researcher approached the design process in an emergent manner, taking primary source material, and engaging with it through drawing and artefact collection. This accumulated experiential knowledge worked its way through subsequent stages of more plan-oriented design, which was more able to consider the potential functionalities of the work, both from a sociological and a technical point of view.

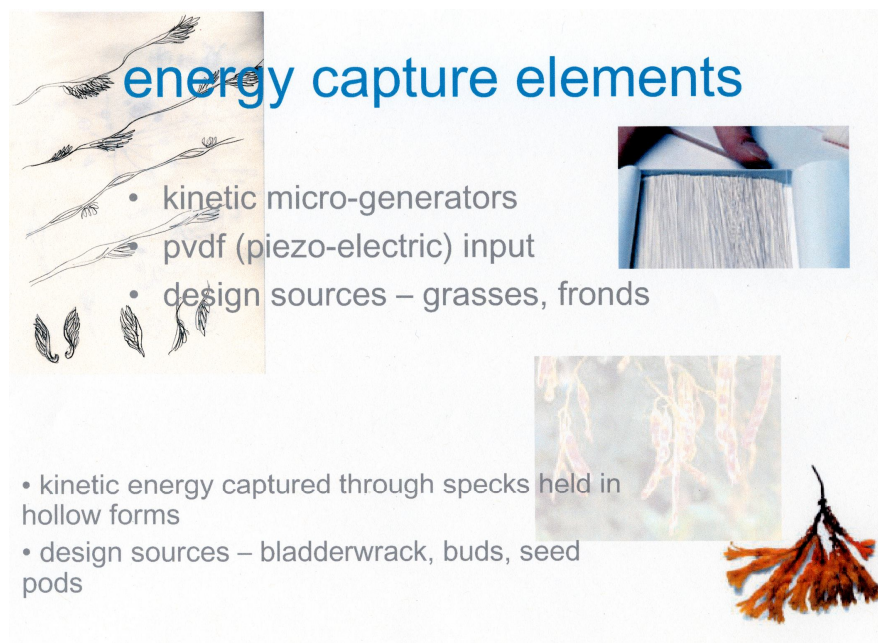


figure 5/3

combining visual research with emerging technologies

The cyclical conversation between maker and material was found to be significantly less intuitive than is normal in a jeweller's ordinary work process. That is, the feedback a maker gets from her material is more

usually immediate, felt and seen as a fine grained part of the making process at the bench, with only the occasional interruption for out sourcing plating or assaying, for example. In the research described here, academic and empirical sociological enquiries and the development of hardware and software had to be built into the process and these new 'materials' afforded a different experience of engagement for the maker (a timeline of the first iteration is given in figure 5/4, and see also *appendix ii*). In practical terms, what this means is that the craftsperson must be prepared to make difficult concessions in terms of either the quantity of work produced, or in its quality of resolution, until these new materials become as familiar as metals and clay. Despite some success with the preliminary jewellery, then, the author must concede that the interactive pieces remain works in progress, even after the second iteration.

drawing and artefact collection, photography and immersion	October 2003 - April 2004
evaluation of concept enamel pieces	December 2004
further plan based drawing, sociological and technical research	January 2004 - April 2004
model making and materials investigation (including enameling, Precious Metal Clay and ceramics trials)	January 2004 - April 2004
finalising materials selection and plastics trials	April 2004 - May 2004
iterative design of the first set of pieces	April 2004 - August 2004
demonstration and evaluation	September - December 2004

figure 5/4  
 timeline of the first design iteration

To develop the Speckled Jewellery, the author collaborated with embedded systems experts in the Speckled Computing lab at Edinburgh University, and with an electronics specialist within Napier University. In addition, she was supported by a visiting artist's residency in the Silversmithing and Jewellery department at Edinburgh College of Art. These resources were not predetermined, but were also emergent, reflecting the exploratory methodology of contemporary craft (Follett & Valentine 2006).

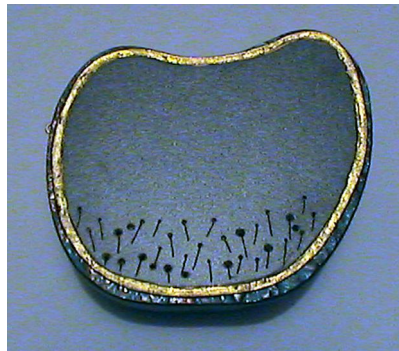


figure 5/5

the first set of three pieces  
neckpiece (top) and two brooches

The problems faced by the development team in creating the jewellery were considerable: the team was newly formed across three institutions, and the emphasis on expressive aspects of the work was challenging for

some of the technologists, while the author struggled with the hardware and software. Added to this was the non-trivial matter of the technology itself being in its infancy; indeed, the jewellery represented the first Speckled application to be implemented (Arvind 2005, 2006). Smart Dust uses the Tiny OS operating system, but Speckled Computing did not have an OS at this stage, requiring the design and build of a custom visualization tool to track packets between multiple nodes. These difficulties were fed back into the research consortium towards further development (Greig & Kettley 2005).

The first network of computational jewellery comprised two brooches and a neckpiece built at the jeweller's workbench using plastics, steel and gold leaf, and measuring approximately 6 x 4 x 3.5 cm (figures 5/5 and 5/8). The Perspex was thermoformed and laminated with Formica, and visual highlights were picked out in gold leaf. Each of the pieces held a single ProSpeckzII prototype Speck and a display of eight LEDs, and the neckpiece also contained a QProx touch sensor (Quantum Research Group 2007). Each piece was able to sense the proximity of the others within a range of up to approximately twenty metres, and reflected the three social distances in the flashing frequency of the LEDs (see table in figure 5/6). Four of the lights on each piece flashed depending on the identity of the other Specks found, and on their distance away (see the video stills in figure 5/7 below), this being intended to map the social interaction of greeting as discussed with the friendship group. The original pseudo-code is included in *appendix vi*.

A trace function was considered, which would continue to display the pattern of lights for four seconds after the interaction event had passed. This was intended to allow other individuals to make potentially significant social inferences about their friends' activities. A further idea was a touch sensor in only one of the pieces, which could act as a reset not only for

the wearer's display, but for all the displays in the network, allowing this individual to override any visual output on the other pieces. This was designed to encourage other types of behaviour and attention informed by the notion of self-identity and expressions of affiliation.

<i>brooch 1 meets</i>	<i>brooch 2</i>	<i>neckpiece</i>	<i>both other pieces</i>
<b>at &lt;30cm</b>	4 LEDs to the right flash at 3 times per second	4 LEDs to the left flash at 3 times per second	all 8 LEDs flash at 3 times per second
<b>between 30 - 100cm</b>	4 LEDs to the right flash once per second	4 LEDs to the left flash once per second	all 8 LEDs flash once per second
<b>at &gt; 100cm</b>	4 LEDs to the right flash once per 3 seconds	4 LEDs to the left flash once per 3 seconds	all 8 LEDs flash once per 3 seconds

figure 5/6  
algorithm; first heuristic evaluation



figure 5/7  
sequence of stills; first heuristic evaluation



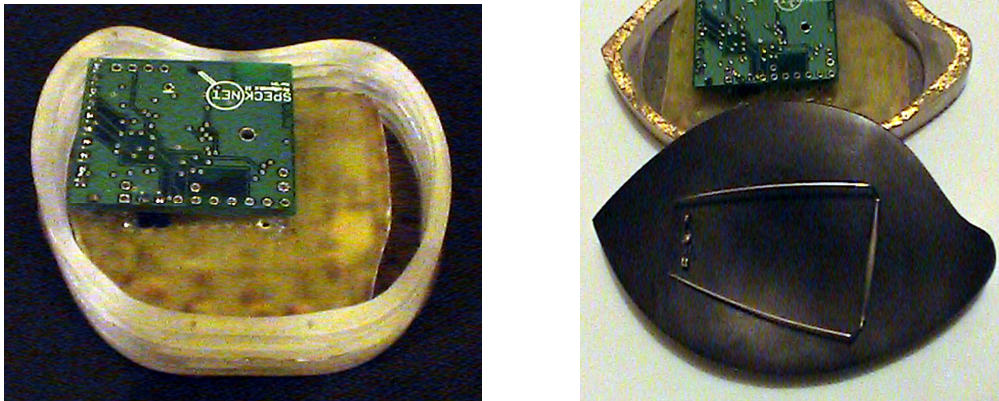


figure 5/8

two of the pieces showing the ProSpeckzII and custom PCB boards in place

### 5.1.3 *Heuristic evaluation*

The work was demonstrated as part of a symposium at Edinburgh College of Art in September 2004 (Creative Digital Interaction Symposium 2004). This served as a heuristic evaluation, as the system was not yet ready for more rigorous user testing. This iteration highlighted several issues, which would need attention before the pieces could become more than just demonstrators, the biggest of which in terms of usability was the inadequate coupling of output to identity and proximity. That is, although the pattern of coloured lights literally mapped unique identities and distances, the output was visually confusing and could not be read easily by a viewer. Another, unexpected result was that demonstrators and 'real life' devices would require significantly treatment in terms of their feedback to the user. In the tests described above, viewers became easily bored by the length of time it took to see any coupling between their input and the system's output, but for everyday use, the times would have to be lengthened for the functions to be meaningful to the group,

who meet infrequently. The issues found are collated in a table in figure 5/9, and how they were addressed is critically discussed in section 5.2. In the meantime, an informal out-of-the-box evaluation session was conducted with the friendship group, echoing the format of the recruitment meeting and the women's engagement with the early look and feel prototypes.

#### *5.1.4 Out-of-the-box-evaluation*

The resulting pieces, as the issues in the table below show, were suitable only for the most cursory demonstrations. Power was such a problem that even tightly controlled demonstrations were often compromised, and the work could not be evaluated for its wearability, robustness or functionality in a social situation as a result. However, it was able to fulfill the role of visual and physical prototype and the participants were given the pieces to play with on this basis. The jewellery was presented to the friendship group at GMc's house in December 2004, and because the women had also reacted to the original enameled concept designs eight months previously (described in section 4.10.2), the qualitative results could be to some extent compared. Although the same visual research material was at the root of all the work, the aesthetics of the two groups of pieces were very different. The first were eminently wearable, executed in precious metals and enamel, and slim and weighty with complex depths of colour. The second group of pieces was made of Perspex and Formica to bypass issues with radio interference, and were boxy, measuring up to 5cm deep. With no components inside them, these pieces were very light, but once batteries were added, they became more difficult to wear.

In contrast to the immediate positive affective reactions observed at the introductory meeting in January 2004, there was no such response when



the first set of Speckled jewellery was taken out of the box. Instead there was a pause as the group made sense of the work, and began to found their voice (and no doubt with the feelings of the maker in mind). Through being able to handle them and try them on, however, the participants became familiar with the three pieces, and collaboratively rationalized them as attractive and wearable (figures in brackets refer to the timings on the audio recorder counter taken when transcribing):

(023) GMc: They look lighter when they're like that, don't they, than they do...

J: aw, they're nice, beautiful

-----

(066) GMc: but it's funny, because they look quite chunky when you see them first, but when you've go them on...

general: no, no...

(067) J: in terms of like you know, jewellery and fashionable, now it's fashionable to have a big... (mm, yes), so, so I wouldn't have said that was particularly huge...

-----

Ch: that's lovely, you see I would put it, put it there...

JP: I would put that...yes, yes...

(072) Ch: I would put that central...in the middle...

JP: I mean it doesn't look...

(073) P: and it's not pulling the...

General: no, no...

all informal evaluation, Ch's house

## A Speckled Jewellery Network

<b><i>issue</i></b>	<b><i>cause</i></b>	<b><i>immediate solution</i></b>	<b><i>long term solution</i></b>
<b>lack of meaningful visual output (coupling)</b>	LEDs too varied trace function interrupts current interaction representation	more designer control over placement of LEDs couple each Speck to only one identifying LED colour	use of very small video quality displays from Micro Electronic Displays and of animated Proce55ing graphics
<b>power hungry (power)</b>	too many LEDs	couple each Speck to only one identifying LED colour  allow users access to an on/off switch  design and implement a charger	R&D into new solid state batteries at St Andrew's University design of a ubiquitous charger system
<b>integration of design with hardware unsatisfactory (wearability)</b>	lack of experience with both the computational hardware and the 'traditional' materials of Perspex and Formica	continued exploration of the traditional materials through heat forming and impressing	increased understanding of the computational hardware  shrinking size and radical packaging of Speckz - towards material science solutions
<b>pieces do not close satisfactorily (wearability)</b>	inner components too large	increased awareness of necessary components  reduction of connector size and layout of boards	engineered closing mechanism
<b>aesthetics of the lights unresolved (expression)</b>	discrete on/off function no modulation of light through other materials	use of modulation at the programming level to introduce fade/brighten  exploration of light through perspex walls and use of gels	use of lightpipes and other optical materials
<b>pieces not wearable for evaluation (wearability)</b>	closing issue and weight	house batteries in separate element to distribute weight  refinement of pin construction  refinement of closure design	engineered closure mechanism  shrinking Speck and battery size  increased distribution of components
<b>size challenging to the friends (wearability and expression)</b>	heterogeneous approaches to adornment and understandings of 'jewellery'	explore different forms of jewellery that may allow larger scales, eg neckpieces  source alternative battery solutions	be aware of heterogeneity of attitudes during analysis  shrinking scale of sensor network platforms and batteries

figure 5/9  
issues arising from first iteration

It can be seen from these comments that there were concerns regarding the size and attachment mechanisms of the pieces as relating to personal approaches to display and dress, and to practical considerations of how the pieces would physically interact with other garments. These were added to the list of issues evident in the heuristic evaluation (figure 5/9).

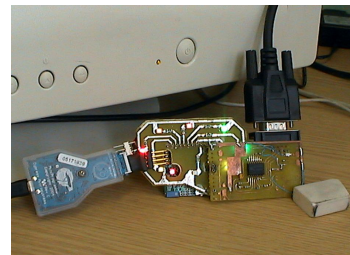
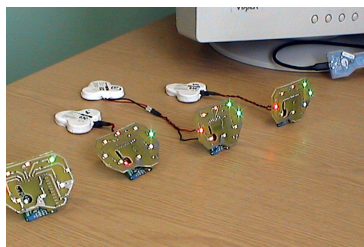
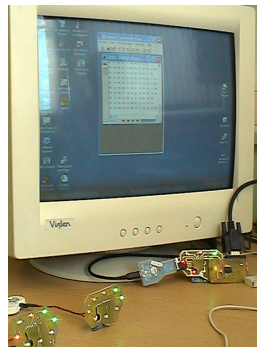


figure 5/10  
table top testing  
packet sniffing and debugging

### 5.2 Second iteration

In the second iteration, developed between January and August 2005, the three brooches were replaced by five neckpieces (figures 5/13 to 5/16 and 5/18 to 5/22), which aimed to address the main issues carried forward from the first iteration, that is, the unsatisfactory coupling

between input and output, the high level of power consumption, and wearability. A newer prototype Speckled node, the ProSpeckz2K, was used, boasting an on/off switch and a smaller footprint. The collaborative design process was improved when the PSoC system development environment was made available within Napier University, and a custom visualization tool was built by Frank Greig to debug the network (figure 5/10).

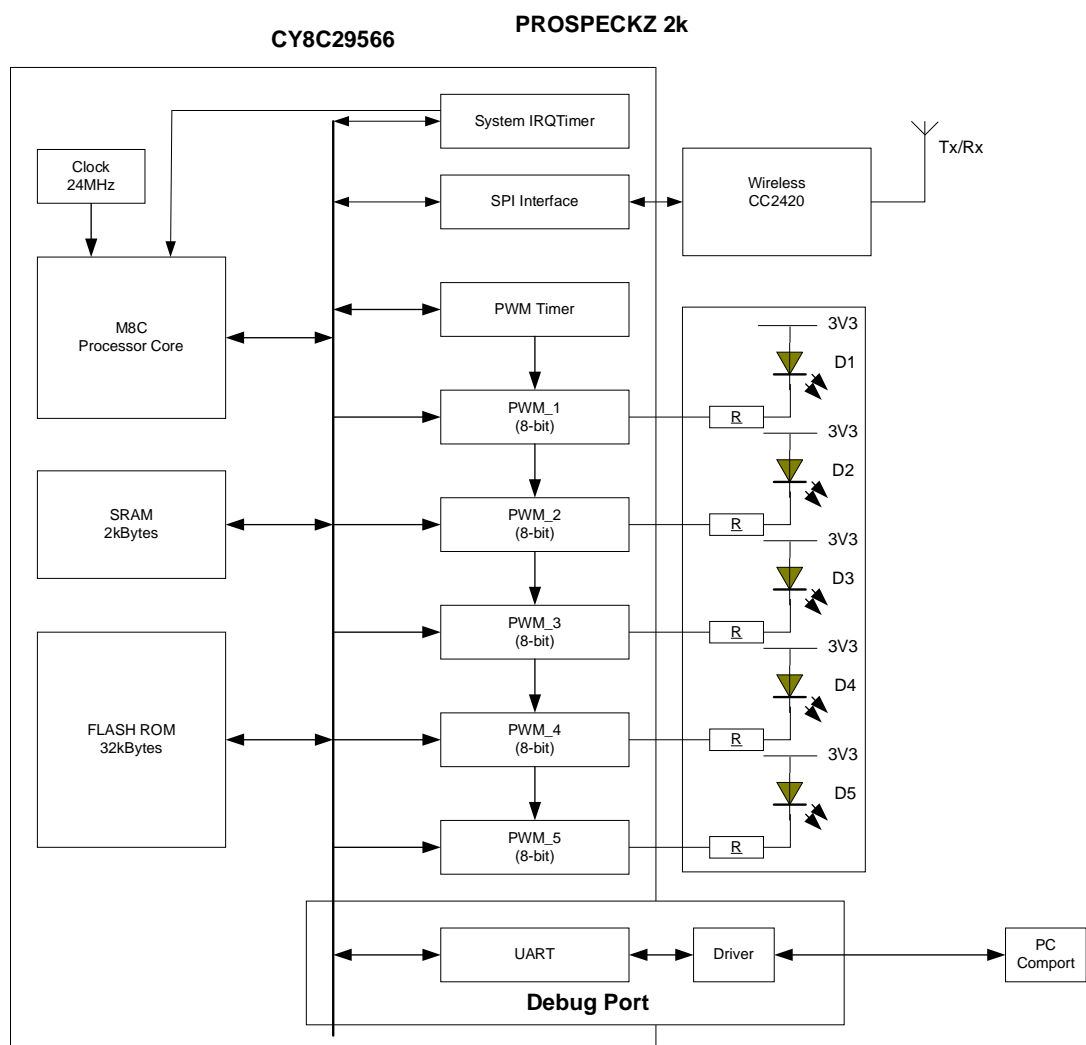


figure 5/11

ProSpeckz2K, 5 LEDs and debugging system

The wireless packet sniffer was built using HyperTerminal, and each node compared RSSI (Received Signal Strength Indication) to its known transmission levels to build a table of present Speck nodes in the network. Each node sent out random pings (within a second), and the system was reset at intervals to avoid collisions. An algorithm combining high power transmissions to determine nodes within range, with low power transmissions to get smaller distance resolutions was also implemented. The block diagram in figure 5/11 shows the ProSpeckz2K with five LEDs and the debug system (Greig & Kettley 2005).

### *Intra-network*

The host piece has a signature colour, which is dim when powered on, and bright when another member of the network is detected.

If the other detected Speck is found at  $> 1$ metre , the rate of dimming and brightening of its signature LED is slow.

If the other detected Speck is found at 30cm - 1metre , the rate of dimming and brightening of its signature LED is medium.

If the other detected Speck is found at  $< 30$ cm, the rate of dimming and brightening of its signature LED is fast.

figure 5/12

re-design January 2005

towards the second iteration

The architecture at this stage was still a master-servant arrangement, although the vision for SpeckNets is peer-to-peer, based on an evolutionary algorithm for self organization. The Specknets also continued to make use of 2.4GHz freeband rather than ZigBee radio, which was still being finalized as a protocol.

There were now five pieces of jewellery, a neckpiece for each of the women in the group (figures 5/13 to 5/16 and 5/18 to 5/22), and the rewritten algorithm is given in figure 5/12.

### *5.2.1 Coupling input and output*

In the words of Paul Dourish, “coupling is how an intentional reference is made effective” (2001, p.138). In other words, it is the grouping of action through a mediating technology (for example a lever) with perception of the thing that is acted upon (for example, a rock) (Dourish 2001, Winograd 2001a). While “users, not designers, manage coupling” (Dourish 2001, p.170), designers do have to ensure that a suitable interface is available for the user to work from, the “hard part” for distributed computing that Winograd refers to (2001b). In the first iteration, the output patterns were too complex, especially in light of the time constraints on users engaging with the system. So although the complexity of that output might be viewed as (desirably) ambiguous, it was not available for coupling in use. Such ambiguity, after the aims of the research, is also available in simplicity and openness, as discussed in Chapter Three, and this was the strategy taken in the second iteration.

By mapping each of the LEDs to a single Speck in the network, each wearer was effectively allocated a unique colour identity, which would only appear when there was an encounter within range. The default state of the output was thus switched from ‘all on’ to ‘all off’, other than a ‘heartbeat’ LED, indicating the successful running of the program, and a power indicator. Further, the eight LEDs (one each of clear, amber, yellow, orange, red, cyan, green, and blue) now followed the same layout on each board.

The trace function was intended to leave a shadow of encounters after the meeting event had passed, with the pattern of lights fading over a short period (set at 4 seconds in initial trials). This caused problems in the conceptual identification of when an encounter had 'ended', and in the interference between outputs for current and past encounters, contributing to the readability issue above. It was hoped the switch to unique identifiers would help to resolve this, but finally, due to the lack of a real-time operating system on the ProSpeck prototype the trace was shown not to be a viable aim, and it was put aside for further work.

### 5.2.2 Power

The new arrangement of LEDs and the new default state was the main strategy for reducing draw on power. In addition, a rechargeable 3.6V battery was sourced from VARTA, consisting of three coin cells arranged in a flat clover-leaf shape. Their form was also exploited for its expressive potential, and the author built custom Perspex cases for them, separating the batteries from the processor nodes to redistribute weight across the body.



figure 5/13  
battery cases with the  
VARTA coin cell arrangement in place

### 5.2.3 Wearability

The placement of LEDs was more closely controlled by the researcher in this iteration, and more development time was given to the exploration of other materials and layers for diffusing the light. The expression of the lights through the front faces of the pieces was manipulated by using different qualities of laminated Perspex sheet, piercing opaque layers, and engraving translucent materials (figures 5/22). In one piece, polyethylene fibre 'paper' was melted through and layered before a pierced sheet of Formica was placed over the top to create texture and ambiguity (figures 5/14 and 5/15).



figure 5/14

off and on states,

showing light quality through the laminated walls

The range of materials used was increased to include translucent and light emissive polymers and precious metal clays with enamel (figures 5/17 and 5/18). Materials normally found in the electronics lab, such as heat shrink sleeving, also were used decoratively on closing mechanisms and on the connecting cables, and chains, entwined with conductive



cable, were constructed at the workbench using silver, laminated layers of Formica and polymer clays as in figure 5/16.



figure 5/15

polyethylene fibre paper and pierced formica sheet with LEDs



figure 5/16

chain with a connecting cable

As with the first iteration, the developmental work served to familiarize the author with materials, and compositional and mechanical aspects of the designs. In addition, the computational pieces became part of a broader 'family' (Colin 2001), which users could potentially select from to vary their levels of connectivity and expression, and the work could continue to be validated as 'craft'. Figure 5/17 shows some of the related developmental pieces.



figure 5/17

supporting work in Perspex, polymer and precious metal clays  
2005 - 2006

#### 5.2.4 *Out-of-the-box evaluation – second iteration*

The following October, 2005, the five women met again to see the new neckpieces for the first time. This session was held in Ch's house, and in contrast with the first tentative out-of-the-box evaluation, was

characterized by very positive immediate affective responses. The jewellery remained large and boxy, but the look and feel of it was no longer completely unfamiliar to the group, and having a piece each to handle meant conversation could be structured more naturally around it. Further, the work now had some authority; crucially the network was operational, and the women could see what the jewellery looked like when it lit up and reacted to the other pieces.



figure 5/18

materials; components for integrated chains



figure 5/19

custom battery cases for the five neckpieces



figure 5/20

processor case with faux coconut  
showing socket in the laminated wall

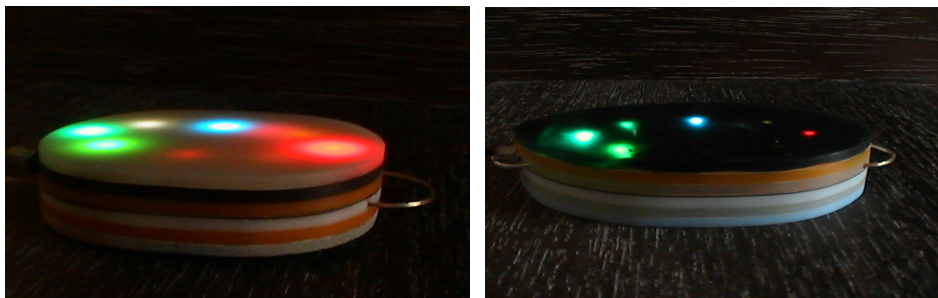


figure 5/21

two of the neckpieces connected and showing others in range

(020) Ch: oh wow!

(laughter)

J: oh golly, look at that!

(025) Ch: that's fab, look at it, very lovely isn't it

informal evaluation, Ch's house



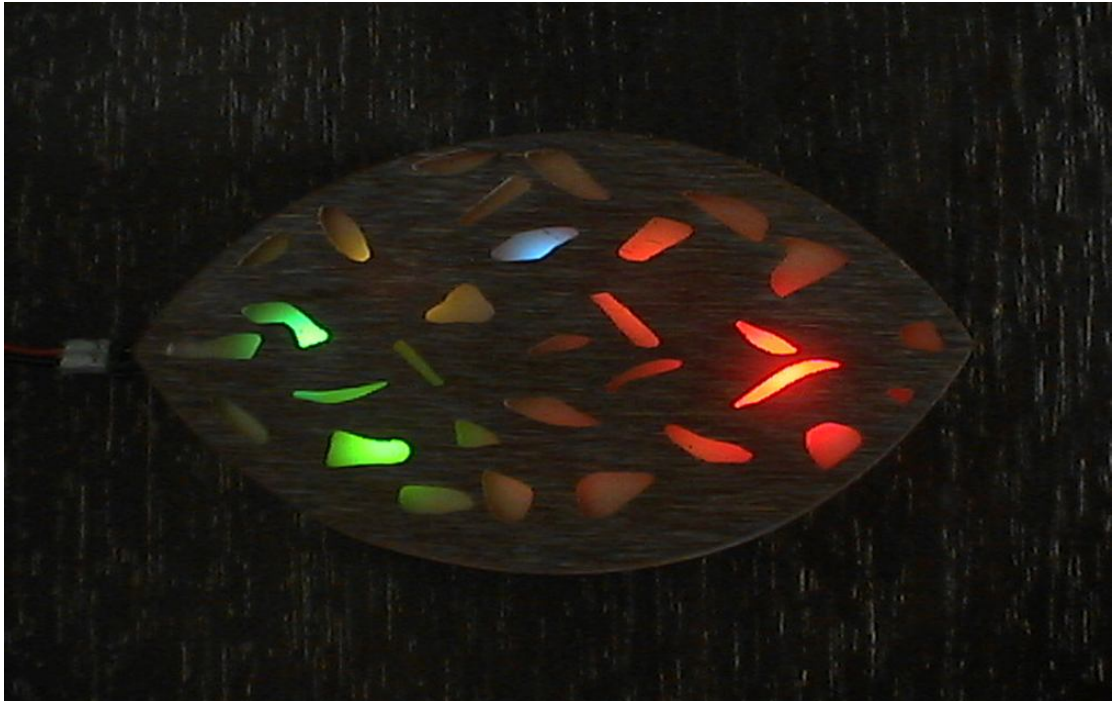


figure 5/22

two more neckpieces showing others in range  
the pierced Formica surfaces changed the quality of the light

(251) JP: that's lovely, it shows up really well

GMc: yeah I like that one

?: it's flashing now

GMc: it's flashing away now

(308) Ch: oh that's lovely, they really are good, great

JP: is it better that way?

J: I would prefer it

informal evaluation, Ch's house

Soon the women began to engage with the pieces as communicative objects, exploring the space of the house as a site for interaction, creating their own premises for use and discussing possible directions and places for the work within their own and others' lifeworlds (figure 5/23).

Ch: it's obviously got a sequence

JP: can you see mine?

?: you can see yours actually

(340) ?: oh that's bright, it's lovely, that's pretty

informal evaluation, Ch's house



figure 5/23

the out of the box evaluation at Ch's house

The issues that had emerged in the first iteration were to a great extent resolved through the steps described here, but the second set of jewellery cannot be said to have been the final design iteration. New wearability issues surfaced with the connecting cables, and the visual language of the light and the forms would still require further work for the researcher to be happy with them as a jeweller. A third design iteration is beyond the scope of the current research, but this set of neckpieces was successful enough to allow for user testing and evaluation with reference to the aims of the research, and this is covered in more detail in Chapters Six and Seven. While a dominant strand of New Media and even Interaction Design practice struggles with the legacy of conceptual art's autonomous object through developing theories that conflate the performer and audience (Brown 2006, Marshall 2005), a craft based approach affords the process equal importance (see Chapter Three). With this in mind, one of the major achievements of the research has been to deliver a functioning network of aesthetic pieces, the first to use Speckled Computing (Arvind 2006), thereby moving beyond the evaluation problems that inevitably arise from asking users to make large imaginative leaps in their encounters with novel concepts (It is said that if

Henry Ford had asked users what they wanted, he'd have given them a faster horse (Bullard 2006)).

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Chapter Five described the creative effort that went into the realization of the Speckled Jewellery through two design iterations, and gave detailed accounts of the issues that bound together the technical limitations and social use implications. It sought to demonstrate that the computation and functionality were approached as materials for expression as much as the physical materials of the jewellery components had been, and gave the women's initial responses to the pieces. Chapter Six goes on to describe the thinking behind the design of the final evaluation.



**Chapter Six****Evaluating for the everyday**

Chapter Five gave an account of the design process that resulted in the networked jewellery. This chapter describes the methods used to bring the jewellery and the friendship group together in a way that approximated the everyday. Through a novel application of Discourse Analysis, three data sets then reveal a braided narrative of **what** the women made of the jewellery, **how** they collaborated to create these new meanings, and **where** the action took place. A novel technique which plots affective responses and premises for use against notional lifeworld spaces is also presented for the evaluation of designs for the everyday.

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**6.1 Reiterating aims towards evaluation**

In considering the goals for designing for the everyday and for authenticity, the functionality of the jewellery had been deliberately left very open and basic. This was intended to allow the friends to construct shared meanings around it, emphasising the agency of the women within the interaction, rather than delivering a predefined set of uses and meanings originating with the designer (Hallnäs & Redström 2006). The information given by the display was reduced to an identity (colour), and approximate distance (rate of flashing), beyond which the wearer might deduce the direction of the other detected person by moving around, but which essentially denied the jewellery the sole figuration of *device*. Rather, the intention was to present the roles of adornment and device equally so as to encourage the women to see the pieces as something undecided, as something requiring their input to create a new genre of

interactive object. The aim in using a public space such as the museum was to provide a context in which these two figurations might begin to merge, as the pieces could be used by the women not only to find and avoid each other, but also within the public arena as indicators of their group membership and as expressive individual accessories. These strategies of ambiguity were devised as a means of promoting active meaning making among the women, as they engaged in the kind of interactions that constitute a friendship group (Coates 1996, Gaver et al 2003, Hallnäs & Redström 2006, Kettley 2005a, O'Connor 1992). It was expected that the jewellery might 'support' such mechanisms of group maintenance, whilst also revealing them immanently in use to the users and the researcher.

## **6.2 A strategic methodological shift**

Before commencing with an account of the methods used, it is necessary to explain a shift in the researcher's thinking regarding the task-based evaluation in relation to the other participative events undertaken, specifically the less formal out-of-the-box evaluations as described in Chapter Five.

That the jewellery should be evaluated in use was a given, but time constraints and concerns regarding its robustness and continuing issues with power, meant that a longitudinal study across a range of domestic and public sites could not be undertaken. It would be useful, for example, to take an approach inspired by Gaver, Dunne and Pacenti's experimental research using Cultural Probes (1999, and see also Gaver et al 2004a). Instead, the Royal Museum of Scotland and the Museum of Scotland in Edinburgh were chosen as a proxy of the group's authentic everyday, or in pedagogical terminology, as contexts for 'quasi-authentic'

activity (Baccarini 2004, Tochon 2000). This combined site was identified as a place the women were likely to visit based on their cultural preferences elicited through the early probes and questionnaires, and the gallery spaces within them were also selected on the basis of stated interests (such as textiles in the case of Ch). Crucially, the pragmatic origins of this part of the evaluation gave it the appearance of the central task-based component of a user-centred iterative design process, and this characterization affected the expectations not only of the participants, as results illustrate later in the chapter, but also of the researcher, who looked in vain for instances of metaphorical meaning-making in the goal oriented interactions of the women. It was easy to forget that, while it was gratifying to find that the technology worked and that the friends liked the pieces aesthetically, that these achievements were not the aims of the research.

Coding and analyzing the data from only the museum session showed that the women clearly characterised the pieces as devices (section 6.6 describes the methods used). As should have been expected, craft was never explicitly referenced and phenomenological experience remained unarticulated in action. While the quasi-authenticity of the museum context had been sufficient to approach how the pieces might be used practically, it was clear that the ways in which more subtle and expressive roles might develop would only emerge through a more holistic treatment of their contexts of social configuration. Therefore, in the final analysis, all data collected over the course of the participative process was included, and the task-based evaluation became only one part of a larger whole. This full scale analysis is recounted in the following sections, and a novel method to visualise the relationship between evaluative context and the collaborative figuration of concept designs is given in section 6.7.

### 6.3 Designing the evaluation

The reconceptualised evaluation comprised three parts: the out of the box session held at Ch's house, the task-based session at the Royal Museum and Museum of Scotland, and individual debriefing interviews. Briefing sessions were held for both the women and the 'research buddies' who would be facilitating the activities in the museum, and collecting audio-visual data. Further, because the network relied on received signal strength (RSSI) to determine proximity information, a heuristic test was also undertaken to pre-check the museum environment for 'seams' in the wireless communication between the pieces (Chalmers 2005).

#### 6.3.1 *Designing the evaluation*

#### *Heuristic test at the museum*

The researcher and an assistant visited the museum ten days before the evaluation, to determine potential seams and affordances for interaction with the jewellery in that space (Chalmers 2005). Distances at which rates of flashing changed or were interrupted were noted with reference to architectural and material structures. It was found that the large marble pillars of the building obstructed communication, but that the pendants worked very well across the gallery areas, in the south stair area, and in the lower floors of the newer Museum of Scotland where the second task would take place (see images at figures 6/3, 6/12, 6/13 and 6/15). The test revealed one major seam (the pillars), and one potentially surprising affordance (communication through floors), which could offer opportunities for creative engagement and meaning making in use.

*6.3.2 Designing the evaluation**The women's briefing session*

A fortnight before the museum evaluation, the women gathered at Ch's house to engage with the second iteration of the networked jewellery for the first time, as described in Chapter Five. This meeting served more than one purpose: while it provided an important out-of-the-box evaluation of the affective impact of the physical prototypes, it also allowed the women to become familiar with the jewellery functions and display, and prepared them for the tasks that they would take part in at the museum.

The session was captured on a video camera mounted on a table-top tripod, and on audio cassette. The jewellery was taken out and a piece given to each of the group to handle and try on, and immediate reactions were captured (see section 5.2.4 and figures 5/23 and 6/18). The researcher helped the women to discover ways of wearing the neckpieces, and to become accustomed to balancing the weight of the components on the body before demonstrating how to plug in the cable from the battery, and turning the piece on. The women practiced plugging and unplugging their cables and were shown the hardware inside the battery and processor cases. They were led to discover their identity colours, and to try reading the information on each other's displays. Unprompted, they then moved around the ground floor of the house, testing distances against rates of flashing on the displays, and spontaneously enacting scenarios of use. As they began to move around, the researcher was able to capture some of this data on a handheld video camera. Finally, the planned activities for the museum were outlined, and suggestions by the women taken on board for the production of postcards that they would be able to hand out if approached by the public.

6.3.3 *Designing the evaluation*

*The buddies' briefing session*

Approximately twenty students, graduate and undergraduate, replied to an email sent to the researcher's department at Napier University, inviting volunteers to become involved in the evaluation. Further information was sent to those who stated related interests and experience, for example, in embedded systems or audio-visual capture, and in studies of interactive systems for museums. The selected students attended a meeting a week before the museum session at the University. Levels of experience with capturing video footage were ascertained, and the cameras available tested. The jewellery was demonstrated and the nature of the research was discussed. The plan for the day and the buddies' roles were explained, and printed details, the information postcards, and maps of the museum were handed out.

6.3.4 *Designing the evaluation*

*A public space*

To investigate the pieces in use, two tasks were designed. In the first, the women started out as individuals, and were instructed to find each other using the jewellery, while in the second, they were organized into two pairs and an individual together with their buddy, and instructed to compete against each other as teams in finding specified exhibits within the museum gallery space (figure 6/5). These simple games were based on social approach and avoidance behaviours that the awareness afforded by the basic functionality could support. In addition, splitting the group up in different ways was seen as a further strategy for approximating real life use of the jewellery, as the members of the friendship group do not constantly spend all their time together, but rather maintain the group as a collection of flexible ties (see Chapter Four). These two broad types of behaviour would then allow the women to bring

their own premises for use into play, linking the experience of doing the task to a projected reality, and demonstrating levels of commitment and invitations to their lifeworld as discussed in Chapter Four (Hallnäs & Redström 2002, Kettleby & Smyth 2006, Redström 2006, and after Rhea, in Press and Cooper 2003, p.74).

<b>participant</b>	<b>colour ID</b>	<b>buddy</b>
J	white	Ce
JP	blue	Je
Ch	red	M, Si
P	light green	Ca
GMc	dark green	Al

Figure 6/1  
friends' initials, colour IDs and  
corresponding research buddies

### 6.3.5 *Designing the evaluation Task One – The Royal Museum of Scotland*

On arriving at the Royal Museum of Scotland, the women and research buddies were asked to gather at a meeting point in the main atrium (figure 6/3). Forty-five minutes were allowed for the distribution of the camcorders and the neckpieces, and for a briefing on the tasks. The women were introduced to their research buddies, and instruction sheets given to each, together with maps of the museum (see *appendix vii* for a copy of the instructions). As part of the briefing at the museum, the five women checked their own identity colours and also made a note on their instruction sheets as to the others' identity colours (figures 6/1 and 6/2).

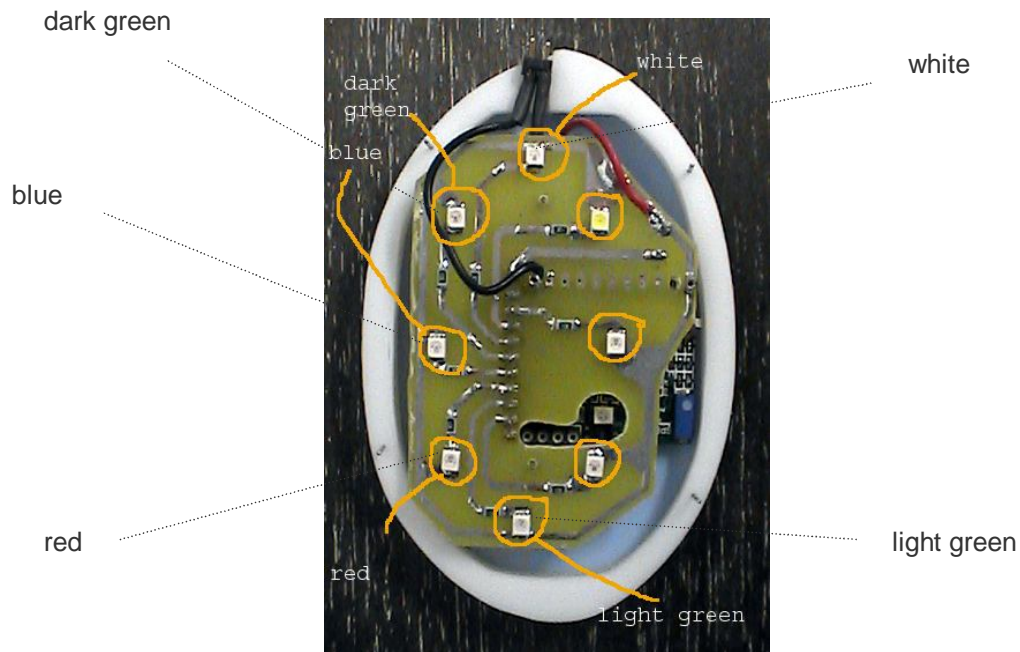


figure 6/2

pendant interior showing generic LED layout

The first task required the friends to begin at different points allocated over three floors, and to locate each other while including at least four given exhibition rooms (see an extract from instructions in figure 6/4 below), gathering as a group again at a specified point at the base of the stairs. The stairs chosen were to the rear of the building by a café, where a discussion and break were planned for between the tasks. The women were encouraged to use this particular stair because it offered an opportunity for the wireless system to demonstrably work in three dimensions (figures 6/11 and 6/12). This area, and the rooms chosen, also offered excellent lighting conditions for the LED displays, whereas in the very bright main foyer at the front of the building, the displays were relatively weak.





figure 6/3

Royal Museum of Scotland atrium

your goal is to find all the other participants while visiting the four given sections of the Royal Museum:

- ❖ Art & Industry Since 1850 (ground floor, map 21)
- ❖ European Art 1200-1800 (first floor, map 55)
- ❖ Modern Jewellery (first floor, map 47)
- ❖ the Ivy Wu Gallery (second floor, map 76)

figure 6/4

excerpt from the instructions for Task 1

### 6.3.6 *Designing the evaluation Task Two – The Museum of Scotland*

The second activity was designed to promote the shared use of displays, and the use of displays in a peripheral way, as one medium of information in an environment that delivered many other ambient cues (such as footsteps), which could also be expected to characterise everyday life. The task took place within the lower spaces of the Museum of Scotland (a newer extension to the Royal Museum of Scotland, see figure 6/13).

Within the exhibition area 'Early People', the teams raced to 'collect' a list of exhibits, and to return to the courtyard on the ground floor before the others (figure 6/5 below). This task was intended to provide a context for avoidance behaviour in contrast to the more normative attraction behaviour of the first activity.

**acquisition game:**

your goal as a pair or individual is to collect as many of the named items below as possible, taking photos as proof, while not giving away their location to the other teams. When you have collected them all make your way back to the start location (seats in the Hawthornden Court area on the ground floor). The winners are the first team back with all items (all these items can be found within the Early People area - no need to wander into 'habitat'). Use the jewellery while you are playing to keep an eye open for the other teams.

collect at least one of each of the following items:

- cauldron(s)
- 'Hearth' by Andy Goldsworthy
- woolen hood
- gold collar(s)
- Roman altar
- Ballachulish figure (goddess/bogwoman)
- a carynx
- Roman officer's memorial from Crammond

figure 6/5

excerpt from the instructions for Task 2

*6.3.7 Designing the evaluation*

*Debriefing interviews*

Following the first pass analysis of the data from the museum, the women were contacted individually for a debriefing interview. As discussed in section 6.2, methodological questions had arisen during this phase, which

challenged assumptions held by the researcher; further, the meanings of specific interactions that had taken place could be reviewed in conversation. A delay over the festive season meant the women had time to construct reflective narratives around what they made of the jewellery, and how it might fit into their everyday lives. A letter was sent to each, thanking them for their involvement and asking for their thoughts. This included a list of questions to think about before speaking with the researcher, and options were given to meet in person, talk on the phone or answer in writing (*appendix xi* gives a copy of the prompt questions). One of the women chose to meet face to face, and the researcher took hand written notes during what was effectively a semi-structured interview; one responded by telephone, and the other two by letter.

#### **6.4 Methods**

As the system had been made at the workbench as a collection of contemporary craft pieces, their deployment would inevitably mean the introduction of craft characteristics into the 'socio-technical assemblage' (Ihde 2002, Latour 2005). The emphasis on the network of actors, both human and artefact, the physicality of the jewellery, and the performative nature of meaning making suggested a form of analysis that would allow the objects and their characteristics a place in the transcriptions alongside speech. Work on materiality in Cognitive Ethnography (Hutchins & Palen 1998) and the recent use of video in craft research (Harper 2006, 2007, NEVAC 2007) informed the decision to capture all interactions with the jewellery on video towards such a process of transcription.

A note here is needed to explain the relevance of the lift and the chair in the transcriptions. One of the women, Ch, had experienced a bad fall on

her way to the museum on the morning of the tasks and took part in a wheelchair provided by the museum. As a result, she placed her pendant on her lap, and used the wheelchair to stow maps and other papers, and relied on lifts to get from floor to floor. This introduced new potential seams, which can be seen in the women's discussions, and which also impacted on the nature of Ch's interactions with her buddies (a second being enlisted to push the chair) and her partner in the second collaborative task, as she was obviously not able to move physically around the space as she might otherwise have done.

#### *6.4.1 Methods*

#### *Collection of data*

The participants completed the approach behaviour task in fifteen minutes and embarked on the avoidance task directly after. The second activity then lasted approximately forty-five minutes. This resulted in five video recordings of fifteen minutes each from the first session, and three of forty-five minutes from the second. Included in this footage was the coordination that took place between the two tasks; in addition, two discussion sessions were captured, the first between participants JP and J at the end of the competitive task, and the second over coffee at the end of the morning, which included the five women, the researcher, and two buddies. These added a further forty minutes of video footage to the data set. In some cases, there were long sections of inactivity or footage of scenery only, and these were cut at the initial editing stage. Other than this, the raw data was saved as several series of small movie files (up to approximately four minutes at a time) using Final Cut Pro (Apple 2007).

6.4.2 *Methods**Transcriptions*

The transcriptions have been reproduced using a convention to protect the identities of the participants, and to differentiate between members of the friendship group and the research assistants. The five participants are referred to as: Ch, GMc, J, JP and P, and the 'research buddies' are Al, Ca, Ce, Je, M, and Si (see also figure 6/1). Where transcriptions are given from the informal evaluation, which was captured on multiple media, timings are given from the audiocassette counter. Where the researcher is present, she is named as S.

For the bulk of the data transcription, a fast turn taking convention was used, which allowed gestures and objects to be included while not yet analysed in depth:

GMc: ...ooh, I've seen somebody...she's white [stopping and looking at pendant]..well the white's[pointing to face with pen]

Al: [simultaneously] once you've found..

GMc: ...there [a zooms in a bit to pendant]

GMc: [walking slowly downstairs] whi...

GMc & Al sessions 1\_03

6.4.3 *Methods**Coding - Grounded Theory*

In Grounded Theory, the researcher takes the case being studied as a whole unit of interacting variables, giving it resonance with the distributed nature of Actor Network Theory. Like ANT, it is skeptical of the

deterministic nature of scientific approaches (Borgatti 1998, Latour 2005), emphasizing a ground up approach to analysis. *Thematic coding* allows a particular issue or perspective to inform the starting point of the analysis, in the definition of a handful of broad themes; in this case the main research themes of authenticity, wearability, craft and the everyday formed the basis for the design of the evaluation session at the museum. The data was then *open coded*, that is, themes were allowed to emerge without specific reference to the initial questions, thereby grounding the research in a specific case. This multiplicity of themes was then reflexively coded to allow for the inevitable evolution of code definitions, thereby giving the process rigor (Boulton & Hammersley 1996, Glaser & Strauss 1967). During this process, theoretical notes or memos were made, from which the final report was developed (Borgatti 1998, Glaser & Strauss 1967, Strauss & Corbin 1994). Lastly, a network of relationships between the codes was developed by the researcher in a process called *axial coding*, allowing the creation of a coherent narrative analysis (Borgatti 1998, Smith Bontempi 2003).

#### 6.4.4 Methods

#### *Devised methods*

Two novel methods of analysis were tested against extracts from the coded transcriptions of the data. These aimed to include the material nature of the craft objects in the interactions, and to make clear the roles they played in the network of meaning making. The first of these devised techniques combined Coates' stave notation (1996) with Hutchins and Palen's object centred convention, which included their subjects' gestures, and the artefacts they referred to (1998). The goal in merging elements of these two approaches was to arrive at a rich account of the roles of the crafted jewellery objects within the social performance of meaning making. Although very promising, this method proved extremely

time consuming. A three and a half minute long video for participant GMc and her buddy AI, to be found in *appendix viii*, took as many hours to transcribe. A response was to return to the joint presentation of the coded transcriptions with their relevant theoretical notes, and to look for frames in the videos that would support these theories, resulting in the second devised method combining segments of raw data, their coding, the researcher's notes, and images to give a more holistic impression of interaction events (see the example used to illustrate the performance of the friendship group in figure 6/19, section 6.5.2 (iii)). This technique was useful in complementing the coarser turn taking convention when there appeared to be mismatches between visual data and the researcher's reading of interactions.

## 6.5 Results

In seeking to organise the themes emerging from the analysis, *axial coding* was used to identify common strands, and to develop relationships between their sub-themes. This structuring exercise enables a descriptive approach to the construction of a storyline accounting for the social configuration of the jewellery prototypes, and a braided narrative is now presented of **what** the women made of the networked system (conceptualising), **how** they arrived at these understandings (performance), and **where** this sense-making was enacted (situation) (see figure 6/6 below).

The sections that follow deal separately with each main category, illustrating sub-themes with excerpts from the data before the story is reconstructed in a summary at the end of the chapter. Where coded transcriptions are referenced as *segments*, fuller versions of these are to be found in *appendix x*.

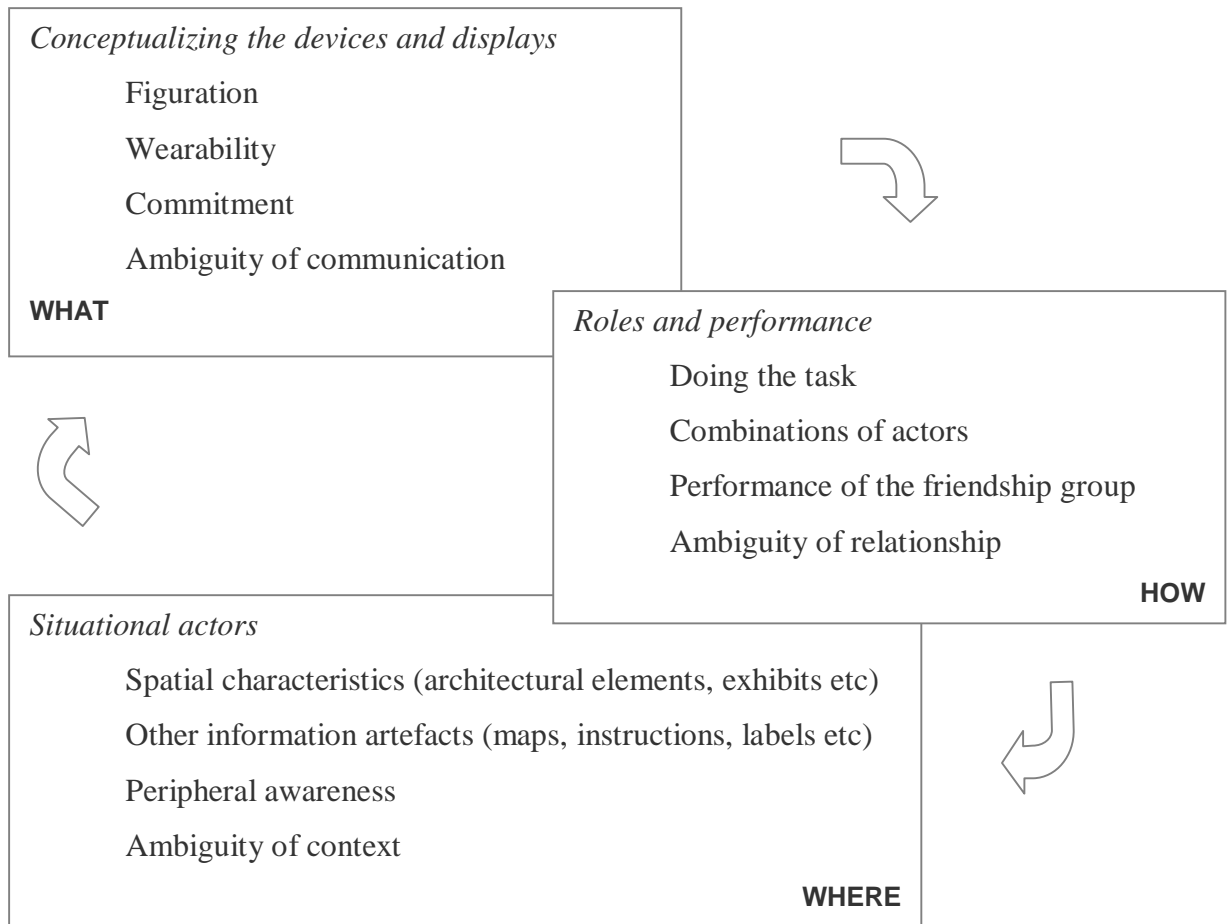


figure 6/6  
axial coding: creating relationships between categories

6.5.1 Results

WHAT

This strand of the analysis refers to what the women felt and understood of the jewellery, of the associations it led them to make, and of their figuration of it as a potential actor in their own lives (see Latour 2005). The sub-themes within this are: **figuration**, including references to art,



utility and blendings of these, references to sensory experiences, and a mixture of the pragmatic and the conceptual in making sense of the jewellery; **wearability**, including ergonomic factors and social implications of wearing the jewellery, the total expressive levels preferred by the women in their dress, sensual experience in use on the body, and ease of use; **commitment**, important in understanding processes of appropriation and adoption, this sub-theme includes affective responses, premises for action, the reduction of ambiguity of relationship through engagement in use, references to existing concepts in blending new understandings, and narratives of positive resolutions towards the integration of the concept into the lifeworld; and **ambiguity of communication**, an extension of Gaver et al's ambiguity of information (2003, Kettley 2005a), which occurs at the interface where the explicit representation of information would normally be expected. Taking into account Goffman's analysis of communication as intentionally and unintentionally expressed, this allows the jewellery to be treated as holistic communicative devices, giving information and giving off expression (Goffman 1959).

## 6.5.1(i)

*WHAT**Figuration*

Results showed that the women conceptualised the pieces primarily as expressive jewellery when they were in informal or reflective situations, and as devices during task-based activities. In Actor Network terms, the jewellery was *figured* differently depending on such external factors as the wearers' intentions to find or avoid each other, and on perceived pre-determined premises for action (see Chapter Four for a discussion of ANT). That is, the pieces were understood to be available for various roles as the women saw situationally fit, and there was a corresponding fluctuation of use value and aesthetic or metaphorical meaning, with sophisticated levels of blending apparent in situations of individual or

collaborative reflection and association. For example, use value appeared in discussion at the out-of-box session at Ch's house only after initial affective response had been worked through.

(211) P: at the moment I would say a piece of jewellery, because I mean it is very attractive isn't it, these lights change and...

(213) Ch: a useful piece of jewellery

informal evaluation, Ch's house  
segment 1

The individual debriefing interviews also blended figurations with attraction, as in GMc's response.

GMc: I liked them as interesting beautiful objects actually, they're lovely, and they have uses too. I like things like that, quite different, and I liked all the different shapes, and that it was like a scarf.

debriefing interview; GMc  
segment 2

From the beginning of the informal out-of-the-box evaluation, when the women first had a chance to see the new collection of pieces, there was a real interest in the look and feel of the jewellery, both as autonomous craft objects, and as things to be worn on the body. Active elements evident in this figuration were material (including the lights), and form (segment 3, informal evaluation, Ch's house). In contrast, during the tasks at the museum, it was found that the pendants were largely conceptualised as devices, and the women concentrated on fulfilling their

roles in completing the tasks, finding and avoiding each other using the jewellery (segment 4, P task 1, movie 08). Occasionally, one of the women later characterized as being 'aesthetically motivated' would break from the flow of the task and initiate comment on the expression of the pieces:

GMc: that looks lovely...actually, they're lovely in this light aren't they

J: oh, they are

Ce: yes actually I think they look gorgeous

J task 1  
segment 18

While the friendship group arrived at the figuration of the jewellery as craft or aesthetic object collaboratively, in individual use personal levels of visual motivation and awareness became more important. GMc was identified as being 'visually motivated' through the probe work earlier in the design process, and during the task spent a good deal of time discussing exhibits, their materials, the setting of the museum, and the look and feel of the jewellery. Much of the joint figuration was achieved through enactment of the 'collaborative floor', a particular style of discussion to be found in female friendship groups in which individuals effectively 'speak with one voice' (Coates 1996, and Chapter Four).

6.5.1 (ii) *WHAT*

*Wearability*

The discussions on wearability during the informal evaluation included both practical and expressive issues, with ergonomic aspects of wearability apparent during the task-based evaluation at the museum,

where the women wore the pieces for a longer period of time. They almost all wore black on the day, a result of the premises for personal action, which had emerged collaboratively in the informal session at Ch's house (figure 6/7).



figure 6/7

personal levels of display – premises for action

JP task 1 movie 04

JP: I suppose you really need to wear something dark, wear a lot of black

P: yes black would be good

informal evaluation, Ch's house

A person's habitual everyday dress exhibits a certain level of display or expression, and the simple assumption made unanimously by the women with regards the jewellery was that, as a highly expressive piece of adornment, it would need to be 'balanced' by plainer garments to allow them to feel comfortable wearing it in public, or to 'set it off'. It was important for the women to establish their identity, and the approach to the design of the 'collection' of jewellery was successful in offering

chances for individuation, while still being signified as part of a group (segment 5, informal evaluation, Ch's house) and:

(280) J: it's obviously very important to us to find out our identity [laughter] – I know who I am...

informal evaluation, Ch's house

GMc: I'd wear it – I liked the designs. They are quite big aren't they, to wear – you'd have to wear something plain with a good line – even a jacket is quite difficult because of the collar - a Jean Muir dress dear! – or with Indian kind of material, you know, like it's coming out of a background...

GMc debriefing interview

There were mixed results with the practicality of wearing the pieces as devices, and the main issues were the lack of 'glanceability', as the wearer had to deliberately lift her pendant to see the display, and robustness of the cable connections when worn (figure 6/8).

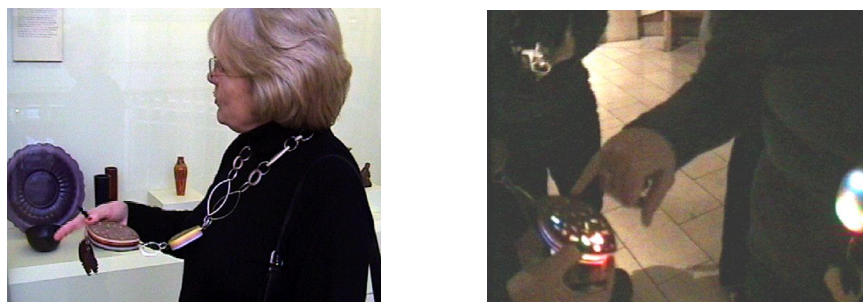


figure 6/8

wearability – glanceability and sharing displays

JP task 1 movie 02, and P task 1 movie 13

Figures 6/9 and 6/10 further illustrate the implications of the outward-facing aspect of the displays when they are in use as devices. In individual use, they were frequently held like a nurse's watch or a compass, with body movements almost reminiscent of dowsing, as the pieces were pointed towards other actors and in the direction of travel. When members of the friendship group came together, they would gather round the interface to interrogate their understandings of the information they had individually inferred from it (figures 6/8 and 6/17).

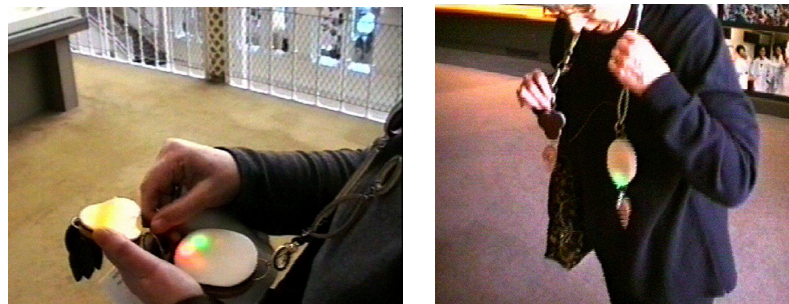


figure 6/9

wearability issues affecting gestures and movement

P task 1 movie 13 and GMc task 1 movie 1

Initially, the researcher thought that 'craft attributes' may force attention towards the object in use, preventing it disappearing in the phenomenological sense of a tool. The images of GMc absent-mindedly playing the surface of her pendant, suggest that certain satisfying tactile qualities, might in fact provide a context for its disappearance (figure 6/10).



figure 6/10

tactile qualities, playing and disappearance

GMc task 1 movie 02

Some of the women in fact claimed that they had forgotten about the jewellery while engaged in the second competitive task, and the displays instead successfully became a locus for co-experience in informal reflection (segment 30, JP and J end of second task, and see also section 6.5.3 (i), spatial characteristics).

This account of disappearance in use is interesting in light of Bolter & Gromala's call for an oscillation between transparency and reflection in interactive systems (2003, Kettley 2007d), and further work building on Harper's participative method of reflection with video footage may reveal more about such oscillation (2006, 2007).

6.5.1 (iii) *WHAT*

*Commitment*

Utterances that suggested levels of commitment emerged relative to the group's lifeworld (and to the individuals' worlds), and statements of intent and affect could be characterized by their notional proximity to the everyday. This is evident in many of the examples given in this section,

and the experimental technique that was developed as a result is described in more detail in section 6.7 (see also Kettley & Smyth 2006).

Immediate affective responses to the look and feel of the jewellery were very positive, suggesting high levels of attraction for the women. This was reiterated in reflection during group discussion, and in the individual feedback interviews, for example in segment 2, *appendix x*.

Ch: that's fab, look at it, very lovely isn't it

informal evaluation, Ch's house  
segment 6, and see also segment 7

Engagement was also evident in the enjoyment in the encounters the jewellery facilitated, and in the playful nature of its social functions (see figure 6/11 below and 6/25).



figure 6/11  
unexpected affordances and engagement  
P task1 movie12



JP: [pouring tea for self] I think I must basically be a child at heart, because [smiling as others respond with small laughs] I naturally became quite excited, you know [including more of the others using eye contact]...as if...[] ooh, somebody's here!!!

group discussion, end of museum session  
segment 8

The materiality of the pieces offered opportunities for tactile enjoyment in use: there were instances of stroking or 'playing' of the pendant surfaces as in figure 6/10, and some of the women enjoyed the sensation of the decorative bunches of leaf shapes through their fingers. When members of the friendship group came together, there was often evidence of enjoyment in the collective quality of the lights. One of the women in particular found it rewarding to manipulate the ways in which her piece could sit on the body or could be held in the air to achieve alternative visual effects with the LEDs diffusing through the materials of their case:

GMc: and what do you see on the side?..do you think the side should have as much relevance as the front? it should shouldn't it, the whole thing...[tilting pendant from side to side]

Al: yeh I see what you mean

GMc: sort of three hundred and sixty degrees.. oh look! look!  
[holding back of pendant outwards]..

GMc and Al task1 movie 03  
segment 10

Once the mapping of the LEDs to identity and proximity was clarified in the informal evaluation, many premises for action were introduced by the

women at varying levels of relevance to, and at different notional distances from, their own everyday lives. This example is characterised as being of the speaker's 'own lifeworld' (Kettley & Smyth 2006):

J: you're not really going to be out with six people are you anyway  
you're probably only going to be looking for one person only

informal evaluation, Ch's house

Imaginary scenarios of use spilled over into the spontaneous enactment of domestic scenarios using the available environmental setting to create a 'stage'. In this example, characterised as a 'premise for immediate action', the women have found that they can 'see' each other through closed doors:

(laughter)

J: you can talk about me

Ch: I like it!

?: we'll talk about you

informal evaluation, Ch's house

*Premises for action*, as shown above, covered immediate motivations in enacting scenarios within the present space, for example, setting the scene in Ch's house, imaginary scenarios that fit into the individual's life world or which would be likely within the context of the friendship group, ideas that could be better imagined in the abstract, as applying to some other person, all the way to the 'flight of fancy', such as in the suggestion to "have a tiara!" (*appendix x*, segment 10) (Kettley & Smyth 2006). Here

is an example of a premise for action at the notional distance of 'other's lifeworld':

P: it would be quite useful for a deaf person living in a flat, where instead of you know, stand at the door and say its so and so...providing you're wearing one of these, and if she's got one hanging inside her door, she would be able..((xx))

GMc and AI task1 movie 03  
segment 11

This level of creative engagement was encouraging, and it highlighted an important aspect that appeared to have relevance for appropriation, namely, that in creating premises for *immediate* action, the women began a process of familiarisation (Turner et al 2004, van de Walle 2005), and that in placing the system mentally within their own everyday experience, they demonstrated a move towards commitment (Hallnäs & Redström 2002, Redström 2006, Rhea, in Press & Cooper 2003). Of course, in such evaluations, both positive and negative scenarios will emerge, and attraction must remain a large part of acceptance. Therefore attraction, and premises for action, might usefully be seen as constituting a simple matrix for determining potential appropriation when designing systems that embody both use value and attributes of expression. This tool is described further, and applied to the results in the conclusion in the final section of this chapter.

6.5.1 (iv) *WHAT* *Ambiguity of Communication*

Much of the enjoyment described above resulted from the ambiguity of the jewellery's support of meetings. Seams in the communication in the

environment had been identified by the researcher prior to the date of the tasks, in the form of the interruption of signals by architectural features (notably pillars). Conversely, there were unexpected communicative affordances to be explored in the form of the radio signal's being almost spherical, working vertically through floors of the museum, and not just on a two dimensional plane (figures 6/11 and 6/12). This could augment awareness of presence beyond audible and visible cues in the immediate environment, and had the potential to be used creatively over the three floors of the first task, and in the unusually varied lines of sight afforded particularly in the Museum of Scotland (Benson and Forsyth Architects 2007) in the second (figures 6/13 and 6/23).

These opportunities were taken up by the women as they investigated distances at which they could see each other's identity LEDs, and the effect of, for example, corners and lifts on their communication. Elements of surprise and the introduction of competitive roles also worked well to engage the participants in use. In this excerpt JP is considering making use of known seams (the lift).

JP: [looking down and up] still Ch's flashing...I suppose we could cheat and go near the um [to Je] lifts [small shared laugh]..oh [rounding a corner and turning to Je] the red is flashing very brilliantly at the moment...she must be very...very close by

JP task 1 movie 02  
segment 12



figure 6/12  
seams and unexpected affordances  
JP task 1 movie 03

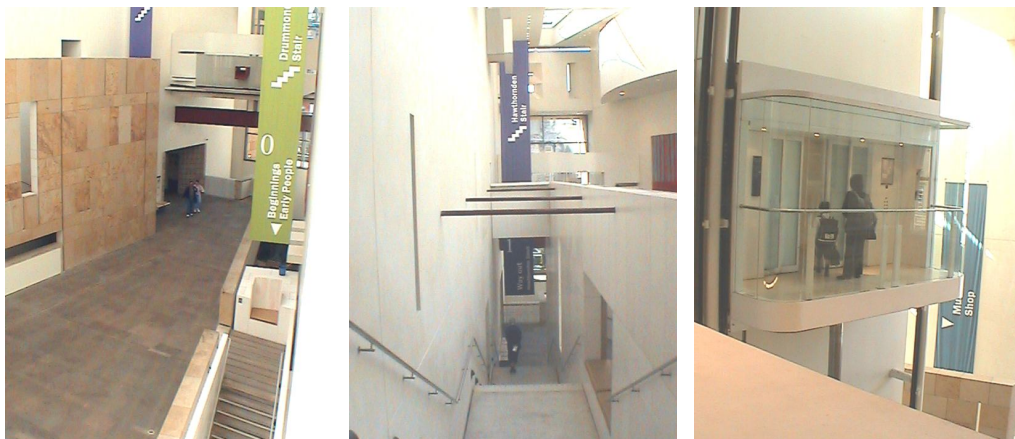


figure 6/13  
lines of sight  
Museum of Scotland, task 2

Ch verbalises her engagement with these seams and affordances in reflection (*appendix x* segment 13), while in this segment the group can be seen trying to work towards a common understanding of the ambiguities they encountered.

J: in the stairwells it was good

(general) yes yes

Ch: and it worked in the lift

yes yes

J: oh did it? cos we lost you in the lift [surprise in raised eyebrows, direct eye contact and raised pitch of voice]

GMc: I had an awful lot of red going on, I said where is she? [opening and closing fingers of one hand like a textured flashing], and and, she was coming up the wheel lift [told for laughs, refers to gestures near end instead of telling to Ch herself - two arms indicate raising of a lift base]

[shared laughter]

group discussion, end of museum session

Ambiguity also refers to the multivalency of the pieces as craft objects, and as a function of figurating the jewellery as craft, this was again evident in the informal parts of the evaluation. The rich arrangement of formal elements, both material and behavioural, in the make up of the pieces, successfully provided the necessary starting points for multiple conceptualisations and associative sense-making, in which the women can be seen bringing their own experience to bear on the situation at hand (GMc being a musician).

GMc: I had a positive view of it anyway – very interesting and innovative, like all the new music, isn't it?

GMc debriefing interview  
segment 14

### 6.5.1 (v) *WHAT the women made of it all – a summary*

Seams and ambiguity of communication were shown to present openings for different figurations of the jewellery, and for different types of engagement and meanings within different settings, while tasks were shown to elicit expectations of the central importance of use value. High levels of commitment were demonstrated as many of the premises for action created by the women were situated close to their own lifeworlds. There were also high levels of attraction in the immediacy of affect in the out-of-the-box evaluation and in further reflection, with individual identity well provided for in the formal design as well as in the LED identities. Practical wearability will require further craft and engineering work to resolve outstanding ergonomic and robustness issues, but levels of social wearability appeared to be good, if a little constrained to ‘events’ due to the scale of the pieces.

### 6.5.2 *Results*

#### *HOW*

This strand seeks to describe the ways in which the wider actor network, including the friendship group, enacted the figurations above. The term *actors* includes not only all human actors involved in the evaluation, but also those objects which were brought into play in the course of sense-making (Hutchins & Palen 1998, Latour 2005). By definition, such a process is dynamic and mobile, and the following sub-themes address elements that were not fixed within the environment: **doing the task** treats the frame of the evaluation itself as an actor, and describes the level of individuals’ tendencies to perform perceived required roles. It also includes perceptions of an absent audience, and the implicit acceptance of perceived premises for action; **combinations of actors** refers to those actors involved in sense-making in the captured discourse (for example participant/research buddy pairs, research buddy/camera actor units),

their fluctuating relationships, and changes in the tenor of interactions when familiar others reappear; **performance of the friendship group** describes any demonstration of a coherent display of expression by the friends as an aggregate actor to non-members, as well as constitutive styles of interaction, such as the collaborative floor; and **ambiguity of relationship** refers to the gap between an actor and an unfamiliar object, which may be bridged by the potential user, viewer or audience in imagining their own extended interaction with the object in some way. It includes engagement in the form of scenarios, stories that contextualize use, premises for action, and the construction of significance in making the object familiar and relevant, overlapping in many ways with **commitment** in section 6.5.1 (iii).

It was found that the frame of evaluation was central to how the women figured or conceptualised the jewellery. In the relatively informal space of Ch's home, they reacted immediately to the jewellery in the same way they had done with earlier prototypes, with strong affective responses to its visual and tactile qualities. They brought with them prior knowledge of the jewellery produced by the researcher, and prior understandings of it as craft, and used these in their construction of the jewellery as craft object, communicative device and as a sophisticated blending of the two. They also explored premises for use, some far-fetched but many also closely related to their own everyday experiences. Meanwhile, in the evaluation at the museum, it was found that the jewellery was accepted as a communicative device with predetermined premises for action, framed by the requirements of the task and by piecemeal perceptions of the nature of the research. In order to understand the ways in which the frame of an evaluation affects what participants make of the systems they are interacting with, especially when the goal is to design for the everyday, it is also necessary to study *how* the task is enacted and experienced. In this way the researcher can come closer to identifying



authenticity, and the relationship between the staged task and the ongoing nature of real life.

6.5.2 (i) *HOW*

*Doing the Task*

Within the tasks, and around them, the women found and created spaces for reflection and narrative. Three distinct types of such ‘downtime’ were identified in the data: bracketing narrative for the camera; meeting familiar others within the task; and the perception of the end of the task (or of there being no task). Figure 6/14 and the segment of coded transcription it illustrates, show how reflection was bracketed within the task, as GMc stops and speaks deliberately for the camera.



figure 6/14

bracketing reflection in the task

GMc and AI task 1 movie 03

GMc: ooh, it is amazing, [walking downstairs, looking at pendant] these would be..[stops briefly and speaks to camera] as a social thing, you know, if they could be made a little bit more reliable.[AI: yeah]...and [holding chain at right shoulder] they're, they're not heavy..but it's sort of..needs to be more user friendly

[stops at landing on stair] I suppose a smaller one would be quite good wouldn't it [adjusting cable, which her arm seems to be through, and leaving the cable loose again]... [lifts cable to look down at pendant face].. have a tiara..!

GMc and AI task1 movie 03  
segment 10

And here, P and JP have met on the landing and are comparing inferences from their displays in looking for J (segment 15, J task 1 movie 04). They are enjoying each others' familiar company after the first task, and are making their way down to the arranged meeting place. They are deep in conversation, comparing their experiences and testing their own understandings of the system against their friend's (figure 6/15). In doing so, they exhibit a classic technique for engaged interaction, in 'mirroring' each other both in speech and in the use of spatial gestures (Madan et al 2005). It is the perception that the task is over, and that corresponding roles may be dropped, that allows this shared reflection to take place.

:



figure 6/15  
end of task reflection  
J task 1 movie 04

## 6.5.2 (ii) HOW

*Combinations of actors*

Different individual actors brought with them their own propensities for visual motivation, pragmatism, and levels of social accountability in being seen to 'do the right thing' by the researcher. An important methodological point to note is that, in asking participants to 'think aloud', as is common in much task based evaluation, the observer is inviting the participant into a social contract, and therefore becomes implicated as an actor in his or her own right. The results of this research suggest that Actor Network Theory may be a framework useful in accounting more closely for the roles of observers, researchers, the texts, and even the *idea* of the research on subjects' sense-making in any study (Latour suggests that the shape given to phenomena can take different forms, or figurations, including "ideo-, or techno-, or bio-morphisms" 2005, p.54). During the morning at the museum this was apparent in the different approaches the participants had to being paired with a research buddy: whereas some prioritised the creation of social ties with other actors above doing the task, others treated the process as 'scientific' and adjusted their own roles accordingly. Here, GMc reflects on her experience of 'getting on with' her research buddy, demonstrating her tendency to establish social relations before 'doing the task'.

...he was nice! At first, I thought, ooh, what are we going to talk about – I kept trying to find out exactly what he did, you know? But he was very quiet, or at least, he was with me...

debriefing interview, GMc  
segment 16

The participants also emerged as having different levels of visual motivation and awareness. Based on the women's' collage boards and

questionnaire responses, on the ownership of types of culturally coded objects, on the results of the self monitoring evaluations, and on activities and occupations, participants GMc and Ch were identified as being *very visually motivated*, JP as *visually aware*, and J and P as *not very visually motivated* (see Chapter Four). The research buddies too, brought their own perceptions of their roles and of the task, and their own levels of visual motivation to bear on the process of sense-making, no matter how 'objectively' they enacted their roles (although in the buddies' case, these have been inferred from their interactions during the tasks only). Segment 17 in *appendix x* is part of the transcription of J's first task and it demonstrates a number of the themes talked about here. The main roles are played by J's buddy Ce, and by her friend GMc, whom she has just unexpectedly met. J has felt throughout that she has been doing the task properly despite interruptions from her buddy Ce, but Ce and GMc now find common ground in their visually motivated outlooks. The result is a spontaneously verbalised figuration of the jewellery pieces as aesthetic objects between GMc and Ce, which J is unable to influence. She tries to bring the conceptualisation back round to the utilitarian but is dominated by Ce's excitement and concedes the others' dominant roles in the interaction before reasserting her independence by demonstrating the effect of distances on the display. The difference between J and GMc's outlooks is demonstrated by the last two lines of the excerpt: as J is testing distances, GMc is focused on the material nature of the lights diffusing through the sides of the pendant, and moves it around to create different effects in the dim lighting of the environment.

As can be seen, the research buddy sometimes plays an active role in the conceptualisation. GMc's buddy Al, above, does not play any active role in this conceptualisation, while J's buddy Ce does. This appears to have been dependent on their own perceptions of doing the task, and of their expected levels of objectivity, as well as on the participants' framing

of the task. So for example, when GMc and Ce meet, they immediately find common ground; although Ce is concerned with doing things right, she is also very visually motivated. Her participant J has denied her the formation of social ties both as a result of holding a different outlook (visual as opposed to non-visual), and for displaying an inappropriate level of subjectivity in what J perceives as being a scientific role, so that when she meets GMc, who habitually creates social ties before considering the task requirements, and who is also visually motivated, there is an immediate verbalising of aesthetic experience. In the meantime AI has been trying to remain objective while his participant GMc has been making social overtures, and now he takes the opportunity to fulfill his role as he understands it, in standing by.

The participants can also be seen adopting 'objective' roles for the evaluation: P and JP, for example, were both individually concerned with 'doing the task' and both of them focused on this objective above their more natural everyday proclivity towards social interaction with each other. They addressed their respective buddy/camera units while within social proximity of each other, and each used the presence of the other as a prop in their own narrative rather than reverting to an 'everyday' co-creation of meaning together (see segment 18, JP task1 movies 01 and figure 6/16).

However, when the task was perceived as being over, these 'proper' roles were often relaxed by both the participants and the research buddies. Thus reflection tended to happen when the task appeared to be over, as the buddies allowed themselves to enter into informal conversation and the women found themselves in familiar company once again (see segment 19, Ch task 1 movie 02, and figures 6/8, 6/17 and 6/19).

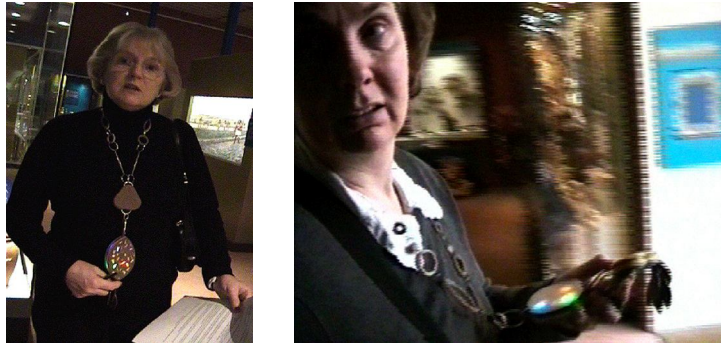


figure 6/16

adopting objective roles

JP task1 movie 01, and P task1 movie 4

JP: [looking up from pendant as she nears a corner]...I'm flashing green...[sees P...smiles]..I'm flashing green, we've found P again [turns with a comedy smile to camera while holding pendant slightly to face camera also]...and it started to flash before I did see her, so [addressed definitely to camera rather than Je, then turns back to face P], it indicated that P was close by [to camera and then to P again; stops to listen to P]

JP task1 movies 01

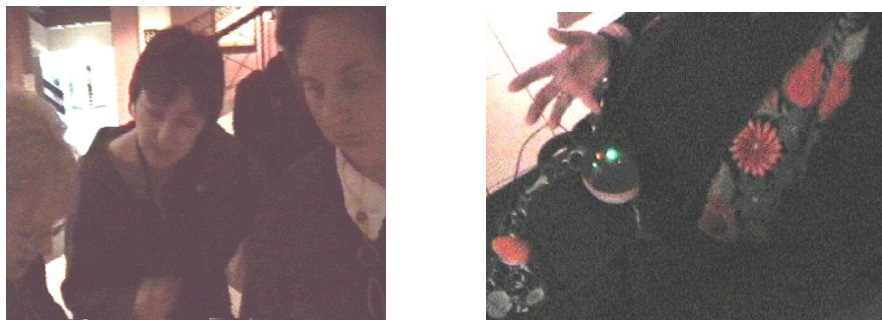


figure 6/17

relaxing of roles and informal reflection

P task 1 movie 14, and Ch task 1 movie 02

## 6.5.2 (iii) HOW

*Performing the friendship group*

The friendship group as a familiar space for sense-making was performed through interaction techniques such as the collaborative floor (Coates 1996), through the mirroring of opinions, gestures and speech patterns (Madan et al 2005), and in the use of storytelling to check comparable experiences and conceptualisations. The ‘collaborative floor’ describes a style of shared informal conversational interaction defined by Coates in her studies of women friends (1996). It is characterised by an ambiguity in turn-taking, where what is said is “jointly accomplished by all speakers” (Coates 1996, p.134). Speakers remain very aware of each other’s presence and contributions as a communal topic is developed. The floor is understood to be occupied by all speakers, and what would normally be construed as interruption is instead seen as a welcome willingness to contribute. Female friendship groups not only produce this type of interaction, they are constituted by it (see figures 5/23 and 6/18).



figure 6/18

collaborative floor in action

informal evaluation, Ch's house





JP: the red seemed to be flashing very quickly and i couldn't understand it because Ch was supposed to be downstairs and i she was actually downstairs [nice gesturing with a turn towards Ch, then gesturing under the table for 'downstairs']

S: [gesturing 'the world is round!'] ah that was probably because...(?)

JP: [echoing researcher's physical gestures]

Ch: ah, yes because I knew JP was somewhere around but I couldn't see her, so [all this gestured out too - some echoing whatever J was saying to JP, probably about the radio signal being spherical not two dimensional]...we guessed you were upstairs rather than downstairs...yes yes, [in response to something from JP] yes, I did

P: [overlapping both to join in] vertically....[waiting for gap]..very good vertically [gestured]..

JP: yes yes

J: in the stairwells it was good

?: yes yes

Ch: and it worked in the lift

?: yes yes

J: oh did it? cos we lost you in the lift [surprise in raised eyebrows, direct eye contact and raised pitch of voice]

GMc: I had an awful lot of red going on, I said where is she? [opening and closing fingers of one hand like a textured flashing], and and, she was coming up the wheel lift [told for laughs, refers to gestures near end instead of telling to Ch herself - two arms indicate raising of a lift base]

[shared laughter]

### Notes

much merging of human identity with their representation on the devices  
talk of usability issues and robustness;  
and of the task itself as an experience

liberal use of concurrence utterances by all group members throughout  
indicating similar experiences,  
figurations and also readiness to take a turn in the conversation  
in contrast, interjections seem to spring from modifications or challenges to the ideas being proposed

sophisticated handling of turn taking, interruptions and reorganisation from dyads to groups and back again –  
consensus is that aim here is to create meaning together, focusing on the pendants as communication devices

figure 6/19  
reflection and the collaborative floor  
end of museum session group discussion



In the excerpt above (figure 6/19), from the end of the morning at the museum, the women's topics of discussion are naturally their experiences of the tasks and the jewellery in use; the researcher and one of the buddies are active in speech and in joining in shared reactions such as laughter, while the women display similar use of body language (see the hands in the three images), and storytelling. Despite the large table, which influences the collaborative floor in making turns longer and more coherent, there are no 'interruptions', only contributions.

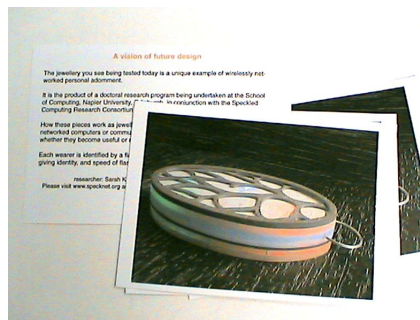


figure 6/20  
information postcards

J: but you know what I found amazing was no-one stopped us to ask us what they are

Ca: well, maybe they're too polite [small laugh]

J task 1  
segment 20

Both the researcher and the participants had expected a certain level of explicit interest from members of the public at the museum, which would

have introduced new roles for the jewellery in performing the friendship group's identity. Postcards were prepared for the research buddies to hand out in such circumstances (figure 6/20), but very few were needed. The disappointment of the women in reaction to this suggested that they might enjoy using the jewellery as a signifier of group membership:

GMc: It was fine wearing it in public – I thought I'd be embarrassed but I wasn't. I wanted to show it off, for strangers to notice it

GMc, debriefing interview

6.5.2 (iv) *HOW the meaning making was performed –  
a summary*

Seeing the performance of the evaluations through the lens of Actor Network Theory allowed the analysis to account for the varied roles of participants and research buddies as well as the influence of the participants' idea of the research itself. Outbreaks of authenticity (after Tochon 2000, and see Chapter Two) were created and taken advantage of by the women in 'water cooler' moments when familiar others were met, in bracketing narrative for the camera, and when the task was understood to be over. Each actor's understanding of role requirements and their levels of visual and social motivation were relevant to the analysis, and these worked together with the frames of evaluation to steer premises for action and emerging figurations of the jewellery. The group enacted itself in informal moments between tasks, which conversely favoured individual feedback, and often exhibited a collaborative floor style of interaction that is particular to female friendship groups.

## 6.5.3 Results

## WHERE

This category is concerned with the situatedness of the evaluations, the contingency of the sites for meaning making, and treats static props within the environment as *actants*, which may be brought into play as influential actors in their own right (Latour 2005). It includes concepts such as way-finding and navigation of information space, as well as regions for performance (Goffman 1959). Its sub-themes are: **spatial characteristics** including the environmental or architectural layouts of props that remain in the setting for an extended duration, and which provide opportunities for action as a result. These included, for example, stairwells, sightlines, and the arrangement of exhibits; **other information artefacts** referring to spatial information already in the environment such as exhibit labels, museum signage, as well as the maps and instructions introduced by the researcher; **peripheral awareness** forming another part of the wider network of information, indicating temporal information - often discussed in terms of web traffic or weather (Ishii et al 1998), or of awareness of other human actors for potential collaboration and co-ordination. Here, it refers to awareness of others' proximity as a result of, for example, footsteps, laughter or the flash of a camera, complementing the information available through the jewellery interface; and **ambiguity of context**, reversing Gaver et al's familiar-object-in-unfamiliar-place tactic (2003), the unfamiliar designs are placed in a known setting. This highlights any indications of understandings of either place or object as a result of their new combination.

Results showed that environmental characteristics such as levels of light could contribute to the figuration of the jewellery as aesthetic artefacts, while physical structures, sightlines and materials interrupting the wireless communication reinforced their conceptualisation as devices. The domestic setting of Ch's home led to a wide range of both functional

and expressive premises for use. The women experimented with the jewellery within the architectural layouts in both domestic and public settings to discover what the jewellery was capable of, but did not verbalise these seams as strategies in use at the museum, rather referring to them in reflection to make sense of their experiences. Other information artefacts, whether existing in the setting already or introduced by the researcher, were also frequently brought into play, creating a shifting network of artefacts within which the jewellery played its roles. The women combined spatial awareness of the sites with the peripheral awareness delivered by the pendants to complete the tasks.

6.5.3 (i)

*WHERE*

*Spatial characteristics*



figure 6/21

low lighting in the chosen gallery spaces

P task 1 movie 05

Levels of light in the environment contributed to the figuration of the jewellery both as aesthetic artefact and as communication device, directing the site of action as the women reacted to different visibility levels in the gallery spaces of the museum. The galleries and the stair case at the south of the building had been chosen for the first evaluation

because of their reduced levels of light, in which the LED displays would be more visible (see the staircase in figures 6/12 and 6/15). Figure 6/21 shows the low levels of light in the Ivy Wu gallery used in the first task. The women constrained their interactions for the same reasons, and found that light levels impacted upon the usefulness of the pieces as well as their aesthetic impact (segment 21, group discussion, end of museum evaluation and segment 22, GMc task 1, movie 02).

JP: ... it was particularly good in the dark [gesturing with arm roughly in direction of back stairs] the colours were very very bright

group discussion, end of museum evaluation

Physical structures, sightlines and materials in the environment both interrupted and facilitated communication, reinforcing the conceptualisation of the jewellery as devices and offering surprising affordances. The women were able to make sense of the three dimensional nature of the wireless connectivity, inferring that other participants might be on other floors when they could not be found despite their apparent proximity according to a flashing LED.

JP: [rounding a corner and turning to Je] the red is flashing very brilliantly at the moment...she must be very..very close by...[]...JP looks down a level as she walks past a railing]

Je: she may not be on this floor...

JP: no, she may not!

JP task 1 movie 02

The women played with the communicative aspects of the jewellery within the architectural layouts of both Ch's house and the museum (see also section 6.5.1 (iii) and segment 24, informal evaluation, Ch's house). Here is an example illustrating premises for action arising directly from the available spaces of Ch's house.

?: if she went away, you know, if she went out the front door, it would stop

?: go out the front door!!

?: she's away

(laughter)

informal evaluation, Ch's house  
segment 24

Such situational characteristics and seams were often referred to in reflection as they women made sense of their experiences together:

P: yes, you don't get each other round corners but [moves arm up and down] you get each other vertically

P task 1 movie 14  
segment 25

In designing for incidental interactions, it was hoped that the presence of exhibits of interest to the women would create a more authentic experience in the use of the jewellery, that is, that they would act to deflect attention from the jewellery as a communication device as might be expected in the course of everyday life. This was not a wholly

successful strategy, as in the event, the extent to which exhibits were given agency depended on the individual participant: the women who paid more attention to the exhibits in task one were those who had been defined as having high levels of visual awareness and low levels of accountability with regards the task. This comment of P's for example, suggests that she has foregone engagement with the exhibits in order to fulfill her required role:

GMc: lovely place...

P: I love the china [raising hand slightly] I wouldn't mind staying there to look at it [grinning]...[looking back to display]...

P and Ca session1\_12

segment 26

Technical and wearability factors also contributed to this situation:

Ce: ... because you are constantly looking down to look at [the pendant], but then . then quite how you would get past that I don't, I'm not quite sure..

J: and because of that we're not looking at the exhibits

Ce: exactly, but i think that's because perhaps we're racing against time, we're using, we're worried about time, eh [J consulting museum map]

J and Ce session1

Conversely, exhibits did sometime play active roles in the development of relationships between the human actors, for example, in Ch's treatment of all actors as equally important (including the research buddies, the

spatial arrangement of the museum, the pendant, its information, and the exhibits) (see segment 27, GMc and AI session 1\_03); between GMc and her buddy AI (segment 28, GMc and AI session1\_03); and between J and Ce (segment 29, J and Ce session1):

Ce: that is the most extraordinary collection, [J stopping by case, referring to museum map], oh, this is a LOVELY case, isn't it

J: [holding pendant, looking in case] (quietly) gosh, look at that [looks down at pendant]

Ce: by Philip Eglin I think they are, these pieces [as J looks down to read pendant]

J and Ce session 1  
segment 29

In the second task, where the goal was to 'collect' exhibits, this effect was dramatically reversed. 'Doing the task' in this case gave the exhibits a far greater agency than the pendants, which became almost 'invisible'. At the end of the second task, J recounts how this occurred for her (figure 6/22):



figure 6/22  
reflection on phenomenological disappearance  
J and JP, end of second task



J: [] I think this... is this is..perhaps..quite good [very slightly pulling the chain in a slow rhythm matching her speech rhythm for emphasis]...in that I forgot I had it on

GMc: yes I did too...

J: I felt it was very comfortable and it was only [moving hand off chain again, leans forward into story] when Ce kept saying 'check to see if there's anybody around!' [gets a laugh]..I thought...[shakes head with an exaggerated 'O' shape mouth] oh!...

JP and J, end of second task  
segment 30

6.5.3 (ii) *WHERE* *Other information artefacts*

Other information artefacts were used frequently, whether found in the setting itself, or provided by the researcher, and were combined with information from the pendants in wayfinding and completing the tasks. Pendants and paper artefacts often afforded pointing and descriptive gestures, as in figure 6/23.



figure 6/23

larger gestures with other information artefacts

Ch and P Task 2 movie 05

Museum signs, task instructions and peripheral information were combined with the pendants' display to create a composite information space, as in segment 31, Ch and P Task 2 movie 09.

Ch: oh...yeah..can we check the lights..

Si: oh crikey! they're all around us!

Ch: they're all about..yeh, JP's right behind us, i can see them..oh we're back here again [looks up]

Ch and P Task 2 movie 09

At one point, a museum attendant was brought into play as an actor in the network of information (segment 32, Ch and P Task 2 movie 06, and figure 6/24) to explain what one of the exhibits on the list was (the Carynx, an ancient form of trumpet).



figure 6/24

the museum attendant as other information artefact

Ch and P Task 2 movie 06

6.5.3 (iii) *WHERE*

*Peripheral awareness*

The second task in particular had been designed to give scope for different kinds of peripheral information, for example, in the acoustic qualities of the open plan galleries, and in the glimpses afforded through architectural openings (see figures 6/12 and 6/13 in section 6.5.1 (iv)). In segment 33, Ch and P Task 2 movie 10, the team is aware of the peripheral cues they are themselves transmitting to others, and they joke about it, enjoying the tension of the game.

In this excerpt the same team has simultaneously spotted another group through the exhibition space, and in the displays on their pendants. Laughter is used to save face as a meeting, normally welcomed, is avoided, and they move away from their temporary rivals.

Ch: yes, we can see them,...

Ch: yes, they flashed [pointing to pendant face using pen], yep, they're flashing

Si: maybe we can go this way

Ch: [looks left and laughs towards that direction]

Si: [laughs aloud too]

Ch: are we going that way then?! [points ahead with pen]

Ch and P Task 2 movie 13  
segment 34

The changeable levels of peripheral awareness combined with the competitive nature of the second task to create an atmosphere of comic tension, and instances of bodily orientation to the space included a range

of scales from the micro to the melodramatic (figure 6/25). Exaggerated gestures and laughter, as in this image, were used in face saving in unexpected encounters.



figure 6/25  
comedic gestures in face saving  
Ch and P Task 2 movie 15

6.8.3 (iv)

*WHERE*

*Ambiguity of context*

Ambiguity of context normally refers to the strangeness of a site into which a familiar object is brought in order to render it strange again, as in Duchamp's *Fountain*, a ready made urinal placed in an art gallery (see Gaver et al 2003). In contrast, this study places an unfamiliar object (the jewellery) within a familiar environment (the museum, a proxy for the everyday lifeworld of the friendship group). Although at the start of the research in early 2004, the women displayed differing levels of awareness and familiarity with technology, none found the jewellery too demanding to use. The balance of aesthetic and function in the design approach, and being involved in the research, provided a context of ownership allowing them to engage with a novel computing paradigm

without difficulty. Asked in retrospect, the women claimed current knowledge of wearable computing.

GMc: ...it's obviously the natural progression, if you read the news and keep up with things...it might be affordable only by some – although computers are everywhere aren't they, all the kids at school have iPods...

GMc: ...it's good to have man made machines as beautiful as possible...

GMc debriefing interview

While ambiguity of context occurred in the introduction of the computational jewellery into this space, the analysis suggests that ambiguity was quickly reduced for the women through their engagement in action with the pendants, and that they saw the museum as a natural setting for its use. Much of this theme is therefore covered in the section on performance earlier in the chapter, and cannot be demonstrated through individual segments of transcription, being rather a meta-theme of the research.

6.5.3 (v) *WHERE the meaning making was enacted –  
a summary*

The friends could be seen making use of the spatial and physical characteristics of the different settings provided for evaluation, which in turn had an impact on the nature of the figurations they gave to the jewellery. Seams and surprising affordances for communication were taken advantage of in action, and were commonly verbalised in reflective narratives co-constructed with other members of the group. Exhibits in

the gallery spaces were brought into play dependant on the perceived requirements of the tasks, and in turn affected the presence of the jewellery as an actor in the network. Ambiguity of context became conflated with ambiguity of relationship, as the everyday lifeworld of the friendship group rather than the museum, was identified as the site into which the jewellery was being introduced. The jewellery became a node in a network of information, which included other information artefacts and peripheral cues.

### 6.6 Outcomes

The outcome of the analysis is a thick description of the friends' shifting figurations of the jewellery as a hybrid object. For them it was at once craft, adornment and device, undecideable until in context, be it domestic or public, and with the aim of personal display or determining proximity to others. They collaboratively negotiated aesthetic, informational and cultural ambiguity to co-create new figurations in situations that were proxies for their authentic lifeworld, and created their own moments of authenticity within the structure of the evaluations to enact this shared process of meaning making. The ways in which authenticity and craft were in evidence are further drawn out in the final chapter.

The outcome is also an involved account of the limits of task based evaluations in understanding what users make of novel concept designs for the everyday. This chapter then finishes with a novel tool for visualizing users' attitudes to a product within an extended participative design process. By taking the analysis of **commitment** in section 6.5.1 (iii) a step further, it is hoped that rich accounts such as this one can be made accessible to design teams in terms of potential consumer take up (see also Kettley & Smyth 2006).

## 6.7 Visualising commitment to concept designs: a novel tool

In the analysis of the friendship group's interactions with the networked jewellery, it was found that the women explored four broad spaces in relation to their own lifeworld (s);

*immediate scenarios* ("if she went away, you know, if she went out the front door, it would stop"; "you can talk about me!") enacted for example within Ch's home,

*their own lifeworld(s)* ("you're not really going to be going out with six people are you...you're probably only be going to be looking for one person..."),

*other people's worlds* ("you know who would like it...autistic children"; "it would be quite useful for a deaf person...where instead of you know, standing at the door and say its so and so...if she's got one hanging inside her door..."), and

*fanciful worlds* ("I think you should make one in platinum and gold...diamonds and a tiara...you could make tiaras!"; "beam me up Scotty!").

In doing so, the friends reacted emotionally to the jewellery (**affect**) and rationalised its potential uses (**premises for action**). These two types of utterance were drawn out from the transcriptions and plotted against the four notional lifeworld spaces in an attempt to visualise overall potential commitment to the concept designs with respect to the women's own and other imaginary lifeworlds (figure 6/26). The utterances coded as **premises for action** or as **exhibiting affect** (whether positive or negative) were plotted against the notional lifeworld distances along the

x-axis, and against a relative scale of attraction on the y-axis. The key in the top right corner indicates at which point in the evaluation procedure the comments were made, allowing reflection on the methods used. For example, it can be seen that the instances from the early informal session are noticeably spread out, as the women tried to make sense of the jewellery with reference to a broad range of associations and ideas. It is evident that no such utterances were derived from the task-based evaluation in the museum, save for two examples found in bracketing reflection for the camera (segment 10, GMc and AI task 1 movie 03), and in reflection after tasks, when P points out the issue of colour blindness:

P:...the other thing is, red green is difficult for some people

group discussion end of evaluation sessions, museum

The debriefing interviews returned a good number of utterances, clustered around the *own lifeworld* area, indicating an increased understanding of the roles the designs might play in relation to the respondents' everyday lives, and as most of these are positive, it might be assumed that the women would be disposed to finding place for the jewellery in their lifeworld(s) (Hallnäs & Redström 2002). The negative attraction responses were unanimously concerned with nervousness in dealing with the hardware of the devices, which may to some extent be resolved through a further design iteration. While the tasks themselves appeared to preclude reflection, increased familiarity of purpose is obviously also related to the opportunity to experience the concept in use, and although not visualized in this version of the method, returning to the transcriptions allows a further trend to emerge: that is, aesthetic comments predominantly came from the out-of-the-box session data, while scenarios of use came primarily from the debriefing interviews.



Again, this would suggest the central role of the task as an opportunity for exploring use value.

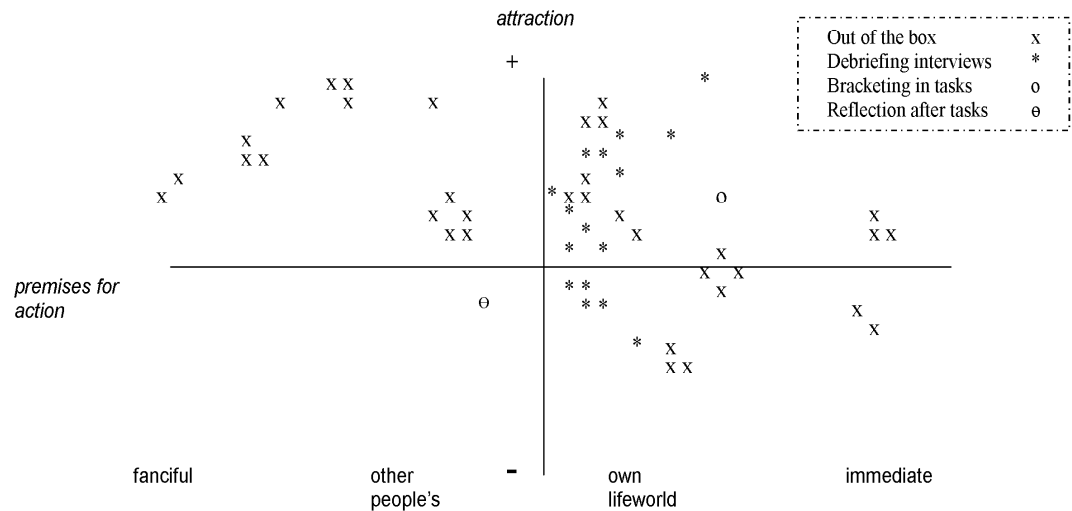


figure 6/26

Plotting affect and premises for use against notional lifeworld spaces

Through the situated enactment of the jewellery, and in being given space to create their own figurations of premises of use as well as of experiential meaning, the women reduced the levels of ambiguity of context and relationship. They were able to close the gap between their apprehension of the jewellery as a novel technical system, and their appropriation of it as a useful and socially appropriate wearable artefact. Through performing the jewellery together as a friendship group, it became easier for the women to position it imaginatively in their own everyday lives, in which the friendship network plays a constitutive role.

This chapter described how the networked jewellery and the friendship group were brought together, and discussed the relationship of the research questions with the design of the evaluation. Analysis of three data sets allowed the researcher to see what the women made of the concept designs, how they collaboratively enacted these meanings, and what the impact of situation was on the process. Notions of agency and figuration from Actor Network Theory informed the analysis, conducted using Grounded Theory, and a novel method for visualising user attitudes to concepts was presented. Chapter Seven finishes with a summary of the methodology as the research's contribution to Wearable Computing.

**Chapter Seven****Reflections and contributions**

Chapter Six recounted how the experimental user-centred process approached designing for the everyday through an understanding of the task-based evaluation as a quasi-authentic event. This final chapter presents the craft based methodology as the central contribution to expressive practices in Wearable Computing, and critically reflects on emergence, domain specific language, Actor Network Theory, and the lifeworld before future work is outlined.

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**7.1 Achieving the aims and objectives of the research**

The objectives at the start of the research were to create a wearable concept design and to evaluate it for the everyday. These have been demonstrably achieved and described in Chapters Four to Six, while the research questions regarding concepts of authenticity, craft and the everyday were addressed through the literature reviews and empirical research presented in Chapters Two to Four. The conclusions reached in these theoretical investigations are presented in this chapter as valuable elements of a larger holistic methodology relevant to the evolving and emerging communities of practice that make up the domain of Wearable Computing.

## 7.2 The contribution

The contribution resulting from the research is a Craft based methodology for the development of computational wearable products for the everyday, and the theoretical proposition for future work is that the commitment of the maker is made available to the consumer through the open craft object, the purpose of which is a continuation of ontological experience, or authenticity.

The methodology includes the following constituent parts:

- a theoretical framework for authenticity in design
- an analysis of craft as a process embodying authenticity
- a post-structural approach to the everyday user group through analyses of the lifeworld
- working physical prototypes developed as expressionals
- a view of the task-based evaluation as important for throwing authenticity into relief, and for providing the familiarization process necessary for bringing the concept closer to the users' own lifeworld(s)
- an Actor Network Theory approach that extends the data sets required to create moments of quasi-authenticity and to account for the roles of the researcher and the evaluation event
- an experimental visualisation technique to reveal users' potential commitment to novel concept designs

- and explicit reflection and accountability on the part of the researcher (the designer).

There have been two other potentially important incidental outcomes, these being the delivery of the first operational application of Speckled Computing, and the case study of a little reported user demographic in emerging technology, that of the female retirement-aged friendship group. Research into gender and technology often focuses on imbalances in study (McGrath Cohoon & Aspray 2006), on feminist discourses of domesticity (Lally 2002), or on the gendered configuration of new products (van Oost 2005), while Oudshoorn et al are rare in addressing gender in the “dynamics underlying [the] processes of configuring the user” (2004 p32). Goodman and Syme, meanwhile, point out that the elderly have until recently been a stereotyped and under-represented group in Human Computer Interaction (2003), and this finds support in the identification of ageism as a severe and institutionalized form of prejudice in design (Cuddy & Fiske 2004). The recent UTOPIA and current COMPANIONS projects are now seeking to deal more sensitively with these issues (COMPANIONS 2007, UTOPIA 2004), but further work is needed.

Critical reflection is expected in a thesis such as this, providing the research with internal validity. In this case it is also an explicit part of the methodology, and while craft is characterised by reflection in action, it is still necessary to summarise key aspects of the process that raise questions or require further work. This externalizes any misgivings of the researcher, and opens up the process of critical reflection to the invaluable experience of others. It is essential to the authenticity of the methodology itself.

### 7.3 Critical Reflection

This section covers a number of points including the emergent nature of the research and the issues this created, tension surrounding differences in language between co-creating disciplines, and in hybrid creation and evaluation processes, the lines at which the Actor Network assemblage apparently stops in the description given, and a conflation of the everyday and the lifeworld. Each of these forms a sub-section below.

#### *7.3.1 Emergence and unpredictable outcomes*

The cyclical nature of the work reflected a typical craft process, something which seemed natural to the researcher until it met with resistance from the more deterministic culture of computer science within which the research was being undertaken. This disjoint revealed the need for a clarification of craft as a methodology not only for the intended readership of the thesis, but also to allow the researcher to understand her own practice in an historical and contemporary context. This understanding was also crucial to the formation of the interdisciplinary team, and of course in the presentation of the work across domains.

Craft practitioners are used to experiencing stretches of time when goals seem to disappear, and are accustomed to operating on trust during these exploratory periods. This often goes unquestioned by the maker, but can unfortunately appear to other disciplines as a dangerously unfocused way of working, resulting in what appears to all intents and purposes an unacceptable level of post-rationalisation. In fact, most makers will attest to the importance of reflection-in-action to their craft, but until this was understood fully by the researcher, she found it difficult

to communicate her need to play with the materials of distributed wearable technology, and to instill a similar level of trust in exploration in others involved in the process. She often resorted to pressure to view the research as a project, a productive venture with identifiable outcomes, and it has taken some effort to remember that craft projects are judged in part by fundamentally different criteria. The researcher has for example, demonstrated the jewellery to other domains as successful when viewed as a moment in a product design lifecycle, presenting the work as being in its first or second design iteration. As a craft project however, the creative process itself is celebrated as a valuable outcome, something which remains difficult to present to other disciplines without undermining the perceived integrity of the work. However, it is this very methodology that is presented here as the central contribution of the thesis.

The researcher's understanding of this fundamental issue grew as the work progressed. In the early stages scoping the contributing fields of wearable computing, HCI and craft seemed a daunting task; in an effort to make some sense of this process, it was visualised it as a non-linear but iterative pathway generating an emergent field at the juncture of the three disparate disciplines (figure 7/1). This drew on Valentine's description of interdisciplinary work as a rollercoaster ride – iterative, looping, exhilarating and immersive – saying that “we as designers would do well to share with others how we deal with ambiguity and uncertainty” in solving indeterminate problems (2005). While inside the process, it is hard to retain an overview; this naïve model served throughout the course of the research as a reminder of the landscape of the problem and the infinite variations of the possible path towards both its definition and solution. Although intended primarily as a personal aid to study, it was used in supervisory meetings and at faculty research events such as eXchange (2004) to communicate the (still emerging) argument for a non-deterministic methodology.

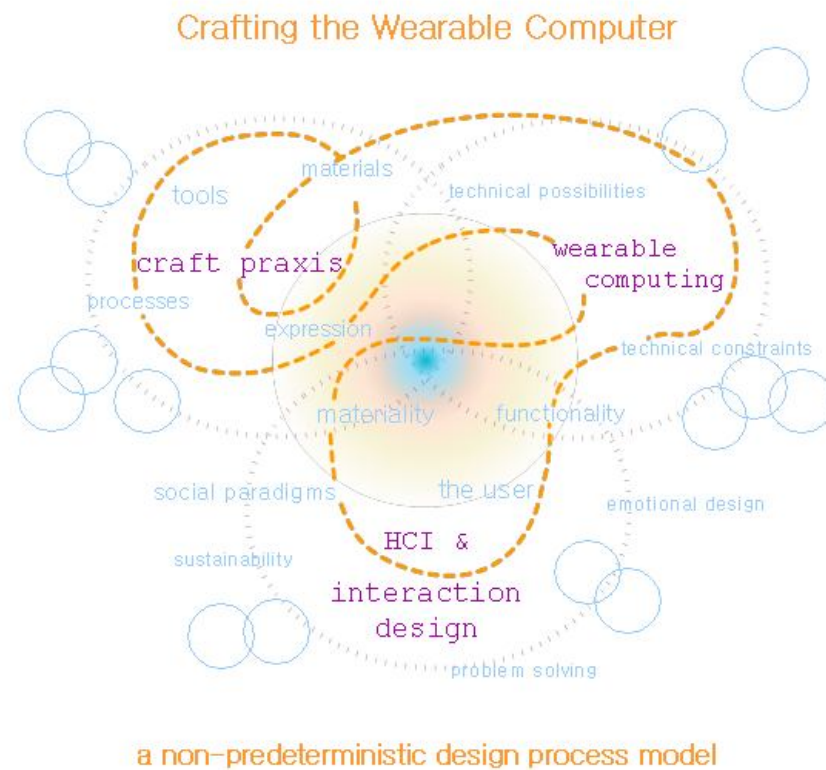


figure 7/1

visualisation of the exploratory interdisciplinary process

Another function of the holistic process of the research has been the difficulty found in structuring the thesis itself. A process like this might be said to have no real start or end point, and may be as relevant to any of the other communities it seeks to engage with. One result of this was a significant redrafting of the literature reviews in Chapters Two and Three after the bulk of the research activity had been completed, the reading towards this moment having been ongoing throughout the whole process (see *appendix ii*). At other times, reading and action have been tightly intertwined, for example, in methodological decisions regarding evaluation through Social Network Analysis and Actor Network Theory.



### 7.3.2 *Language in co-creation and in evaluation*

As in accounts of many other collaborative and interdisciplinary processes, the course of this research has been informed by linguistic tensions. This became immediately apparent in various expectations of the design process as Design, in contrast to the researcher's own implicit Craft expectations of the creative process, the most obvious outcomes of this ambiguity being the literature review and empirical investigations into Craft presented in Chapter Three.

Also apparent in the report is a further tension in the terminology (and by extension role) for the researcher herself. At times she is the researcher, but often she is the maker or craftsperson. In some ways this reflects the current situation in attitudes to the physical in research. The object and process have traditionally been means to conceptual and theoretical ends after an ideal of truth rooted in the Enlightenment, but this is challenged by distributed approaches to experience. At the same time the doctoral research process itself is evolving to include practice based processes and object based outputs (Biggs & Büchler 2007). Still, the terminology remains difficult, and while it has been occasionally useful or more accurate to use one or another of the terms available (artist, designer, maker, jeweller, craftsperson, researcher, writer, actor), much of the time, these roles have been fluid and concurrent. A useful French-Canadian term is that of *artist-researcher*, as used by Joanna Berzowska (2007), although it reads awkwardly in long texts written in the third person, such as the scientific thesis. In fact, there is an argument that to present such qualitative research in the third person is inauthentic, a linguistic abdication of responsibility and a clinging on to those ideals of objectivity that the research itself seeks to question (Wood 2000).

In a more pragmatic vein, the researcher's enthusiasm for the novel languages of Human Computer Interaction and Interaction Design introduced tensions particularly when talking about those people the research sought to observe. The term 'user' has been under critical review for some time in HCI and UCD, with many preferring 'actor', while in performance, the audience also suffers from an historical separation from the action. The impact of this is obvious in Chapter Six, when terminology became an issue in thinking about evaluation. Indeed the term itself is not to be found in Craft, assessment achieved instead through the critical reflection of the maker first and foremost. Whether the task based evaluation in the museum helped the friendship group to critically reflect on the networked jewellery is a moot point, instead they became a part of the performance that enabled the researcher to reflect on it. In addition, this figuration of the reflection as evaluation pre-configured the jewellery as device, causing methodological problems in analysis. Combining these sites of critical responsibility, the participant and the researcher, will remain one of the challenges of implementing the proposed methodology. However, it is quite likely that this will also be the very aspect of it that is the source of its most valuable results, and in recognition of an intersubjective network of assessment in evaluation, such results will be more truthful to the situation.

### *7.3.3 The delimiting of the Actor Network assemblage*

Despite this fundamental framework of distribution, Actor Network Theory may appear to have informed the work in rather a loose way. Latour stresses that while ANT is a strong theory, it is not a *framework* that can be *applied* – rather it is a descriptive process that recognises the power of things and the connections between actors in the production of meaning (2004), an account of ANT which sat well with the aims of describing

processes of socially enacted meaning making around a series of hybrid objects. The initial conception of the network as an assemblage of female friends and networked jewellery expanded in assessment to include the enframing roles of the idea of the research and the presence of human actors affiliated to the research. A Critical Technical Practice approach could take this still further in a description of the networks that produced the jewellery, including for example the Speckled Computing Consortium and the Silversmithing and Jewellery department at Edinburgh College of Art (Boehner et al 2005, Dunne et al 2005, Sengers et al 2004). A more political account of the women's experiences could also be produced through a focus on the tactics and strategies of actors in dealing with perceived resistances in the 'parliament of things' (Galloway 2005, Latour 1993), something which may be achieved through a more longitudinal study of the jewellery embedded within the friends' lifeworlds.

#### *7.3.4 The everyday and the lifeworld*

There has been a certain conflation of the lifeworld and the everyday which needs to be teased out, and which offers a rich seam for further work, particularly when such longitudinal approaches become more feasible. In this case the friendship group as a mechanism was seen as a constitutive microcosm of the everyday, and the lifeworld was understood to function as a network of actors engaged in assimilating and co-producing meaning. Again, terminology lays traps for the researcher: *the everyday* has a habit of becoming shorthand for some mass of mundanity which we, as observers, typically imagine ourselves to stand outside of, while *lifeworld* is often constrained to reference a private subjective reality. The approach here attempted to step outside this dualism in its recognition of the group as rich, changing and interconnected, and saw it as a constituent part of a larger dynamic system. One result of the probe

work done with the women was the realization that in their heterogeneity, the friends in many ways represented the post-structural nature of contemporary society.

#### **7.4 Further work**

Each of the materials, technological, tangible and sociological, were unfamiliar to the researcher at the beginning of the process yet needed to be engaged with deeply. Each of these now requires further work to create a truly successful design, and for the outputs to be described as craft objects. One potentially rich approach to this is through a version of 'process art', in which a list of verbs is compiled in relation to a material, and then carried out to allow expressive characteristics to emerge almost naturally (Tuxill 2007, p.358); in relation to the use of LED light output for example, these might include *to reflect*, *to diffuse*, *to dim*, and so on. The material of electronics and networks also needs to be further investigated, and since this work has been completed, the researcher has become involved with the Physical Computing community, learning the basics of electronics and beginning to work with conductive yarns and fabrics towards the construction of expressive physical circuits and custom components at different scales. She is also training in fourth generation programming environments for artists, applications with visual interfaces that allow expressive control over sound and visual outputs, such as Processing (2007), Arduino (2007) and Pure Data (2007). All of these require a long term commitment to create work that is successfully integrated, and the Speckled Jewellery should be seen as a starting point in this light. Finally, the material that is human behaviour (as opposed to received experience) is extremely important. To take this further in any meaningful way will require collaboration with dramatic theorists, directors and actors, and the author has made contact with a research group

looking at the potential for design through performance (Emergent Objects 2007). Possible methods would include Forum Theatre (Boal 2002, Jacucci et al 2005, Newell et al 2006, Sullivan & Lloyd 2006), and improvisation (Johnstone 1989, 1999). Further enquiry into Human Communication would also facilitate designing such networked jewellery for multiple groups, exploiting and providing a social research platform for the self-organisation of Speckz into zones (Harper 1993, Reid & Ng 2006, Wong & Arvind 2005).

The work contributes to the nascent field of digital jewellery research, which in the UK is preparing to move forward as a network. In this way, the strengths and experiences of different research processes can be merged to investigate with more authority the merger of technology and human adornment. For example, the emphasis on implementation in this doctoral process took precedence over the creation of high quality video representations of the work, whether as scenarios or in use. Ironically given the goal of authenticity, it may be that the evaluation event in the Museum should be re-staged in order to produce such footage so that the work can be more effectively disseminated.

Further, the author is interested in pursuing research into Craft as a particular type of neurological activity resulting in peak experiences and feelings of *flow* (Csikszentmihalyi 1991, Maslow 1994, Rahilly 1993). To this end, an investigation into the rhythms of visibility and invisibility of material to the maker may be useful, accomplished through an analysis of the frequency of 'speech utterances' in conversation with the material (Schön 1983, Dearden 2006). Any of these might also lead to a model of craft in use, and eventually support the development of a theory that links the experience of the maker with that of the user in a holistic model of authenticity.

## 7.5 Conclusion

The methodology described here is not given as a prescriptive framework, but rather as a proposed starting point. It involves many inversions of standard design thinking, perhaps most obviously that *design solves problems*. This approach rather acknowledges the crucial role of problems in creative systems of meaning making and authentic experience.

Craft, especially in its critically aware contemporary form, appears to provide a valuable model for the design of computational wearables that present the user with a context for authenticity. Contemporary Craft seeks to dissolve dichotomies of planning and situation, of mind and body, of expert and layman, of process and product, and despite lacking a comprehensive academic historiography, is an extremely important contemporary resource for other creative disciplines facing post-modern crises as media and computation become radically distributed. Craft no longer needs to hide behind its characterisation as unthinking doxa, but instead offers designers and users alike a way to engage with the computationally embedded world in a meaningful and authentic way. The proposition is that Wearable Computing, as an emerging area of design, is in an ideal position to take a responsible and informed approach to its working philosophy, and that it would benefit by embracing the challenging methodology of Contemporary Craft, rather than unquestioningly inheriting deterministic foundations.

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The final chapter summarized the methodology that emerged through the risky transdisciplinary process of designing a wearable network concept. It outlined the main features of this methodology, while presenting it as a

beginning rather than an end point; it concluded that Craft, particularly in its contemporary incarnation, provides an extremely valuable model for Interaction Design and Wearable Computing when engaging with the everyday need for authenticity.





## References

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- Aaker, J. (1999). The Malleable Self: The Role of Self-Expression in Persuasion. *Journal of Marketing Research*, No. 36 (February), pp. 45-57.
- Abowd, G. D. & Mynatt, E. D. (2000). Charting past, present, and future research in ubiquitous computing. *ACM Transactions on Computer-Human Interaction*, 7 (1): 29-58.
- Aeolab (2007). *Projects*. <http://www.aeolab.com/?s=projects>. Retrieved 16/06/07.
- Agre, P. & I. Horswill, I. (1997). Lifeworld Analysis. *Journal of Artificial Intelligence Research*. Volume 6: 111-145.
- Allan, G. (1989) *Friendship: Developing a sociological perspective*. Hemel Hempstead: Harvester Wheatsheaf.
- Allan, G. (1996) *Kinship and Friendship in Modern Britain*, Oxford: Oxford University Press.
- Anttila, A. (2006). *In conversation with the author*. Third International Mobile Music Workshop, University of Sussex, Brighton, 2-3 March 2006.
- Apple (2007). *Final Cut Pro 6 - Introduction*. <http://www.apple.com/finalcutstudio/finalcutpro/>. Retrieved 23 July 2007.

Arduino (2007). *What is Arduino?* <http://www.arduino.cc/>. Retrieved 24/07/07.

Arendt, H. (Ed.), (1973). Walter Benjamin: Illuminations. (H. Zohn Trans.). In C. Harrison & P. Wood (2003). *Art in Theory 1900-2000: An anthology of changing ideas* (pp.520-527). Oxford: Blackwell.

Arvind, D. K. (2004). Speckled Computing – An Overview. *2<sup>nd</sup> Workshop for Speckled Computing*. Edinburgh University 2-3 September 2004. <http://www.specknet.org/publications/20904workshop>. Retrieved 15/03/06.

Arvind, D. K. (2005). *Speckled Computing*. Speckled Computing Arts Network Meeting, Edinburgh University. 29 June 2005.

Arvind, D. K. (2006). *Presentation given to atelier*, Convivio Interaction Design Summer School. European network for Excellence, Napier University, Edinburgh. 17 August 2006.

Arvind, D. K. & Wong, K. J. (2004). Speckled Computing: Disruptive Technology for Networked Information Appliances. In *Proceedings of the IEEE International Symposium on Consumer Electronics (ISCE'04)* (UK), pp 219-223.

Ashby, M. & Johnson, K. (2002). *Materials and Design*. Oxford: Butterworth-Heinemann.

Astfalck, J., Paxman, K. & Horn, A. (2004). Whose Jewellery is it anyway? *Proceedings of Challenging Crafts*, Gray's School of Art, The Robert Gordon University, 2004.

<http://www2.rgu.ac.uk/challengingcraft/ChallengingCraft/papers/jivanastfalck/aph04.htm>. Retrieved 07/01/08.

Astfalck, J. (2005). Jewellery as a Fine Art Practice. In C. Grant (Ed.). *New Directions in Jewellery* pp. 18-24. London: Black Dog Publishing.

Attiwill, S. (2004). RE: What's in a Name. On Craft Australia's Online Forum: *Interact, Contemporary Craft in a Digital Future*.  
[http://www.craftaustralia.com.au/phorum/read.php?f=12&i=14&t=8#reply\\_14](http://www.craftaustralia.com.au/phorum/read.php?f=12&i=14&t=8#reply_14). Retrieved 13/06/07.

Baccarini, D. (2004). The implementation of authentic activities for learning: A case study. In the *Proceedings of the Teaching and Learning Forum*. Murdoch University, Western Australia, 9-10 February 2004.  
<http://lsn.curtin.edu.au/tlf/tlf2004/baccarini.html>. Retrieved 06/03/06.

Bachmann, I. (2002). New Craft Paradigms. In J. Johnson (Ed.). *Exploring Contemporary Craft: History, theory & critical writing* pp 45-49. Ontario: Coach House Books with The Craft Studio at Harbourfront Centre.

Baldwin, T. (Ed.) (2004). *Maurice Merleau-Ponty: Basic writings*. London: Routledge.

Barnhart, R. K. (Ed.). (1988). *Chambers Dictionary of Etymology*. Edinburgh: Harrap.

Barnard, M. (1996). *Fashion as Communication*. London: Routledge.

Barthes, R. (1993). (A. Lavers Trans.). *Mythologies*. London: Vintage.

Baudrillard, J. (1968). (J. Benedict Trans.) *The System of Objects*. London: Verso.

Bednall, J. (2006). Epoche and bracketing within the phenomenological paradigm. *Issues In Educational Research* Vol. 16, Issue 2.

Benson and Forsyth Architects. (2007). *Museum of Scotland*.  
[http://www.edinburgharchitecture.co.uk/museum\\_of\\_scotland.htm](http://www.edinburgharchitecture.co.uk/museum_of_scotland.htm).  
Retrieved 18/09/07.

Berndt, T. J. (2002). Friendship Quality and Social Development. *Current Directions in Psychological Science* 11 (1), 7–10.

Berzowska, J. (2005a). *Power, Control, Access, Memory*. Presentation given at the ICA, London, 29/11/05.  
<http://edgy.media.mit.edu:8080/incorporated/ml-pratt-2005.pdf/>. Retrieved 26/03/06.

Berzowska, J. (2005b). *In discussion at Interrogating Fashion Workshop*, 29 November 2005, London College of Fashion.

Berzowska, J. (2007). *Constellation Dresses and the Leeches: Questions of Power for Electronic Garments*. XS Labs.  
<http://www.xslabs.net/papers/iffiti07-berzowska-LC.pdf>. Retrieved 24/09/07.

Berzowska, J. & Coelho, M. (2005). Kukkia and Vilkas: Kinetic Electronic Garments. In *Proceedings Ninth IEEE International Symposium on Wearable Computers (ISWC'05)*. pp.82-85.

Berzowska, J. and Bromley, M. (2007). Soft Computation through Conductive Textiles. In the *Proceedings of the International Foundation of Fashion Technology Institutes Conference, 2007 (IFFTI '07)*.

Biggs, M. & Büchler, D. A. (2007). Rigor and Practice-based research. *Design Issues*, Vol. 23, No.3 pp. 62-69.

Blais (1999). The Meaning of Techniques and Materials. In G. Hickey (Ed.). *Common Ground: Contemporary craft, architecture and the decorative arts* pp.46-55. Quebec: Canadian Museum of Civilisation with the Institute for Contemporary Canadian Craft.

Blieszner, R. (1988). Individual Development and Intimate Relationships in Middle and Late Adulthood. In R. Milardo. (1988). *Families and Social Networks*. Newbury Park, CA: Sage, pp. 147-67.

Boal (2002). *Games for Actors and Non-Actors*. Routledge.

Boehner, K, David, S, Kaye, J and Sengers, P (2005). Critical Technical Practices as a Methodology for Values in Design. CHI 2005 Workshop on Quality, Values, and Choices. April 2005.

Bolter, J. D & Gromala, D. (2003). *Windows and Mirrors: Interaction Design, Digital Art and the Myth of Transparency*. Cambridge, MA: MIT press, Leonardo Series.

Borgatti, S. (1998). *Introduction to Grounded Theory*.  
<http://www.analytictech.com/mb870/introtoGT.htm>. Retrieved 27 July 2007.

Boulton, D. & Hammersley, M. (1996). Analysis of Unstructured Data. In Roger Sapsford & Victor Jupp (Eds.), *Data Collection and Analysis* pp.282-297. London: Sage.

Bourriaud, N., Pinto, R. & Damianovic, M. (2003). *Lucy Orta*. (Contemporary Artists Series) Phaidon Press.

Boyle, D. (2003). *Authenticity*. London: Flamingo.

Braddock, S. E. & O'Mahony, M. (1998). *Techno Textiles: Revolutionary Fabrics for Fashion and Design*. London: Thames & Hudson.

Brand, S. (2000). *The Clock of the Long Now*. London: Pheonix.

Brassett, J. (2005). Entropy (fashion) and Emergence (fashioning). In C. Breward & C. Evans (Eds.). *Fashion and Modernity*. Oxford: Berg. pp.197-209.

Brett, D. (2005). *Rethinking Decoration: Pleasure and Ideology in the Visual Arts*. Cambridge: Cambridge University Press.

Briggs, A. (2005). Response (to Hill). In C. Breward & C. Evans (Eds.). *Fashion and Modernity*. Oxford: Berg. pp.79-81.

The British Museum (n/d). *Explore/Highlights: Etienne Delaune, Goldsmith's Workshop, an engraving*.  
[http://www.thebritishmuseum.ac.uk/explore/highlights/highlight\\_objects/pd/e/etienne\\_delaune,\\_goldsmiths\\_wo.aspx](http://www.thebritishmuseum.ac.uk/explore/highlights/highlight_objects/pd/e/etienne_delaune,_goldsmiths_wo.aspx). Retrieved 24/07/07.

- Britton, A. (1998). Clay: Changing scenes. In Harrod, T. & M. L. T. Bateman (Eds.), *50 Years of Craft* pp.28-37. London: Contemporary Applied Arts.
- Broadhead, C. (2005). A Part/ Apart. In C. Grant (Ed.). *New Directions in Jewellery*, pp. 25-35. London: Black Dog Publishing.
- Brown, N. (2007). *Edward T. Hall: Proxemic Theory, 1966*. Center for Spatially Integrated Social Science. Regents of University of California, Santa Barbara. <http://www.csiss.org/classics/content/13>. Retrieved 12/06/07.
- Brown, R. (2006). *In conversation with the author*. Art and Technology in the 21st Century. The Changing Room Gallery, Stirling UK. Networking Artist Networks initiative. 28 Jan 2006.
- Buechley, L. (2006). A Construction Kit for Electronic Textiles. In *Proceedings of the IEEE International Symposium on Wearable Computers (ISWC)*, Montreux, Switzerland, October, 2006.
- Bullard, L. (2006). A Faster Horse. *Life Among the Mammals*. <http://lamammals.blogspot.com/2006/10/faster-horse.html>. Retrieved 21/07/07.
- Bursch, N. & Black, A. (2007). Craft Hard, Die Free: Radical curatorial strategies for craftivism in unruly contexts. *Proceedings of New Craft – Future Voices. Past, Present and Future Craft Practice Research*. pp 134 - 144. Duncan of Jordanstone College of Art & Design 4 – 6 July 2007.
- Burns, C. (2003). Talk given at DAMA, Napier University.

Businessweek. (2002). *A Seamless Style for Wearable Computers*.  
[http://www.businessweek.com/technology/content/oct2002/tc20021016\\_5437.htm](http://www.businessweek.com/technology/content/oct2002/tc20021016_5437.htm). Retrieved 21/07/05.

Cagan, J. & Vogel, C. M. (2002). *Creating Breakthrough Products: Innovation from product planning to program approval*. Upper Saddle River, NJ: Prentice Hall PTR.

Cambridge Advanced Learners Dictionary (2006).  
<http://dictionary.cambridge.org/>. Retrieved 09/03/06.

Campbell, K. B. (2005). Theorizing the Authentic: Identity, Engagement and Public Space. *Administration and Society*. Vol.36 No. 6, January 2005. pp688-705.

Cantor, M. H. (1979). Neighbors and Friends: An Overlooked Resource in the Informal Support Systems. *Research on Aging*. No. 1, pp. 434-63.

Cardwell, S., Cather, B. & Groak, S. (1997). New Materials for Construction. *The Arup Journal* 3/1997, pp18-20.

Carpentier, N. & Hannot, W. (2007). To be a Common Hero: The Political Identity of Mediated Ordinary People. *Proceedings of the Political Studies Association Annual Conference*, University of Bath, UK (11-13 April 2007).

Carrigy, T. (2007). Adaptive Craft: Crafting a Digital Yoke. In *Proceedings New Craft- Future Voices*, Dundee 4 – 6 July 2007. pp. 295 - 303.

Carroll, J. M. (2004). Beyond Fun. *interactions*, September/October 2004, pp.38-40.



Chalmers, M., MacColl, I. & Bell, M. (2003) Seamful Design: Showing the Seams in Wearable Computing. In the *Proceedings of IEE Eurowearable 2003*, 4<sup>th</sup>-5<sup>th</sup> September 2003, University of Birmingham. pp. 11-17. London: IEE.

Chalmers, M. (2005). *Mixing Media and Showing Seams*. Talk given at Manipulate Media, an experimental workshop on Performative Development of Ubiquitous Media. Held at the Centre for Contemporary Arts, Glasgow, 7 – 8 July 2005.

Chang, A. (2005). Engineers are from Mars, Fashion designers are from Venus: Bridging the gap between two opposing industries. *First International Wearable Futures Conference: Hybrid Culture in the Design and Development of Soft Technology*. 14 - 16 September 2005, University of Wales, Newport, Wales, UK.

Charlesworth, J. (2005). Wearables as relationship 'tools'. In *Proceedings First International Wearable Futures Conference: Hybrid Culture in the Design and Development of Soft Technology*. 14 - 16 September 2005, University of Wales, Newport, Wales, UK.

Charmed Technology (2006). *Wireless Everywear*.  
<http://www.charmed.com>. Retrieved 09/03/06.

Charmed (2007). *Charmed Technology – CharmBadge*.  
<http://www.charmed.com/products/charmbadge.html>. Retrieved 16/06/07.

Cherry, N. (2004). Grow Your Own: Angiogenetic Body Ornament. Paper presented at *Challenging Craft*, Robert Gordon University, Aberdeen, 8-10 September 2004.

Chupin, J. (1999). Real Presences in Meaningful Crafts. In G. Hickey (Ed.). *Common Ground: Contemporary craft, architecture and the decorative arts* pp.29-44. Quebec: Canadian Museum of Civilisation with the Institute for Contemporary Canadian Craft. pp.130-138.

Clawson, J., Lyons, K., Starner, T., & Clarkson, E. (2005). The Impacts of Limited Visual Feedback on Mobile Text Entry for the Twiddler and Mini-QWERTY Keyboards. In *Proceedings Ninth IEEE International Symposium on Wearable Computers (ISWC'05)*. pp. 170-177.

Clothier, I. 2005. Created Identities: Hybrid Cultures and the Internet. In *Convergence*, Vol. 11 Issue 4, pp.44–59. London: Sage.

Co, E. (2000). *Computation and Technology as Expressive Elements in Fashion*. Masters Thesis, Massachusetts Institute of Technology. <http://acg.media.mit.edu/people/elise/thesis/index.html>. Retrieved 16/06/07.

Coakley, L. (2002). All over the place, in town, in the pub, everywhere: A Social Geography of Women's Friendships in Cork. *Irish Geography*, Vol. 35, Issue 1, pp.40-50.

Coates, J. (1996). *Women Talk: Conversation Between Women Friends*. Oxford: Basil Blackwell.

Cochrane, G. (2007). *What is Craft?* craftscotland. <http://www.craftscotland.org/whatiscraft.html>. Retrieved 12/06/07.

Cohn, S. (2000). *Techno Craft: The work of Susan Cohn 1980 to 2000*. Canberra: The National Gallery of Australia.

Cohn, S. (2007a). WearNow Symposium, Australian Network for the Arts and Technology in partnership with Craft Australia, National Museum of Australia, Canberra, 2-3 February 2007

Cohn, S. (2007b). Cyber-Jewels & Techno-Gadgets; smart ornament. In *Filter* Issue 64, summer 2007: ReSkin – The future of wearable technology. Adelaide: Australian Network for the Arts and Technology. pp.8-10.

Colin, K. (2001). *Fabrications*. Iver Heath: ElekTex.

COMPANIONS (2007). *COMPANIONS*.

<http://www.cid.soc.napier.ac.uk/researchprojects/op/displayoneproject/researchprojectid/10169937>. Retrieved 21/09/07.

Cooper, R. (2000). Empathy and Technique in Design. *The Design Journal*. Vol. 3. Issue 3.

Costelloe, T.M., (1996). Between the Subject and Sociology: Alfred Schutz's Phenomenology of the Life-World. *Human Studies* Vol. 19, Issue 3, pp. 247-266.

Coupland, N. (2003). Sociolinguistic Authenticities. *Journal of Sociolinguistics* 7 (3), 417–431.

Cousens, C. (2004). A Sense of Place. *Craft in Dialogue*, IASPIS, September 4 2004. Konstpedemin, Goteborg, Sweden.  
<http://www.iaspis.com/craft/filer/cousen.rtf>. Retrieved 12/06/07.

Coyne, R. (1995). *Designing Information Technology in the Postmodern Age: From Method to Metaphor*. Cambridge, MA: MIT press, Leonardo Series.

Craftivism. (n/d). *Protest and Dissent Come in Many Different Forms*. <http://craftivism.com/what.html>. Retrieved 13/06/07.

*Creative Digital Interaction Symposium* (2004). Edinburgh College of Art. September 14th, 2004. <http://www.eca.ac.uk/tacitus/symposium.htm>. Retrieved 09/03/06.

Creative Entrepreneurs Network (2005). *Nanotechnology event*. 31 January 2005. The Lighthouse, Glasgow.

Crohan, S. E., & Antonucci, T. C. (1989). Friends as a source of social support in old age. In Adams, R. G. & Blieszner, R. (Eds.). *Older adult friendship: Structure and process*. Newbury Park, London: Sage Publications.

Cross, S. (2001). In *100% Proof* exhibition catalogue. London: Flow Gallery.

Csikszentmihalyi, M. & E. Rochberg-Halton (1981). *The Meaning of Things*. Cambridge: Cambridge University Press.

Csikszentmihalyi, M. (1991). *Flow: the Psychology of Optimal Experience*. New York: Harper Collins.

Csikszentmihalyi, M. (1995). Design and Order in Everyday Life. In V. Margolin & R. Buchanan (Ed.). *The Idea of Design*. (pp118-126). Cambridge, MA: MIT Press.

Cuddy, A. J. C. & Fiske, S. T. (2004). Dodering but Dear: Process, Content, and Function in Stereotyping of Older Persons. In T. Nelson (Ed.). *Ageism*. Cambridge MA: MIT Press. Pp3-26.

Cunningham, J. (2005). *Curator's talk*. Association for Contemporary Jewellery event: Maker Wearer Viewer exhibition. Glasgow School of Art, 12 April 2005.

CuteCircuit. (2007). *CuteCircuit Design Process*.

<http://www.cutecircuit.com/now/about-cutecircuit/design-process/>.

Retrieved 27 July 2007.

D&AD Nesta Product Design and Innovation Awards Brief (2003).

Original brief no longer online. See NESTA for a review of winners:

[http://www.nesta.org.uk/news/media\\_centre/news\\_releases/release.aspx?id=3584](http://www.nesta.org.uk/news/media_centre/news_releases/release.aspx?id=3584). Retrieved 13/06/07.

Daftcyborg. (2007). *Wearable Computing Fashion Show at TED City*

*Conference*. <http://www.youtube.com/watch?v=aGkecWzLq4g>. Retrieved 24/09/07.

Datamonitor. (2002a). Organic, Natural, Ethical and Vegetarian

Consumers. *New Consumer Insight Portfolio*. Report no. DMCM0081, February 2002.

<http://www.datamonitor.com/~b7346ef216084835820167c4bc58e8fa~/products/free/Report/DMCM0081/010dmcm0081.pdf>. Retrieved 12/06/07.

Datamonitor. (2002b). Specialty & Gourmet Shoppers. *New Consumer*

*Insight Portfolio*. Report no. DMCM0097, August 2002. [http://datamonitor-](http://datamonitor-market-)  
[market-](http://datamonitor-market-)

research.com/Merchant2/merchant.mvc?Screen=PROD&Product\_Code=DMCM0097&Category\_Code=. Retrieved 12/06/07.

Datamonitor (2007). New developments in Global Trends: The definitive guide to modern consumer lifestyles and behaviour. Report no. DMCM2468.

Davies, N. & Gellersen, H. (2002). Beyond Prototypes: Challenges in deploying ubiquitous systems. *IEEE Pervasive Computing* January – March 2002, pp.26-35.

Dearden, A. (2006). Designing as a Conversation with Digital Materials. *Design Studies* Vol. 27, No.3, pp.399-421.

de Certeau, M. (1984). *The Practice of Everyday Life*. Berkeley: University of California Press.

De Michelis, G. (2005). *Manipulate Media: experimental workshop on Performative Development of Ubiquitous Media*. 7-8 July 2005, Centre for Contemporary Arts, Glasgow, Scotland.

Dennett, D. C. (1991). *Consciousness Explained*. London: Penguin Books.

Derrez, P. (2005). Jewellery? What Kind of Jewellery are we Actually Talking About? In C. Grant (Ed.). *New Directions in Jewellery* pp. 11-17. London: Black Dog Publishing.

Designing for the 21<sup>st</sup> Century (n/d). *Interrogating Fashion: Practice, Process and Presentation: New Paradigms in Fashion Design*. [http://www.design21.dundee.ac.uk/Phase1/21Clusters/Interrogating\\_Fashion.htm](http://www.design21.dundee.ac.uk/Phase1/21Clusters/Interrogating_Fashion.htm). Retrieved 21/07/09.

Designing for the 21<sup>st</sup> Century Initiative (2005). *Research Clusters Reflection and Projection Workshop*. 8-10 September 2005. The Lighthouse, Glasgow.

de Sousa, R. (2007). Truth, Authenticity, and Rationality. *Dialectica* Vol. 61 Issue 3 Page 323 September 2007.

DeVaul, R., Schwartz, S., Pentland, A. (2001). *MIThril: Context Aware Computing for Daily Life*.

<http://www.media.mit.edu/wearables/mithril/MIThril.pdf>. No longer retrievable.

de Waal, E. (1998). Solace and Renewal: The real life of pots. In Harrod, T. & M. L. T. Bateman (Eds.), *50 Years of Craft*, pp.68-77. London: Contemporary Applied Arts.

de Waal, E. (2006). Places Sensed, Senses Placed. In Mazanti, L. & J. Veiteberg (Eds.). (2005). *Languages. Papers and Exhibition*. Think Tank. A European Initiative for the Applied Arts, edition 02, pp.14-16. Gmunden: Think Tank.

Dewey, J. (1929). *Experience and Nature*, second edition. Open Court.

Dewey, J. (1934). *Art as Experience*. New York: Perigee.

Dormer, P. (Ed.). (1997). *The Culture of Craft: Status and Future*. Manchester: Manchester University Press.

Dougherty, D. (2006). Genuine Ingenuity. *Make* Vol. 07 p. 48.

Dourish, P. (2001). *Where the Action Is: The foundations of embodied interaction*. Cambridge, MA: MIT Press.

Drutt-English, H. W. & Dormer, P. (1995). *Jewelry of Our Time: Art, ornament and obsession*. London: Thames and Hudson.

Duck, S. (1988). *Relating to Others*. Open University Press, London.

Dunne, L. (2004). *The Design of Wearable Technology: Addressing the human-device interface through functional apparel design*. Unpublished PhD thesis. <http://www.lucydunne.com/LucyDunneMastersThesis.pdf>. Retrieved 03/02/06.

Dunne, L., Ashdown, S., & McDonald, E. (2002). "Smart Systems": Wearable integration of intelligent technology. *Proceedings of the First Conference of the International Centre for Excellence in Wearable Electronics and Smart Fashion Products*. Cottbus, Germany.

Dunne, L.E., Smyth, B., Ashdown, S.P., Sengers, P., & Kaye, J. (2005). Configuring the User in Wearable Technology Design. *Proceedings of the First Wearable Futures Conference*, Newport, Wales. September, 2005.

Dunne, L., Toney, A., Ashdown, S., & Thomas, B. (2004). Subtle Integration of Technology: a case study of the business suit. *Proceedings of the First International Forum on Applied Wearable Computing*. Bremen, Germany.

Durschei, V. (2005). Foreword. In V. Durschei & L. Neri-Belkaïd (Eds.). *Access to Accessory*, pp.16-17. Geneva: Geneva University of Design.



Eckert, C. (2005). In discussion at *The Fashion Paradox, Interrogating Fashion*. London College of Fashion. Designing for the 21<sup>st</sup> Century Research Cluster Workshop, London College of Fashion, October 2005.

eCulture (2003). *V2 Events*.

<http://framework.v2.nl/archive/index/event/all.xslt/class-event?offset=141&sortby=name>. Retrieved 18/06/07.

Ellis, D. (2004). *The Hidden Hand and the Fluid Object: Craft in three sites of representation*. PhD thesis, School of Education, Division of Education, Arts and Social Science, University of South Australia, Adelaide. <http://www.library.unisa.edu.au/adt-root/uploads/approved/adt-SUSA-02022005-091703/public/01front.pdf>. Retrieved 12/06/07.

Emergent Objects (2007). *Emergent Objects: Performing Design Colloquium*. University of Leeds, School of Performance and Cultural Industries. 7<sup>th</sup> and 8<sup>th</sup> June 2007.

Entwistle, J. (2000). *The Fashioned Body: Fashion, dress and modern social theory*. Cambridge: Polity Press.

Entwistle, J. & Wilson, E. (Eds.). (2001). *Body Dressing*. Oxford: Berg.

Ethington, P.J. (1997). The Intellectual Construction of "Social Distance": Toward a Recovery of Georg Simmel's Social Geometry. *Cybergeo European Journal of Geography*.

<http://www.cybergeo.eu/index227.html>. Retrieved 12/06/07.

European Initiative for the Applied Arts (2006). *2<sup>nd</sup> Meeting*. Artworkers Guild. 10 February 2006, London UK.

Evans, J. (1998). Ping-Pong Balls and Eggs: the curious world of Sigurd Bronger. In Hovland, R. & Bronger, S. (1998). *Sigurd Bronger*. Oslo: Laboratorium Mechanum.

Evans, J. (2002). The New Jewellery: A documentary account. *Designing Britain 1945-1975 digital archive*. AHDS Visual Arts. [http://vads.ahds.ac.uk/learning/designingbritain/html/tnj\\_body3.html](http://vads.ahds.ac.uk/learning/designingbritain/html/tnj_body3.html). Retrieved 13/06/07.

Evans, J. (2006). *La Mort du Joaillier: tales from beyond the grave*. Talk given at Carry the Can, Association for Contemporary Jewellery International Conference 5 – 8 July 2006, London Metropolitan University.

Findeli, A. (1999). How Can We Learn From the Bauhaus Tradition Today? In G. Hickey (Ed.). *Common Ground: Contemporary craft, architecture and the decorative arts* pp.29-44. Quebec: Canadian Museum of Civilisation with The Institute for Contemporary Canadian Craft.

Follett, G. & Valentine, L. (2006). *AHRC Past, Present & Future Crafts Practice*. Space & Place Programme 2005-2006. Duncan of Jordanstone College of Art and Design, University of Dundee. 14 March 2006.

Forlizzi, J. & Battarbee, K. (2004). Understanding Experience in Interactive Systems. *Proceedings of Designing Interactive Systems, DIS2004*, August 1, 2004, Cambridge, MA: ACM.

Forlizzi, J. & McCormack, M. (2000). Case study: user research to inform the design and development of integrated wearable computers and web-based services. In *Proceedings of the Conference on Designing interactive Systems: Processes, Practices, Methods, and Techniques* pp. 275-279. New York, 17–19 August, 2000. D. ACM Press, New York, NY.

Foster, H. (1996). *The Return of the Real*. Cambridge, MA: MIT Press.

Fox, K. (2004). *Watching the English: The hidden rules of English behaviour*. London: Hodder & Stoughton.

Fry, T. (1994). *Remakings: Ecology, design, philosophy*. Sydney: Envirobook.

Galbraith, M. (2001). *Embedded Systems for Computational Garment Design*. Masters Thesis.

<http://acg.media.mit.edu/people/megan/thesis.html>. Retrieved 12/06/07.

Galloway, A. (2004a). Intimations of Everyday Life: Ubiquitous Computing and the City. *Cultural Studies* 18(2-3): 383-407.

Galloway, A. (2004b). Fashion Sensing / Fashioning Sense: A conversation about aesthetics with International Fashion Machine's Maggie Orth. *Horizon Zero Issue 16. Wear: Smart clothes, fashionable technologies*. July/August 2004.

<http://www.horizonzero.ca/textsite/wear.php?is=16&file=8&tlang=0>.

Retrieved 27 July 2007.

Galloway, A. (2005). *Design in the Parliament of Things*. Presentation at Design Engaged, 11-13 November, 2005, Berlin, Germany.

[http://www.purselipsquarejaw.org/papers/galloway\\_designengaged\\_05.pdf](http://www.purselipsquarejaw.org/papers/galloway_designengaged_05.pdf). Retrieved 27/07/07.

Galloway, A. (2006). Seams and Scars, Or How to Locate Accountability in Collaborative Work. In C. Brickwood, D. Garcia & W. Renger (eds.). *Uncommon Ground*. Amsterdam: BIS Publishers.

[http://www.purselipsquarejaw.org/papers/galloway\\_uncommonground\\_preprint.pdf](http://www.purselipsquarejaw.org/papers/galloway_uncommonground_preprint.pdf). Retrieved 23 July 2007.

Game, A. (2003). Foreward. *Jack Cunningham – On the Line* exhibition catalogue, pp.6-7. Glasgow: The Glasgow School of Art.

Game, A. & Goring, E. (1998). *Jewellery Moves: Ornament for the 21<sup>st</sup> Century*. Edinburgh: NMS Publishing.

Gangestad, S. W., & Snyder, M. (2000). Self-monitoring: Appraisal and reappraisal. *Psychological Bulletin*, 126, 530-555.

Gaspar, M. (2006). *Bite Your Tongue: Considerations on crafts and design in Catalonia*. Talk given at Languages. Think Tank. A European Initiative for the Applied Arts. The Art Workers Guild, London, 10 February 2006. Also in Mazanti, L. & J. Veiteberg (Eds.). (2005). *Languages. Papers and Exhibition*. Think Tank. A European Initiative for the Applied Arts, edition 02, pp.31-35. Gmunden: Think Tank.

Gates, D. (2007). Lost for Words: Development in a new language. *Proceedings of New Craft – Future Voices. Past, Present and Future Craft Practice Research*. pp 256-262. Duncan of Jordanstone College of Art & Design 4 – 6 July 2007.

Gaver, W. W. (2002). Designing for Homo Ludens. *13 Magazine* No.12, June 2002.

Gaver, W., Beaver, J. & Benford, S. (2003). Ambiguity as a Resource for Design, *Proc. ACM CHI*, pp. 233--240, 2003.

Gaver, W. W., Boucher, A., Pennington, S., & Walker, B. (2004a). Cultural Probes and the Value of Uncertainty. *Interactions*, Volume XI.5, pp.53-56.

Gaver, W. W., Boucher, A., Pennington, S., & Walker, B. (2005). Evaluating Technologies for Ludic Engagement. *Extended Proceedings*

of the *Affective Evaluation workshop, CHI'05*, April 2–7, Portland, Oregon.

Gaver, W. W., Bowers, J., Boucher, A., Gellerson, H., Pennington, S., Schmidt, A., Steed, A., Villars, N., & Walker, B. (2004b). The drift table: designing for ludic engagement. In *CHI '04 extended abstracts on Human factors in computing systems*. pp. 885 - 900. Conference on Human Factors in Computing Systems. Vienna, Austria. ACM Press New York, NY, USA.

Gaver, W. W., Dunne, A., & Pacenti, E. (1999). Design: Cultural probes. *Interactions* Vol. 6, Issue 1, pp. 21-29.

Gemperle, F., Kasabach, C., Stivoric, J., Bauer, M., & Martin R. (1998). Design for Wearability. *Proceedings of the Second International Symposium for Wearable Computers*. Pittsburgh, USA. Pp.116-122.

Glaser & Strauss (1967). *The Discovery of Grounded Theory*. Chicago: Aldine.

Glassie, H. (1999). *The Potter's Art*. Bloomington: Indiana University; Material Culture.

Goffman, E. (1959). *The Presentation of Self in Everyday Life*. London: Penguin Books.

Goffman, E. (1963). *Behaviour in Public Places: notes on the social organization of gatherings*. New York: The Free Press.

Golomb, J. (1995). *In Search of Authenticity: From Kierkegaard to Camus*. New York: Routledge.

- Goodman, J. & Syme, A. (2003). Age Old Question(naire)s. Include. London March 2003.
- Greasley P. (2007). In conversation with the author. *Emergent Objects Colloquium*, Design for the 21<sup>st</sup> Century, Leeds Metropolitan University, 7-8 June 2007.
- Greenhalgh, P. (1997). The History of Craft. In Dormer, P. (Ed.). *The Culture of Craft: Status and Future*. Manchester: Manchester University Press.
- Greenhalgh, P. (1997a). The Progress of Captain Ludd. In Dormer, P. (Ed.). *The Culture of Craft: Status and Future*. Manchester: Manchester University Press.
- Greenhalgh, P. (2003). *The Persistence of Craft*. London: Rutgers University Press.
- Greer, B. (2004). *Taking Back the Knit: Creating communities via needlecraft*. MA thesis, Goldsmiths University, London.  
<http://www.craftivism.com/archives/taking%20back%20the%20knit.pdf>. Retrieved 13/06/07.
- Greig, F. & Kettley, S. (2005). *Speckled Jewellery Network: application development*. Poster presented at the Fourth Speckled Computing Workshop. Edinburgh University, 15<sup>th</sup> September 2005.
- Guignon, C. (2004). *On Being Authentic*. London: Routledge.
- Hall, E. T. (1966). *The Hidden Dimension*. Garden City, N.Y.: Doubleday.

Hall-Elston, C. & Mullins, L. C. (1999). Social Relationships, Emotional Closeness, and Loneliness Among Older Meal Program Participants. *Social Behavior and Personality*. No. 27, pp. 503-517.

Hallnäs, L. & Redström, J. (2002). From use to presence: on the expressions and aesthetics of everyday computational things. In *ACM Transactions on Computer-Human Interaction (TOCHI)*, 9 (2) p. 106-124

Hallnäs, L. & Redström, J. (2006). *Interaction Design: Foundations, Experiments*. Textile Research Centre, Swedish School of Textiles, University College of Borås and Interactive Institute.

Hammond L. (2002). *Fashion Research Methods*. Kent Institute of Art and Design MA study resources.

<http://www.kiad.ac.uk/mafashion/research/research.htm>. Retrieved 12/06/07.

Harper, P. (2006). *The Poetics of Making: the language of objects*. Talk given at Carry the Can, Association for Contemporary Jewellery International Conference 5 – 8 July 2006, London Metropolitan University.

Harper, P. (2007). The Poetics of Making. *Proceedings of New Craft – Future Voices. Past, Present and Future Craft Practice Research*. pp 63 – 71. Duncan of Jordanstone College of Art & Design 4 – 6 July 2007.

Harper, R. H. R. (1993). *Why do People Wear Active Badges?* Technical report EPC-1993-120. Cambridge: Rank Xerox Ltd.

Harrison, C. & Wood, P. (Eds.) (2003). *Art in Theory 1900-2000: An anthology of changing ideas*. Oxford: Blackwell.

Harrod, T. (1998). A Brief History in Time. In Harrod, T. & Bateman, M. L. T. (Eds.). (1998). *50 Years of Craft*, pp.8-17. London: Contemporary Applied Arts.

Harrod, T. & Bateman, M. L. T. (Eds.). (1998). *50 Years of Craft*, pp.18-27. London: Contemporary Applied Arts.

Hartup, W. W., & Stevens, N. (1999). Friendships and Adaptation Across the Life Span. *Current Directions in Psychological Science*, Vol. 8, Issue 3, pp.76–79.

Helgeson, V. S., Shaver, P., & Dyer, M. (1987). Prototypes of intimacy and distance in same-sex and opposite-sex relationships. *Journal of Social and Personal Relationships*. Vol. 4, 195-233

Hexagram (2007). *Institute for Research/Creation in Media Arts Technologies. Projects*.

<http://www.hexagram.org/hexengine/projects.php?lang=en>. Retrieved 27 July 2007.

Hickey, G. (1997). Craft Within a Consuming Society. In Dormer, P. (Ed.). (1997). *The Culture of Craft: Status and Future*. pp. 83-100.

Hida, T. (1998). The Structure of Vessels. In *The Domain of the Form: Functional Beauty and its Trasmigration*. Crafts Gallery, The National Museum of Modern Art, Tokyo. Pp118-125.

Hill, A. (2005). People Dress so Badly Nowadays: Fashion and late modernity. In C. Breward & C. Evans (Eds.). *Fashion and Modernity*. Oxford: Berg. pp.67-78.



Hogg, D. (2004). Contemporary Jewellery: A personal reflection. In H. Belsher & J. Turrell. *Jewellery Unlimited*. London: Association for Contemporary Jewellery.

Honore, C. (2004). *In Praise of Slow: How a Worldwide Movement Is Challenging the Cult of Speed*. London: Orion Books.

Houston J. & Williamson, M. (1998). The Banqueting Table: The aura of software. In Harrod, T. & M. L. T. Bateman (Eds.). *50 Years of Craft*, pp.18-27. London: Contemporary Applied Arts.

Hummels, C. C. M. (2000). *Gestural Design Tools: prototypes, experiments and scenarios*. Doctoral dissertation, Delft University of Technology. <http://studiolab.io.tudelft.nl/hummels/publications>. Retrieved 23 July 2007.

Hummels, C.C.M., Djajadiningrat, J.P., & Overbeeke, C.J. (2001). Knowing, doing and feeling: communicating with your digital products. *Proceedings of Interdisziplinäres Kolleg Kognitions- und Neurowissenschaften.*, Günne am Möhnensee, March 2-9 2001, 289-308.

Hutchins, E. (1995). *Cognition in the Wild*. Cambridge, MA: MIT Press.

Hutchins, E. & Palen, L. (1998). Constructing Meaning from Space, Gesture and Speech. In L. B. Resnick, R. Saljo, C. Pontecorvo, and B. Burge (Eds.) *Discourse, Tools, and Reasoning: Situated Cognition and Technologically Supported Environments*. Springer-Verlag, Germany.

IDEO (2003) *Methods Cards: 51 Ways to Inspire Design*. Palo Alto: IDEO

Igoe, T. & O'Sullivan, D. (2004). *Physical Computing: Sensing and Controlling the Physical World with Computers*. Course Technology PTR

Ihde, D. (2002). *Bodies in Technology*. Minneapolis: University of Minnesota Press

Ind, N. (Ed.). (2003). *Beyond Branding: How the new values of transparency and integrity are changing the world of brands*. London: Kogan Page.

Infomat: Fashion Industry Search Engine. (2007). *Trends*.  
<http://www.infomat.com>. Retrieved 12/06/07.

Information and Design. (2006). *What Is Card Sorting?*  
<http://www.infodesign.com.au/usabilityresources/design/cardsorting.asp>.  
Retrieved 13/06/07.

Innes, J. (1997). *Trade Secrets – Surfaces and Finishes*. London; Pheonix Illustrated.

Intelligent Textiles Ltd. (2006). *Intelligent Textiles*.  
<http://www.intelligenttextiles.com/>. Retrieved 26/03/06.

International Fashion Machines. (2007). *IFM: International Fashion Machines*. <http://www.ifmachines.com/>. Retrieved 24/09/07.

Ionascu, A. (2007). The Anatomy and Aesthetics of use. In G. Folett, S. Moir & L. Valentine (Eds.). *Future Voices: Celebrating Dversity. Exhibition Proceedings New Craft - Future Voices*. Duncan of Jordnstone College of Art and Design. July 2007. pp.74-77.

Ishii, H., Wisneski, C., Brave, S., Dahley, A., Gorbet, M., Ullmer, B., & Yarin, P. (1998). ambientROOM: Integrating Ambient Media with Architectural Space. *Conference Summary of CHI '98*, April 18-23. [http://tangible.media.mit.edu/content/papers/pdf/ambientROOM\\_CHI98.pdf](http://tangible.media.mit.edu/content/papers/pdf/ambientROOM_CHI98.pdf). Retrieved 23 July 2007.

Jacucci, C., Jacucci, G., Wagner, I., & Psik, T. (2005). A manifesto for the performative development of ubiquitous media. *Proceedings of the 4th Decennial Conference on Critical Computing: between sense and sensibility*, Aarhus, Denmark. pp.19-28.

Jerrrome, D. (1984). Good Company: The Sociological Implications of Friendship. *Sociological Review*, Vol. 32, Issue 4, pp. 606–715.

Jerrrome & Wenger (1999). Stability and change in late-life friendships. *Ageing & Society* No. 19, pp. 661-676.

Johnstone, K. (1989). *Impro – Improvisation and the Theatre*. London: Methuen Drama

Johnstone, K. (1999). *Impro for Storytellers*. London: Faber and Faber.

Jönsson, L. (2006). “Konsthandverk” and “slöjd”: The old words are still with us. In Mazanti, L. & J. Veiteberg (Eds.). (2005). *Languages. Papers and Exhibition*. Think Tank. A European Initiative for the Applied Arts, edition 02, pp.17-21. Gmunden: Think Tank.

Jordan, P. (2000). *Designing Pleasurable Products*. London: Taylor & Francis.

Kälviäinen, M. (2000). The Significance of 'Craft' Qualities in Creating Experiential Design Products. *The Design Journal*, Vol. 3, Issue 3: 4-15.

Kennedy, B. (1999). Material Girl Living in a Material World. In *Techno Craft: the work of Susan Cohn 1980 to 2000*. Canberra: National Gallery of Australia.

Kettley, S (2005a). Framing the Ambiguous Wearable. *Convivio Online Journal*.

[http://webzine.convivionet.net/index.php?option=com\\_content&task=view&id=23&Itemid=71](http://webzine.convivionet.net/index.php?option=com_content&task=view&id=23&Itemid=71). Retrieved 25/05/05.

Kettley, S. (2005b). Visualising Social Space with Networked Jewellery. In Turner, P., Davenport, E., & Turner, S. (Eds.). *More Space. Proceedings of the second workshop on Place, Spatiality and Technology*, pp.92-98.. Napier University, Edinburgh 12-14 December 2004.

Kettley, S. (2005c). Crafts Praxis for Critical Wearables Design. In *Proceedings Wearable Futures Conference*, University of Wales, Newport, Sept 2005. Also in *AI & Society Journal* Vol. 21 (4) 2007 33.

Kettley, S. (2005d). Crafts Praxis as a Design Resource. In *Proceedings of the Engineering & Product Design Education Conference*, Napier University, Edinburgh, September 2005. P. Rodgers, L. Brodhurst, & D. Hepburn (Eds.). (2005). *Crossing Design Boundaries*, pp.545-549. London: Taylor & Francis Group.

Kettley, S. (2005e). Multivalency and Socially Performative Meaning Making Workshop paper presented at *Understanding and Designing for Aesthetic Experience, HCI 2005*, Napier University, September 5, 2005.

<http://193.1.99.5/aesthetics/papers.html>. Retrieved 09/03/06.

Kettley, S. (2005f). On Not Designing Tools. In Ghaoui, C. (Ed.). *Encyclopedia of Human Computer Interaction*. Information Science Reference.

Kettley, S. (2006). *Seamfulness, Craft and Wearable Computing*. Presentation given at The UpGrade! New Media Scotland, Dundee Contemporary Arts, 29 November 2006.

Kettley, S. (2007a). *The Distributed Wearable*. Presentation given at WearNow Symposium, Australian Network for the Arts and Technology in collaboration with Craft Australia. The National Museum of Australia, Canberra, Australia, Feb. 2007.

Kettley, S. (2007b). Distribution – craft and speckled computing. In *716 craft-design*, Craft Australia, April 2007.  
<http://www.craftaustralia.com.au/716/> and at  
<http://www.craftaustralia.com.au/research/20070327.php>. Retrieved 12/06/07.

Kettley, S. (2007c). An Engagement with Emerging Technology. In *Axis Dialogue*, January 2007. <http://www.axisweb.org/dlHOME.aspx>. ISSN 1749-4990. Retrieved 12/06/07.

Kettley, S. (2007d). Reflection and Transparency: Rhythms in Experiences with Craft. In *Proceedings New Craft – Future Voices International Conference*, pp 304-310. University of Dundee, Scotland, 04-06 July 2007.

Kettley, S. & Smyth, M. (2004a). The Materiality of Wearable Computers - Craft & Authentic User Experience. *Proceedings of Pixelraiders2*. Sheffield Hallam University, 6-8 April 2004.

Kettley, S. & Smyth, M. (2004b). The Materiality of Wearable Computers - Craft & Authentic User Experience. *The Design Journal*. Vol. 7. Issue 2.

Kettley, S. & Smyth, M. (2006). Plotting Affect and Premises for Use in Aesthetic Interaction Design: towards evaluation for the everyday. *Proceedings of HCI UK*. Vol.1. London September 11-15 2006.

Kilduff, M. & Tsai, W. (2003). *Social Networks and Organizations*. Thousand. Oaks, CA: Sage.

Knight, J. F., Baber, C., Schwirtz, A. & Bristow, H. W. (2002). The Comfort Assessment of Wearable Computers. In *The Proceedings of the Sixth International Symposium for Wearable Computers*. Los Alamitos, CA: IEEE Computer Society

Knight, C. (2003). *Artists talk*. Eye of the Beholder, Association for Contemporary Jewellery Conference. Manchester Metropolitan University. 10-13 April 2003.

Knuth, D. E. (1974). *Computer Programming as an Art*. ACM Turing Award Lecture. <http://fresh.homeunix.net/~luke/misc/knuth-turingaward.pdf>. Retrieved 13/06/07.

Kokkinos, P. (2005). Pot: as movable memory. In Gustafson, P. (2005). *Craft Perception and Practice: a Canadian discourse*. Vancouver: Ronsdale Press. pp.183–194.

Koplos, J. (2002). What's Crafts Criticism Anyway? In J. Johnson (Ed.). *Exploring Contemporary Craft: History, theory & critical writing* pp. 13-23. Ontario: Coach House Books with The Craft Studio at Harbourfront Centre.

Krell, D. F. (Ed.). (1993). *Basic Writings: Martin Heidegger*. London: Routledge.

Kwint (1999). Introduction: The physical past. In M. Kwint, C. Breward & J. Aynsley (Eds.). *Material Memories*. Oxford: Berg.

Lakoff G., & Johnson, M. (1999). *Philosophy in the Flesh*. Harper Collins.

Lally, E. (2002). *At Home with Computers*. Oxford: Berg.

Lamb, H. L. (2005). *Artist's talk*. Association for Contemporary Jewellery event: Maker Wearer Viewer exhibition. Glasgow School of Art, 12 April 2005. See also exhibition catalogue Cunningham, J. *Maker Wearer Viewer: Contemporary Narrative European Jewellery* p.68. Glasgow: Glasgow School of Art.

Landin, H. & Worbin, L. (2004). Fabrication by Creating Dynamic Patterns. *Proceedings of Pixelraiders2*, Sheffield Hallam University, 6-8 April 2004.

Latour, B. (1993). *We Have Never Been Modern*. Cambridge, MA: Harvard University Press.

Latour, B. (1997). *On Recalling ANT*. Keynote speech given at Actor Network and After Workshop, Keele University, July 1997.

<http://www.lancs.ac.uk/fss/sociology/papers/latour-recalling-ant.pdf>.  
Retrieved 06/03/06.

Latour, B. (2004). A prologue in form of a dialog between a Student and his (somewhat) Socratic Professor. In C. Avgerou, C. Ciborra, & F.F. Land (Eds.). *The Social Study of Information and Communication Study*. Oxford: Oxford University Press, 2004, pp.62-76. Also at <http://www.bruno-latour.fr/articles/article/090.html>. Retrieved 24/07/07.

Latour, B. (2005). *Reassembling the Social: An Introduction to Actor Network Theory*. Oxford: Oxford University Press.

Leach, M., & Benyon, D. (2005). Speckled Computing: A new challenge for Human-Computer Interaction. In *Proceedings of HCI 2005*, September 2005, Edinburgh, UK. Vol 2 2005.

Leather, H. & Ling, M. (2005). *The 5Cube and 5CubeOTS Projects*. [http://www.specknet.org/publications/Hugh\\_Leather.pdf](http://www.specknet.org/publications/Hugh_Leather.pdf). Retrieved 20/03/06.

Lefebvre, H. (2002). *Critique of everyday life*. London: Verso.

Lehmann, U. (2000). *Tigersprung: Fashion in modernity*. Cambridge, MA: MIT Press.

Lewis, D. & Bridger, D. (2000). *Authenticity: The Soul of the New Consumer*. London: Nicholas Brealey Publishing.

Lightman, A. (2002). *Brave New Unwired World: The digital big bang and the infinite internet*. New York: John Wiley and Sons.



Lindsay, S. (2005). Artist's statement. In C. Grant (Ed.). *New Directions in Jewellery* p.161. London: Black Dog Publishing.

Lurie, A. (1981). *The Language of Clothes*. New York: Random House.

Lyons, K., Plaisted, D., & Starner, T. (2004). Expert Chording Text Entry on the Twiddler One-Handed Keyboard. In *Proceedings of the Eight International Symposium for Wearable Computers (ISWC 2004)*. p. 94-101.

MacKenzie & Spinardi (1995). Cited in P. Dormer (1997). Craft and the Turing Test for Practical Thinking. In P. Dormer (Ed.). *The Culture of Craft: Status and Future* pp.137-157. Manchester: Manchester University Press.

Madan, A., Caneel, R. & Pentland, A. (2005). Voices of Attraction. *Proceedings Augmented Cognition, HCI 2005*, Las Vegas.

*Make: Technology On Your Time*. (2007).

<http://makezine.com/magazine/>. Retrieved 12/06/07.

Mann, J. (2004). A Programming Model for Specknets. *Presentation given at 2<sup>nd</sup> Workshop for Speckled Computing*. Edinburgh University 2-3 September 2004.

Mann, S. (1997). Smart Clothing: The Wearable Computer and WearCam. *Personal Technologies Journal*, Vol. 1, Issue 1, pp.21-27. London: Springer.

Marchetti, L. (2005). Accessory, terra incognita. In V. Durschei & L. Neri-Belkaïd (Eds.), *Access to Accessory*, pp. 58-61. Geneva: Haute Ecole d'Arts Appliqués.

Margolin, V. (1997). Getting to know the user. *Design Studies*, 18(3), 227-235.

Marshall, J. (2005). *Mute Objects/a\_crate?*. Presentation given at the First Speckled Computing Arts Network Meeting. Edinburgh University, 29 June 2005.

Marshall, P. D. (2004). *New Media Cultures*. London: Arnold.

Martin, T. (2001). *Tutorial on Low Power design for Wearable Computers: Waste Not Want Not*. International Symposium for Wearable Computers, ISWC'01. 29 September 2001.

Maslow, A. (1971). *The farther reaches of human nature*. New York: Viking Press.

Maslow, A. H. (1994). *Religions, Values, and Peak-Experiences*. New York: Penguin Books.

Maslow, A., Lowry, R., & Lowry, R. J. (1998). *Towards a Psychology of Being*. Chichester: Wiley.

Mathieu, P. (1994). The Space of Pottery: An investigation into the nature of craft. In G. A. Hickey (Ed.). *Making and Metaphor: A discussion of meaning in contemporary craft* pp.26-34. Quebec: The Canadian Museum of Civilisation with the Institute for Contemporary Canadian Craft.

- Maxwell, K. (2002). The Maturation of HCI: Moving beyond usability toward holistic interaction. In J. M. Carroll (2002). *Human-Computer Interaction in the New Millennium*, pp.191-204. New York: Addison-Wesley.
- Mazanti, L. (2003). Craft as Avant-Garde. Lecture delivered at *Craft in Dialogue*, Stockholm, September 1, 2003.
- Mazanti, L. (2004). Re-reading the Functional. *Proceedings of Challenging Craft*, Gray's School of Art, Aberdeen, 8-10 September 2004.
- Mazanti, L. (2006). *Super Objects*. Ph.D thesis. Denmark's Design School / the National Academy of Fine Arts, School of Architecture, Copenhagen.
- McCarthy, J. & Wright, P. (2004). *Technology As Experience*. Cambridge, MA: MIT Press.
- McCullough, M. (1998). *Abstracting Craft – The Practiced Digital Hand*. Cambridge, MA: MIT Press.
- McCullough, M. (2004). *Digital Ground: Architecture, pervasive computing and environmental knowing*. Cambridge, MA: MIT Press.
- McGrath Cohoon, J. & Aspray, W. (Eds.). (2006). *Women and Information Technology: Research on Underrepresentation*. Cambridge, MA: MIT Press.

McIntyre, K, Horn, A, & Grange, N. (2007). At Home with Craft. In *Proceedings New Craft- Future Voices*, Dundee 4 – 6 July 2007. pp. 419 – 434.

Merleau-Ponty, (1968). *The Visible and the Invisible*. Evanston: Northwestern University Press.

Metcalf, B. (2002). Contemporary Craft: A brief overview. In J. Johnson (Ed.). *Exploring Contemporary Craft: History, theory & critical writing* pp. 13-23. Ontario: Coach House Books with The Craft Studio at Harbourfront Centre.

Michael, M. (2006). *Technoscience and Everyday Life: The Complex Simplicities of the Mundane*. Maidenhead, Berks: Open University Press/McGraw-Hill.

Miller, D. (2006). *Art & Technology. Report from the NAN Scotland event in Stirling, January 2006*. [http://www.a-n.co.uk/cgi-bin/db2www.exe/article.d2w/input?menu=4&section=261845&topic=261843&id=284001&textonly=\(textonly\)](http://www.a-n.co.uk/cgi-bin/db2www.exe/article.d2w/input?menu=4&section=261845&topic=261843&id=284001&textonly=(textonly)). Retrieved 09/03/06.

MIT. (2003). *MIThril*. <http://www.media.mit.edu/wearables/mithril/>. Retrieved 06/03/06.

MIT. (2006). *Wearable Computing*. <http://www.media.mit.edu/wearables/index.html>. Retrieved 09/03/06.

Mitchell, W., J., Inouye, A. S., & Blumenthal, M. S. (Eds.), (2003). *Beyond Productivity*. Washington: National Academies Press.

Moore, J. (2002). Authentic Marketing. *Argent*, Vol.1 Issue 5.

Murray, L. K. (2005). Pavement Jewellery. In *Findings*. London Metropolitan University: Association for Contemporary Jewellery.

Murtazin, E. (2002). (trans. M. Sennikova). *Review Vertu or the phone for 6000 Euro*. <http://www.mobile-review.com/review/vertu-en.shtml>. Retrieved 20/03/06.

NEVAC (2007). *National Electronic and Video Archives of the Crafts*. <http://www.media.uwe.ac.uk/nevac/>. Retrieved 07/01/08.

Newell, A. F., Carmichael, A., Morgan, M., & Dickinson, A. (2006). The use of theatre in requirements gathering and usability studies. *Interacting with Computers*. Vol. 18, Issue 5, September 2006. pp 996-1011.

Nielsen, J. (2000). *Designing Web Usability: the practice of simplicity*. Indianapolis: New Riders

Nokia (2002). *Vertu Launches the World's Most Exclusive Instrument for Personal Communication*. January 21, 2002. [http://press.nokia.com/PR/200201/845684\\_5.html](http://press.nokia.com/PR/200201/845684_5.html). Retrieved 26/03/06.

Norman, D. (1998). *The Invisible Computer*. Cambridge, MA: MIT Press.

Oberlack, U. (2005). Illumination and Emanation: Light as body adornment. In *Proceedings Wearable Futures Conference*, University of Wales, Newport, Sept 2005.

O'Connor, P. (1992). *Friendships between women: a critical review*. Harvester Wheatsheaf.

Ohlin, P. (2007). Truth, Authenticity, and the Brand. *Chief Marketer*.  
[http://chiefmarketer.com/disciplines/branding/truth\\_authenticity\\_brand\\_11082006/](http://chiefmarketer.com/disciplines/branding/truth_authenticity_brand_11082006/). Retrieved 24/10/07.

O'Mahony, M. (2002). *Cyborg, the Man-Machine*. London: Thames & Hudson.

van Oost, E.C.J. (2005). Materialized gender: how shavers configure the users' femininity and masculinity. In N.E.J. Oudshoorn & T. Pinch (Eds.), *How users matter. The co-construction of users and technology* (pp. 193-208). Cambridge, MA: MIT Press.

Orth, M. (2001). *Sculpted Computational Objects with Smart and Active Computing Materials*. PhD Thesis at the Massachusetts Institute of Technology. <http://web.media.mit.edu/~morth/thesis/thesis.html>. Retrieved 28/08/02.

Oudshoorn, N. & Pinch, T. (2003). *How Users Matter: The co-construction of users and technologies*. Cambridge, MA: MIT Press.

Oudshoorn, N., Romnes, E. & Stienstra, M. (2004). Configuring the User As Everybody: Gender and Design Cultures in Information and Communication Technologies. *Science, Technology & Human Values*. Vol. 29, No. 1 Winter 2004, pp.30-63. Sage Publications.

Oxlade, R. (2001). "Good" Draughtsmanship or Real Drawing. *Blunt Edge*, No. 1.

Palmer, A. (2002). Craft Theory and Education. In J. Johnson (Ed.). *Exploring Contemporary Craft: History, theory & critical writing* pp. 55-61.

Ontario: Coach House Books with The Craft Studio at Harbourfront Centre.

Park, M. (2005). Craft is the New Black. *Konsthandverk; Contemporary Craft Biennale catalogue*, pp7-12. Göteborg, Sweden, 3 September – 9 October 2005.

Partington, M. (2004). Introduction. In H. Belsher & J. Turrell. *Jewellery Unlimited*. London: The Association for Contemporary Jewellery.

Pavey, R. (1999). Unwearable Tension: Freddie Robins's deconstructed knitwear. In *Crafts Magazine*, Issue No.160, September/October 1999, pp.36-39.

Paxon, A. (2001). Artist's statement. *100% Proof exhibition catalogue*. London: Flow Gallery.

Paxon, A. (2003). *Artist's talk*. Association for Contemporary Jewellery: Eye of the Beholder Conference. Manchester Metropolitan University. 10-13 April 2003.

Pearson, I. (2005). Presentation given at Interrogating Fashion Designing for the 21<sup>st</sup> Century Research Cluster Workshop, London College of Fashion, 20 May 2005.

Pearson, I. & DiDuca, D. (2005). Spiritual Revival towards 2010 – Traditional religion or nouveau-hippies? *The Journal of The Communications Network*. Vol. 4 Part 1, January–March 2005.

Peters, R. (2005). *Artist's talk*. Association for Contemporary Jewellery event in association with the Embassy Gallery, Edinburgh. Fools Gold exhibition. 23 March 2005, Edinburgh College of Art.

Petersen, M. G., Iversen, O. S., Krogh, P. G., & Ludvigsen, M. (2004). Aesthetic interaction: a pragmatist's aesthetics of interactive systems. In *Proceedings of the 2004 Conference on Designing interactive Systems: Processes, Practices, Methods, and Techniques*. Cambridge, MA, USA, August 01 - 04, 2004. DIS '04. ACM Press, New York, NY, 269-276.

Petitot, J., Varela, F. J, Pachoud, B. & Roy, J. M. (Eds.) (1999). *Naturalizing Phenomenology: Issues in contemporary phenomenology and cognitive science*. Stanford University Press.

Philips. (2000). *New Nomads; An Exploration of Wearable Electronics*. Rotterdam: 010 Publishers.

Polanyi, M. (1998). *Personal Knowledge: Towards a post-critical philosophy*. London: Routledge.

Polhemus, T. (2005). The Ornamented Ape. In V. Durschei & L. Belkaïd Neri (Eds.). *Access to Accessory*. Haute École d'Arts Appliqués HES Genève.

Post, E. R. & Orth, M. A. (1997). Smart Fabric or Wearable Clothing. *Proceedings of the First International Symposium on Wearable Computers*, 13-14 Oct 1997 pp. 167-168.

Post, E. R., Orth, M. A., Russo, P. R. & Gershenfeld, N. (2000). E-broidery: Design and Fabrication of Textile-Based Computing. *IBM Systems Journal* Vol. 39, Nos. 3&4.



Press, M. (1996). Crafting a Sustainable Future from Today's Waste. *The Interdisciplinary Journal of Design and Contextual Studies*. Issues 5 & 6, <http://www.co-design.co.uk/mpress.htm>. Retrieved 14/06/07.

Press, M. & Cooper, R. (2003). *The Design Experience: The Role of Design. and Designers in the Twenty-First Century*. Aldershot: Ashgate,

Processing (2007). *Processing*. <http://processing.org/>. retrieved 24/07/07.

Pure Data (2007). *PD*. <http://www.puredata.org/>. Retrieved 24/07/07.

Pye, D. (1968). *The Nature and Art of Workmanship*. London: Design Handbooks.

Pye, D. (1978). *The Nature and Aesthetics of Design*. London: Herbert Press.

Quantum Research Group. (2007). *The Market Leader in Human Interface Touch Controls*. <http://www.qprox.com/>. Retrieved 21/09/09.

Quigley, T. R. (1996). *Maurice Merleau-Ponty, "Eye and Mind" (1964)*. <http://homepage.newschool.edu/~quigleyt/vcs/mp-em.pdf>. Retrieved 24/10/07.

Ragnhildur Mogensen, H. (2007). *Conversation with Grandma*. Jewellery object shown as part of the maker's degree show, Edinburgh College of Art, June 2007.

Rahilly, D. A. (1993). A Phenomenological Analysis of Authentic Experience. *Journal of Humanistic Psychology*, 33 (2), 49-71.

Rana, M. (2004). Where Do I Go From Here? In *Proceedings Challenging Craft International Conference* 8-10 September 2004, Gray's School of Art, Aberdeen.

Rana, M. (2006). *Mah Rana*. <http://www.mahrana.com/meanings.htm>. Retrieved 27/03/06.

Redström, J. (2006). Towards User Design? On the shift from object to user as the subject of design. *Design Studies*, Vol. 27, Issue 2, pp. 123-139.

Rees, D. (2005). *No More Useless Beauty*. Presentation given at Fashion in Context: Presentation & Display, Audience & Engagement. Interrogating Fashion, Designing for the 21<sup>st</sup> Century Research Cluster Workshop, London College of Fashion, 21 April 2005.

Reid, S. A., & Ng, S. H. (2006). The dynamics of intragroup differentiation in an intergroup social context. *Human Communication Research*, Vol. 32, No. 4. pp. 504-525.

reSkin (2007). *reSkin Media Lab* at ANU, 15 Jan – 1 Feb 2007. Australian Network for the Arts and Technology with Craft Australia. <http://www.anat.org.au/reskin/>. Retrieved 24/09/07.

Rettberg, S. (2004). *ISEA Fashion (Wearable Computing) Report*. <http://retts.net/2004/08/25/isea-fashion-wearable-computing-report/>. Retrieved 21/07/05.

Rhodes, B. (2002). *In discussion at the Sixth International Symposium for Wearable Computers*. 7-10 October 2002, University of Washington, Seattle.

Roberts, G. (2005). *Artist's talk*. Association for Contemporary Jewellery event: Maker Wearer Viewer exhibition. Glasgow School of Art, 12 April 2005. See also exhibition catalogue Cunningham, J. *Maker Wearer Viewer: Contemporary Narrative European Jewellery* p.72. Glasgow: Glasgow School of Art.

Rogers, C. R. (1965). *Client-Centered Therapy, Its Current Practice, Implications and Theory*. Houghton Mifflin. Boston. In D. A. Rahilly, Phenomenological Analysis of Authentic Experience. *Journal of Humanistic Psychology*, 33 (2), 49-71.

Rogers, W. K. (1998). Human Life and World: On the insufficiency of the phenomenological concept of the life-world. In the *Proceedings of the Twentieth World Congress of Philosophy*. Boston, MA, 10-15 August 1998

Royal College of Art. (2006). Freddie Robbins – Tutor. [http://www.rca.ac.uk/pages/research/freddie\\_robbsins\\_621.html](http://www.rca.ac.uk/pages/research/freddie_robbsins_621.html). Retrieved 09/03/06.

Rust, C., Whiteley, G & Wilson, A. (2000). Experimental Making in Multidisciplinary Research. *The Design Journal*. Vol. 3. Issue 3, pp.16-24.

Sandino, L. (2003). Studio Jewellery: Mapping the absent body. In P. Greenhalgh (Ed.). *The Persistence of Craft*. London: Rutgers University Press, pp.107-116.

Sandywell, B. (2004). *The Myth of Everyday Life: toward a heterology of the ordinary*. Cultural Studies Vol. 18, No.2/3, March/May 2004, pp.160-180.

Sawchuk, K. (1987). A Tale of Inscription: Fashion Statements. *Canadian Journal of Political and Social Theory*. Vol. XI, Nos. 1-2, pp. 51-67.

Schön, D. (1983). *The Reflective Practitioner*. Cambridge, MA: Basic Books

Schwartz, S. J. & Pentland, A. (2000). *The Smart Vest: Packaging alternative for wearable computing*. Update to MIT Media Lab Vismod Technical Report #504 14 May, 2000.  
<http://web.media.mit.edu/~schwartz/smartvest.doc>. Retrieved 16/06/07.

Scott, J. (2000). *Social Network Analysis; a handbook*. London: Sage.

Sengers, P., Kaye, J., Boehner, K., Fairbank, J., Gay, G., Medynskiy, Y., & Wyche, S. (2004). Culturally Embedded Computing. *Pervasive Computing*, Vol. 3, No. 1. pp.14-21.

SeymourPowell (2006). *SeymourPowell*. London: SeymourPowell.

Shedroff, N. (2007). In discussion. *Emergent Objects Colloquium*, Design for the 21<sup>st</sup> Century, Leeds Metropolitan University, 7-8 June 2007.

Silk, J.B. (2003). Cooperation without counting: the puzzle of friendship. In: *The Genetic and Cultural Evolution of Cooperation* (P. Hammerstein, ed.), Dahlem Workshop Report 90. Cambridge, MA, The MIT Press, pp. 37-54.

Sledziewski, E. (2005). Accessorium sequitur principale...and vice versa. In *Access to Accessory*, pp.38-39. Geneva: Geneva University of Design.

Smith Bontempi (2003). *Distance Learning Within Museums: A qualitative study*. <http://faculty-staff.ou.edu/B/Elaine.S.Bontempi-1/dlstudy.html>. Retrieved 27 July 2007.

Snyder, M., & Gangestad, S. (1986). On the nature of self-monitoring: Matters of assessment, matters of validity. *Journal of Personality and Social Psychology*, No. 51, pp.125-139.

*Speckled Computing Arts Network* (2005). <http://www.specknet.org/publications/SCAB/>. Retrieved 09/03/06.

Stark, M. (2002). *The State of the U.S. Consumer 2002*. [http://www.saatchikevin.com/workingit/myra\\_stark\\_report2002.html](http://www.saatchikevin.com/workingit/myra_stark_report2002.html). Retrieved 06/03/06.

Starner, T. (2001a). The Challenges of Wearable Computing: Part 1. *IEEE Micro*. Vol.21, No.4, July - August 2001, pp44-52.

Starner, T. (2001b). The Challenges of Wearable Computing: Part 2. *IEEE Micro*. Vol.21, No.4, July - August 2001, pp54-67.

Starner, T., Auxier, J., Ashbrook, D. & Gandy, M. (2000). The Gesture Pendant: A self-illuminating, wearable, infrared computer vision system for home automation control and medical monitoring. *Proceedings of the 4th IEEE International Symposium on Wearable Computers*. Atlanta GA, October 2000.

Starner, T. & Rhodes, B. (2002). *An Introduction to Wearable Computing*. Tutorial presented at ISWC'02 (The Sixth International Symposium for Wearable Computers).

Stein, S. J., Andrews, T., & Isaacs, G. (2001). Incorporating Authentic Learning Experiences within a Business Management Course. *Paper presented at the Annual Conference of the Australian Association for Research in Education*. 2-6 December 2001, The University of Notre Dame, Fremantle Australia.

Stewart (1999). Prologue: From the museum of touch. In M. Kwint, C. Breward & J. Aynsley (Eds.). *Material Memories: Design and Evocation*. Oxford: Berg. pp 17 – 36.

Strauss, A. and Corbin, J. (1994). Grounded Theory Methodology - An Overview. In N. K. Denzin & Y. S. Lincoln (Eds.). *Handbook of Qualitative Research*, (pp273-285). Thousand Oaks: Sage.

Strom, G. (2002). Mobile Devices as Props in Daily Role Playing. In *Proceedings of Personal and Ubiquitous Computing (2002)* 6:307-310. London: Springer-Verlag

Stronks, B., Nijholt, A., van der Vet, P., & Heylen, D. (2002). Designing for friendship: becoming friends with your ECA. In *Proceedings of the Embodied Conversational Agents - Let's Specify and Evaluate Them!* Bologna, Italy, 2002. pp. 91–7.

Sullivan, J. & Lloyd, R. S. (2006). The Forum Theatre of Augusto Boal: A Dramatic Model for Dialogue and Community-Based Environmental Science. *Local Environment*, Vol. 11, No.6, December 2006, pp. 627-646.

The Sunday Herald. (2003). This year's Edinburgh Festival has broken all the records. *SMG Sunday Newspapers Ltd.* August 31<sup>st</sup> 2003.  
[http://findarticles.com/p/articles/mi\\_qn4156/is\\_20030831/ai\\_n12584542](http://findarticles.com/p/articles/mi_qn4156/is_20030831/ai_n12584542).  
Retrieved 12/06/07.

Sutton, A. (1998). From the Diligent to the Zany: Fifty years of textiles on show. In Harrod, T. & M. L. T. Bateman (Eds.), *50 Years of Craft* pp.38-47. London: Contemporary Applied Arts.

Swallow, S. & Thompson, A. P. (2005). Intelligent Textiles Ltd.  
*Presentation given at the Interrogating Fashion Research Cluster Symposium, 28-29 November 2005.* London College of Fashion, 29 November 2005.

Swann, P. (2007). A Perspective on Scottish Contemporary Crafts. In C. Baird & R. Watban (Eds.). *The Cutting Edge: Scotland's Contemporary Crafts*. Edinburgh: National Museums of Scotland. Pp14 – 25.

Technology Media. (2002). *Infineon Presents Enabling Technologies for "Smart Clothing"*. 26 April 2002.  
<http://www.infineon.com/cms/en/corporate/press/news/releases/2002/130751.html>. Retrieved 24/07/07.

technovelgy (2004). *Where Science Meets Fiction*.  
<http://www.technovelgy.com/>. Retrieved 26/03/06.

ten Hompel, S. (2002). In A. Fabian & S. ten Hompel. *A Field of Silver: Silver in a Field*. London: London Guildhall University.

Thomas, B., Grimmer, K., Zucco, J. & Milanese, S. (2002). Where Does the Mouse Go? An Investigation into the Placement of a Body-Attached

TouchPad Mouse for Wearable Computers. *Personal and Ubiquitous Computing* 6:97-112. London: Springer Verlag.

Thompson, P. (1997). The Potential for Oral History and Life Story: Research on the Crafts Movement. In T. Harrod (Ed.). *Obscure Objects of Desire: Reviewing the Crafts of the Twentieth Century*. Proceedings of the Crafts Council Conference University of East Anglia 10-12 January 1997. pp.42-50.

Tochon, F. (2000). When authentic experiences are “enminded” into disciplinary genres: crossing biographic and situated knowledge. *Learning and Instruction* 10: 331-59.

Toney, A., Mulley, B., Thomas, B. H. & Piekarski, W. (2002). Minimal Social Weight User Interactions for Wearable Computers in Business Suits. In *The Proceedings of the Sixth International Symposium for Wearable Computers*. Los Alamitos, CA: IEEE Computer Society

Tripathi, A. K. (2004). Technologically Mediated Lifeworld. *Ubiquity*, Vol. 5, Issue 41, Dec. 23-31, 2004, <http://www.acm.org/ubiquity/>. Retrieved 12/06/07.

Turner, P., Davenport, E., & Van De Walle, G. (2004). Familiarity as Changing Perception. *Proceedings European Conference on Cognitive Ergonomics* 12, York, September 2004.

Tuxill, (2007). A Reconceptualisation of Contemporary Sculptural Ceramics from a Post-Minimalist Perspective. In *Proceedings New Craft-Future Voices*, Dundee 4 – 6 July 2007. pp. 353-361.



University of California at Berkeley (2001). *Smart Dust*.  
<http://robotics.eecs.berkeley.edu/~pister/SmartDust/>. Retrieved 26/03/06.

University of the Arts, London College of Fashion. (n/d). *Major Projects; Dai Rees*. <http://www.fashion.arts.ac.uk/5192.htm>. Retrieved 24/07/07.

UTOPIA (2004). *UTOPIA: Usable Technology for Older People: inclusive and appropriate*. <http://www.computing.dundee.ac.uk/projects/utopia/>. Retrieved 21/09/07.

Valentine, L. (2005). *The Language of Interdisciplinary Teams*. Talk given at Educating the Innovator. Center for Contemporary Arts, Glasgow. 19 April 2005.

van de Bunt, G.G., Van Duijn, M.A.J., & Snijders, T.A.B. (1999). Friendship Networks Through Time: An Actor-Oriented Dynamic Statistical Network Model. *Computational & Mathematical Organization Theory*, Vol. 5, Issue 2, pp.167-192.

van Dijk, T. A. (1997). *Discourse as Social Interaction*. London: Sage Publications.

Veiteberg, J. (2005). *Craft in Transition*. Bergen National Academy of the Arts.

Verbeek, P. & Kockelkoren, P. (1997). Matter Matters. In *Eternally Yours*. Rotterdam:010 Publishers: pp. 100-131.

Vertu (2006). *Vertu*. <http://www.vertu.com/>. Retrieved 26/03/06.

Viseu, A. (2005). *Augmented Bodies: The visions and realities of wearable computers*. PhD Thesis. Department of Human Development and Applied Psychology, Ontario Institute for Studies in Education of the University of Toronto.

Wallace, J. (2004). Sometimes I Forget to Remember. In *Proceedings Challenging Craft International Conference 8-10 September 2004*, Gray's School of Art, Aberdeen.

Wallace, J. & Press, M. (2004). All This Useless Beauty. *Proceedings of Pixelraiders2*, Sheffield Hallam University, 6-8 April 2004.

Wallace, J., Dearden, A. & Fisher, T. (2005). The Value of Jewellery within the Conception, Design and Experience of Body Focused Digital Devices. In *Proceedings First International Wearable Futures Conference: Hybrid Culture in the Design and Development of Soft Technology*. 14 - 16 September 2005, University of Wales, Newport, Wales, UK.

van de Walle, G. (2005). *The Concept of Familiarisation: A Case Study in Everyday Computing*. Doctoral Thesis, Napier University, Edinburgh. Unpublished.

Walston, D. (2005). *Interaction Design in the Mobile Devices Industry*. Lecture delivered to Designing the Future Experiences of the Past: Convivio 4<sup>th</sup> international interaction design summer school, Timisoara, Romania. 12 August 2005.

Watier, K. (2002). *Xybernaut's Strategy for Creating Consumer Demand for wearable Computing Products*.

<http://www.watier.org/kathy/papers/xybernaut.doc>. Retrieved 26/03/06.

Watier, K. (2003). *Marketing Wearable Computers to Consumers: An Examination of Early Adopter Consumers' Feelings and Attitudes Toward Wearable Computers*. Masters thesis, Georgetown University.  
<http://www.watier.org/kathy/papers/Marketing%20Wearable%20Computers%20to%20Consumers.pdf>. Retrieved 26/03/06.

Watkins, D. (1999). *Design Sourcebook: Jewellery*. London: New Holland.

Weigert, A. J. (1981). *Sociology of Everyday Life*. New York: Longman Inc.

Weiser, M. (1991). The Computer for the 21<sup>st</sup> Century. *Scientific American*, 265, 3, 94-104.

Weiser, M. (1993). Some Computer Science Issues in Ubiquitous Computing. *Communications of the ACM (CACM)*, 36 (7): 74–83, July 1993.

Weiser, M. (1994). The World is not a Desktop. *interactions*; January 1994, pp. 7-8.

White, H. (2004). Authenticity, Anxiety, Autonomy. *Proceedings of Challenging Craft*, Robert Gordon University, Aberdeen, 8-10 September 2004. URL: <http://www.challengingcraft.org>.

White, H. & Steel, E. (2007). Agents of Change: From collection to connection. In *Proceedings New Craft – Future Voices International Conference*, pp 94-104. University of Dundee, Scotland, 04-06 July 2007.

- Wilson, C. (2000). Vicariousness and Authenticity. In K. Goldberg (Ed.). *The Robot in the Garden*. Cambridge, MA: MIT Press. pp. 64 – 88.
- Wilson, E. (2005). Fashion and Modernity. In C. Breward & C. Evans (Eds.). *Fashion and Modernity*. Oxford: Berg. pp 9 – 14.
- Wilson, S. (2004). Craft not Design! In Proceedings of the *Challenging Craft International Conference*. Gray's School of Art, Robert Gordon University, Aberdeen UK. 8-10 September 2004.
- Winograd, T. (2001a). Interaction Spaces for 21st Century Computing. In Carroll, J. (Ed.), *HCI in the New Millennium*. Addison Wesley.
- Winograd, T. (2001b). Architectures for Context. In T. P. Moran & P. Dourish (Eds.). *HCI Journal, Special Issue on Context-Aware Computing*. Vol. 16.
- Wong, K.J. & Arvind, D.K. (2005). Specknets: new challenges for wireless communication protocols. In *Proceedings Third International Conference on Information Technology and Applications, ICITA 2005*. Vol. 2, 4-7 July 2005. pp. 728 – 733.
- Wong, K. J., Arvind, D. K., Sharwood-Smith. N., & Smith, A. (2005). Specknet-based Responsive Environments. In *Proceedings of The IEEE International Symposium on Consumer Electronics*, pp 334-338, Macau, June 2005.
- Wood (20002). The Culture of Academic Rigour: does design research really need it? *The Design Journal* 3.1 (2000): 44 – 57.

Wright, P. H. (1982). Men's friendships, women's friendships and the alleged inferiority of the latter. *Sex Roles*. Vol. 8, 1-20.

Wright, P. & McCarthy, J. (Eds.). (2003). *Funology: From usability to user enjoyment*. Dordrecht: Kluwer.

Wypijewski, J. (Ed.). (1999). *Painting By Numbers: Komar and Melamid's scientific guide to art*. Berkeley: University of California Press.

XS Labs. (2007). *Extra-Soft Intro*. <http://www.xslabs.net/intro.html>. Retrieved 27 July 2007.

Xybernaut (2005). *Shaping the Mobile World*. <http://www.xybernaut.com/>. Retrieved 26/03/06.

Xybernaut (2007a). *Industry Solutions*. <http://www.xybernaut.com/itemDetail.asp?categoryID=5&itemID=2022>. Retrieved 13/06/07.

Xybernaut (2007b). *Atigo Product Platform*. <http://www.xybernaut.com/itemList.asp?categoryID=27>. Retrieved 15/06/06.

Young, J. (2001). *Heidegger's Philosophy of Art*. Cambridge: Cambridge University Press.

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## List of outputs – publications & exhibitions

### peer reviewed conference papers

*Reflection and Transparency: Rhythms in Experiences with Craft* Proceedings of New Craft – Future Voices, Dundee 4 – 6 July 2007.

*ensemble- a sound and jewellery work* extended exhibitions abstract in New Craft – Future Voices, Dundee 4 – 6 July 2007.

*ensemble: embodied experiences in a sound and jewellery installation (with Michael Smyth)* British Computer Society's CREATE 2007: Creative Inventions, Innovations and Everyday Designs in HCI Conference. London, June 2007.

*Plotting Affect and Premises for Use in Aesthetic Interaction Design: towards evaluation for the everyday* In People and Computers XX - Engage: Proceedings of HCI 2006, Vol.1. ISBN: 1846285887: Springer.

*Crafts Praxis for Critical Wearables Design* Wearable Futures Conference, University of Wales, Newport, Sept 2005.

*Crafts Praxis as a Design Resource* paper accepted for 5<sup>th</sup> Engineering, Product Design in Education Conference, Edinburgh, Sept 2005 .

*The Materiality of Wearable Computers – Craft and Authentic User Experience* Proceedings of Pixelraiders2, Sheffield Hallam University, 8-10 April 2004.

### other conference papers

*An Engagement with Emerging Technology* Association of Contemporary Jewellers, Carry the Can Conference, London July 2006.

## **journal papers**

*Peacocks and Wallflowers: the enactment of social visibility in wearables*  
Journal of Visual Communication, forthcoming 2008.

*Embracing the Gap – A New Ontology for Design?* Design Philosophy Papers,  
forthcoming, September 2007.

*Crafts Praxis for Critical Wearables Design* AI & Society Journal, Vol. 21 (4) 2007.

*The Materiality of Wearable Computers – Craft and Authentic User Experience* The  
Design Journal Volume 7, Issue 2. London: Ashgate Publishing. ISBN: 0 7546 4107  
4, June 2004.

## **position papers**

*Working with craftspeople – motivations, concepts and challenges* Designing the Not  
Quite Yet Workshop, HCI UK, London, Sept 2006.

*Multivalency and Socially Performative Meaning Making* Understanding and  
Designing for Aesthetic Experience Workshop, HCI UK Conference, Edinburgh Sept  
2005.

*Visualising Social Space with Networked Jewellery* Space, Spatiality and  
Technologies, Dec 2004; URL <http://www.spacespatiality.org>.

## **posters**

*Ensemble: AHRC Arts & Science Research Fellowship* shown at the 6<sup>th</sup> Speckled  
Computing Consortium Workshop. Edinburgh University. 12<sup>th</sup> September 2007.

with Frank Greig - *Speckled Jewellery Network: Application Development* shown at the 4<sup>th</sup> Speckled Computing Consortium Workshop. Edinburgh University, 15<sup>th</sup> September 2005.

*Visualising Social Space with Networked Jewellery* shown at the 3<sup>rd</sup> Speckled Computing Consortium Workshop. Edinburgh University, 20 May 2005.

*Smart Jewellery with ProSpeckz* shown at the 2<sup>nd</sup> Speckled Computing Consortium Workshop. Edinburgh University, 2<sup>nd</sup> September 2004.

*Complementing HCI* poster presented at eXchange, Napier University faculty research event, May 2004.

## articles

*Craft and Collaboration in the Field of Technology* Creative Choices (CC), a project of the Creative Knowledge Lab for Creative & Cultural Skills (CCS), [www.ccskills.org.uk](http://www.ccskills.org.uk), forthcoming 2008.

*Distribution – craft and speckled computing* invited article for *716 craft-design*, Craft Australia's monthly news online. April 2007.  
<http://www.craftaustralia.com.au/716/> and at  
<http://www.craftaustralia.com.au/research/20070327.php>

*An Engagement with Emerging Technology* article published in *Axis Dialogue* online journal January 2007. <http://www.axisweb.org/diHOME.aspx>. ISSN 1749-4990.

*Framing the Ambiguous Wearable* article accepted for publication in the online *Convivio Journal* Nov 2004; URL <http://www.convivionet.net>

*Art as Methodology* article accepted for publication in Ghaoui, C. (Ed). *Encyclopaedia of Human Computer Interaction*, forthcoming Spring 2005. Idea Group Inc. ISBN: 1-59140-562-9



*On Not Designing Tools* article accepted for publication in Ghaoui, C. (Ed).  
*Encyclopaedia of Human Computer Interaction*, forthcoming Spring 2005. Idea Group  
 Inc. ISBN: 1-59140-562-9

## presentations

- *Ensemble / Crafting Wearable Computing* Sheffield Hallam University, November 2007
- *Towards Materiality* Metropolitan Works, London, 11<sup>th</sup> Oct 2007
- *More Speckled Jewellery* given at the Sixth Speckled Computing Workshop, Edinburgh University, 6<sup>th</sup> Sept 2007
- *The Distributed Wearable* WearNow Symposium, Canberra, Australia, Feb 2007 (also panelist)
- *Seamfulness, Craft and Wearable Computing* The UpGrade!, New Media Scotland, Dundee Contemporary Arts, November 2006
- invited presenter, a-n Artists Newsletter Networking event, Stirling, Jan 2006
- representative, Interrogating Fashion Cluster at Design in the 21<sup>st</sup> Century Research Conference, Nov 2005
- invited speaker, Interrogating Fashion Cluster Symposium, ICA, London, Nov 2005
- *Networked Jewellery* Speckled Computing Arts Network Meeting, Edinburgh University, 29<sup>th</sup> June 2005.
- *Visualising Social Space with Networked Jewellery* 3<sup>rd</sup> Speckled Computing Consortium Workshop. Edinburgh University, 20 May 2005.
- *Contemporary Craft Practice, Emerging Technologies* Interrogating Fashion research cluster seminar, London College of Fashion, February 2005.
- *Crafting Wearable Computing* First Pervasive and Locative Arts Network (PLAN) workshop (PLAN), London ICA, 1-2 February 2005; URL <http://www.open-plan.org/>.
- *Oh, What a Piece of Work is Man* Creative Entrepreneurs Club Nanotechnology event, Glasgow Lighthouse, 31 January 2005. <http://www.creativeentrepreneurs.com/event.aspx?id=diary&eventid=58>
- report for the Association of Contemporary Jewellers on the Challenging Craft conference, *Findings* magazine, Dec 2004 (travel grant provided by ACJ).

- *Interactive Jewellery – a Collaboration* Creative Digital Interaction symposium, Edinburgh College of Art, 14<sup>th</sup> September 2004; URL <http://www.eca.ac.uk/tacitus/symposium.htm>.
- *A Design-Led Approach to Smart Jewellery with ProSpeckz* 2<sup>nd</sup> Speckled Computing Workshop, Edinburgh University, 2-3 September 2004; URL <http://www.specknet.org/publications/SpeckWorkshop.html>
- report on ISWC'02 published in *Interfaces*, magazine for the British HCI Group, No. 53, Winter 2002; URL <http://www.bcs-hci.org.uk/interfaces/interfaces53.pdf>.

### exhibitions and awards

- *Stille* shown at ElectroFringe, Newcastle, Australia, September 2007
- Access All Areas : *HUG*, a new interactive work commissioned by the Travelling Gallery, Scotland, Autumn 2007
- winner, Small Treasures Competition, PMC Foundation,
  - for creative use of precious metal clay, May 2007
- Visual Arts Scotland annual exhibition, Royal Scottish Academy, March 2007
- reSkin, ANU School of Art, Canberra, Jan 2007
- C.A.J, the Museum of Culture in Kyoto (Kyoto Bunka Hakubutsukan) – Dorothy Hogg and students, Jan 2007
- Children In Need, Festival of Trees – invited donation December 2006
- Scottish Arts Council Lottery Funding, interdisciplinary Professional Development award
  - towards attendance at reSkin Media Lab
- interactive demonstration, Fifth Workshop in Speckled Computing, Edinburgh Sept 2006
- interactive demonstration, Speckled Jewellery at Futuresonic, in collaboration with the Pervasive and Locative Arts Network (PLAN), Manchester, July 2006
- Arts and Humanities Research Council Arts and Science Fellowship recipient
  - project title '*ensemble*', start date April 2006
- interactive demonstration, Interrogating Fashion Research Cluster Symposium, ICA, London, Nov 2005
  - plus display, Royal College of Fashion, London, Nov 2005
- Scottish Gallery, Edinburgh – Flower Power, July 2005

- Children in Need exhibition, Aberdeen, June 2005
- Visual Arts Scotland annual exhibition, Royal Scottish Academy, Jan 2005
  - joint winner of the Scottish Gallery Award for Applied Arts
- interactive demonstration, Creative Digital Technology, Edinburgh College of Art, Sept 2004
- interactive demonstration, Second Workshop in Speckled computing, Edinburgh, Sept 2004
- ACJ travel award to attend Challenging Craft, Sept 2004
- Lesley Craze Gallery, London – Looking Over My Shoulder, Sept 2004
- ACJ's Jewellery Unlimited, Bristol, April 2004 (with catalogue)

**Table of reading, outputs and research activity**

year	reading	writing	research events
2002	<p>Attended ISWC, Seattle</p> <p>Wearable computing literature</p>		
2003	<p>Authenticity in marketing literature</p> <p>User centred design processes, incl. IDEO methods</p> <p>Eternally Yours – sustainable design and materials</p> <p>Csikszentmihalyi on meanings and objects</p> <p>Kalviainen on craft and authentic experience</p> <p>Rust on rigour in different disciplines</p> <p>Working through a methodology for the comfortBlanket &amp; issues with analysis</p> <p>Attended eCulture, Amsterdam</p> <p>Brenda Laurel – humanistic values in computer based production</p>		<p>Designing and producing the prototype representations of the comfortBlanket</p> <p>Oct 2003 – Sept 2005 - Production of enamel and mixed media jewellery</p>
2004	<p>Coyne, Winograd &amp; Flores and Ihde on phenomenology</p> <p>Verbeek on authenticity of materials and sustainable design</p> <p>Eldridge and Langer on philosophies of art</p> <p>Attended Pixelraiders</p> <p>Visiting residency at ECA –</p>	<p><b>The Materiality of Wearable Computers - Craft &amp; Authentic User Experience.</b> <i>Proceedings of Pixelraiders2.</i> – materiality, reappearance of the object in use (challenging transparency), towards meaningful objects as a response to consumer demands for authenticity, craft as a methodology</p>	<p>January 2004 - evaluation of the comfortBlanket</p> <p>January 2004 – introductory friendship group meeting and recruitment to the research</p> <p>January 2004 – introduction to the Speckled Computing Consortium, Scotland</p> <p>March 2004 - Collage activity</p>

	<p>working through materials towards novel UCD methods</p> <p>Attended Challenging Craft</p> <p>Anthony Dunne on critical interaction design</p> <p>Jayne Wallace's research statement</p> <p>Funology</p> <p>Augusto Boal on theatre of the oppressed and games for actors and non-actors</p> <p>Gaver et al on ambiguity</p> <p>SNA workshop at Napier</p> <p>Simmel and Ethington on social space and the everyday</p> <p>Goffman</p>	<p>for delivering authenticity, the user experience; familiarity in narrative provided by craft process – the comfortBlanket. (showed an interest in framing, although not realised at the time)</p> <p><b>Materiality of Wearable Computers - Craft &amp; Authentic User Experience.</b> <i>The Design Journal.</i> – to investigate the need for authentic experience in everyday life, evaluate crafts practice for its contribution to design and build processes; relationship between craft and product design, refining definitions of contemporary craft and a critical approach to design. Mentions new way of understanding the contemporary intuition of alienation as experienced through objects – towards a consideration of what makes agentive meaning making possible.</p>	<p>May 2004 – proposal to the Speckled Computing Consortium</p> <p>May – August 2004 - Build of the first set of networked jewellery</p> <p>June 2004 - Proxemics drama games</p> <p>September 2004 – demonstration of first iteration</p> <p>Oct 2004 - Social space questionnaire</p> <p>Dec 2004 - Self monitoring analysis and out of the box evaluation of the first set of jewellery</p>
<p><b>2005</b></p>	<p>Contributed to Pervasive and Locative Network, and Interrogating Fashion research clusters</p> <p>Dourish on embodied interaction Hutchins on distributed cognition</p> <p>Presence literature</p> <p>Valentine's presentation on interdisciplinary practice</p> <p>Latour on Actor Network Theory</p> <p>Jewellery presentations – Ruudt Peters, Cunningham, Cousens</p> <p>Carroll (Ed) – New Millenium in HCI</p> <p>Sengers and Gaver on critical technical practice; attended Manipulate Media workshop on performative methodology</p>	<p><b>Visualising Social Space with Networked Jewellery.</b> <i>Place, Spatiality and Technology</i> – visualisation and analysis of a specific social space via the networked jewellery, interaction with distributed systems; importance of the wider roles of jewellery; the algorithm from proxemics, introduction of the friendship group, speeding up and making visible the exchange o visual information in clothing and consumption; beyond traditional demographic segmentation; Grounded Theory and Social Network Analysis considered as tools for the research.</p>	<p>Interviews with makers</p> <p>January 2005 – redesign of the algorithm</p> <p>October 2005 – out of the box evaluation of the second iteration of jewellery</p> <p>November 2005 – museum evaluation of the jewellery</p>

	<p>Attended Convivio Interaction Design summer school</p> <p>Van Dijk (Ed) on discourse as social interaction</p> <p>Goffman</p> <p>Friendship and female discourse literature</p>	<p><b>Framing the Ambiguous Wearable.</b> <i>Convivio Online Journal.</i> – framing tactics, undecideables, crossing boundaries and the nature of ambiguity in design; working with Coyne’s framework; contemporary craft as a vehicle for ambiguity, some problems using contemporary craft</p> <p><b>Crafts Praxis for Critical Wearables Design.</b> In <i>Proceedings Wearable Futures Conference</i></p> <p><b>Crafts Praxis as a Design Resource.</b> In <i>Proceedings of the Engineering &amp; Product Design Education Conference</i></p> <p><b>Multivalency and Socially Performative Meaning Making.</b> Workshop paper presented at <i>Understanding and Designing for Aesthetic Experience, HCI 2005</i></p> <p><b>On Not Designing Tools, and Art as Methodology</b> In Ghaoui, C. (Ed.). <i>Encyclopedia of Human Computer Interaction</i> – complementing the paradigm of transparency with the obstinate object ready for personal meaning, introducing breakdown: art as a critical design process, visual perception being overtaken by plenary bodily perception, emotional design as a strand of pragmatism</p>	
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<p><b>2006</b></p>	<p>Goffman on forms of talk</p> <p>Dewey on art as experience</p> <p>Attended Think Tank, a European Initiative for the Applied Arts</p> <p>Watier and Viseu on wearables visions and actualities</p> <p>Attended ACJ's Carry the Can conference on ethics in jewellery practice</p> <p>Attended HCI UK, including Jude Kelly's keynote speech on commitment</p> <p>Innovative Craft talks in Edinburgh – Edmund de Waal and Jorunn Veiteberg</p> <p>[ran the AHRC project ensemble]</p>	<p><b>Plotting Affect and Premises for Use in Aesthetic Interaction Design: towards evaluation for the everyday.</b> <i>Proceedings of HCI UK.</i></p>	<p>January 2006 – post evaluation interviews</p> <p>April – December 2006 – AHRC Research Fellowship on ensemble project</p>
<p><b>2007</b></p>	<p>Attended reSkin, ANAT's wearables technology lab with a craft ethos</p> <p>Rahilly and Guignon on authenticity</p> <p>Craft literature</p>	<p><b>Distribution – craft and speckled computing.</b> In <i>716 craft-design</i>, Craft Australia</p> <p><b>An Engagement with Emerging Technology.</b> In <i>Axis Dialogue</i></p> <p><b>Reflection and Transparency: Rhythms in Experiences with Craft.</b> In <i>Proceedings New Craft – Future Voices International Conference</i></p>	<p>January – March 2007 – three months AHRC project dissemination period, including public installation</p> <p>Rewriting the thesis</p>

## A redesigned Social Distance Scale

### Appendix: Social Space Questionnaire for a Friendship Group

Your name:

#### Section I

For each of the other friends in the group, please indicate agreement with the statement by ticking the appropriate box:


	"I regularly ....."					
1	attend a club with					
2	share lifts with					
3	go for walks with					
4	knock on the door of					
5	invite round for coffee					
6	accept spare tickets from					
7	go on day trips with					
8	bump into in the street					
9	bump into at a mutual friend's					
10	bump into at events					
11	go shopping with					
12	am introduced to close family members of					
13	am introduced to visiting family members					
14	am introduced to other close friends					
15	am introduced to visiting friends					
16	enquire as to the health of					
17	visit at home on health related concerns					
18	visit in hospital					
19	recommend books to					
20	recommend musical events to					
21	recommend tradesmen to					
22	take up recommendations made by					
23	lend books to					
24	lend clothes to					
25	lend tools to					
26	borrow books from					
27	borrow clothes from					
28	borrow tools from					
29	telephone					
30	write to					
31	send birthday cards to					
32	send Christmas cards to					
33	send cards to without occasion					
34	send holiday postcards to					
35	pop a note through the door of					
36	take parcel deliveries for					
37	speak on the street with					
38	speak in a local shop with					
39	bring holiday souvenirs home for					
40	give Christmas gifts to					
41	give birthday gifts to					
42	holiday with					
43	work with					
44	share other mutual friends with					
45	admire the taste of					
46	admire the dress sense of					
47	admire the lifestyle of					
48	admire the outlook of					
49	admire the integrity of					
50	admire the politics of					
51	enjoy recommendations for events made by					
52	take up recommendations for tradesmen made by					
53	take up recommendations for other services made by					
54	admire a particular item of clothing of					
55	admire a piece of jewellery of					
56	have enjoyed gifts given by					
57	discuss politics with					
58	discuss local issues with					
59	discuss arts events with					
60	discuss books with					





Thank you. Please use this space to comment on any of these questions or your answers - for example, you may feel that bumping into someone in the street twice does not mean this happens 'regularly', or it may be that someone lives far enough away to affect whether or not you would 'pop over'. There may be other activities you feel are a part of your friendship that are missed out:


**Section 2**

Thank you. Please indicate in the next section the frequency with which you make contact with the others in the group:

	frequently	sometimes	occasionally	rarely
"I telephone..."				
				

	frequently	sometimes	occasionally	rarely
"I talk in the street with..."				
				

	frequently	sometimes	occasionally	rarely
"I pop over to the house of..."				
				

	frequently	sometimes	occasionally	rarely
"I email..."				
				

Thank you. Please use the space below to further describe any of the activities above. For example, it may be that email is something you never use, or you may wish to clarify what you consider to be 'frequent' etc:

**Thank you very much indeed for your time.**

**PRIVACY**

This process may begin to appear quite revealing, particularly if you are part of a smaller group being researched. None of your answers will be published or reproduced with reference to you, and no data or analyses of it will be passed on to any other member of the group by the researcher unless every individual expressly requests this.



Social space questionnaire notes*JP*

Lots of ticks indicate that JP engages in a wide range of types of interaction with all of her friends, both active and cultural (functional support and sharing ideologies). Encounters are of all types, spontaneous, pre-arranged and ad-hoc.

*Ch*

Prompted Ch to describe JP as her original friend in the group, who led her to meet the others. Her relationship with GMc is the other apparent one in the responses, and mostly culturally based, sharing high levels of visual awareness and a sense of taste – she admires a lot about GMc. Speaking in the street is not common within the area, but happens at sites which the women have occasion to travel to (eg Tesco's). A function of the through traffic of the area, the poor quality of local shops, and the availability of large stores about two miles away. Also differentiates between this group and others in the use of email, and in the contingent factor being in her leaving work, so she does not have access to a system anymore. She specifies both text and mobile use with JP.

*GMc*

As a newer member of the group, GMc doesn't share as many mutual friends outwith the group. In contrast to Ch's understanding of their relationship, she sees it as wholly metaphoric and culturally shared, not responding to any of the practical items for that association. She admires the lifestyles and outlooks of all the others, but not dress sense or politics, perhaps for different reasons. JP, in her responses on politics, thought she discussed this topic with everyone except GMc. She does return Ch's admiration of specific pieces of jewellery, and not clothing.

*J*

Again, ticks are mostly for JP, some for GMc, less for P and very few for Ch. Associations with JP are of all types, as are those with GMc, just fewer of them. J admires GMc's taste and dress sense (and doing this in retrospect, I know that GMc

would reciprocate that now, but it was not ticked then). While J has cultural associations with GMc and JP, they are constrained by her own choices on what is interesting (no art). Again, she would speak in the street or local shops with any of the others, but finds it just doesn't happen. In section two, on frequency she modifies this by saying it doesn't happen often but when it does, the encounter is significant ("long chat"). She doesn't pass P's house on her way anywhere, and so doesn't pop over; as GMc is relatively new to the group, she thinks it will happen, but hasn't yet.

*P*

Ticks almost all for JP, many for GMc, none for J, and only the club and lifts for Ch (which are connected). With GMc, encounters are of all types; spontaneous, ad hoc, and pre-arranged. They cover all topics and functional as well as cultural bases. P felt very uncomfortable with the notion of responding to the "admiration" items on expression ("I would feel hyper-critical and disloyal if I answered these questions"). She "would never pop over without an invitation", unless in an "emergency", and feels that the group is a contingent one for her, although it centres around her long standing association with JP, of 30 years. The newer relationship with GMc was quickly cemented through shared reference points to Norfolk and church life, and is promising also on these grounds. She says:

"The sample is not really a friendship group. We were thrown together by an interest in Pilates, and J has now withdrawn from that event. I have, however, been friendly with JP for around thirty years and thus she features strongly in this survey. Again, GMc has become more of a friend than J and Ch since we share a connection with Winterton-on-Sea."

Like Ch, she uses email with other groups, but not this one, because they are local. She uses the phone. P feels her friendships in this group are not intimate, and names another group with whom she associates more strongly.

## Self Monitoring Scale

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THE EVOLUTION OF SELF-MONITORING 179

**Table 13-1 The 18-Item Measure of Self-Monitoring**

1. I find it hard to imitate the behavior of other people. (F)
2. At parties and social gatherings, I do not attempt to do or say things that others will like. (F)
3. I can only argue for ideas which I already believe. (F)
4. I can make impromptu speeches even on topics about which I have almost no information. (T)
5. I guess I put on a show to impress or entertain others. (T)
6. I would probably make a good actor. (T)
7. In a group of people I am rarely the center of attention. (F)
8. In different situations and with different people, I often act like very different persons. (T)
9. I am not particularly good at making other people like me. (F)
10. I'm not always the person I appear to be. (T)
11. I would not change my opinions (or the way I do things) in order to please someone or win their favor. (F)
12. I have considered being an entertainer. (T)
13. I have never been good at games like charades or improvisational acting. (F)
14. I have trouble changing my behavior to suit different people and different situations. (F)
15. At a party I let others keep the jokes and stories going. (F)
16. I feel a bit awkward in company and do not show up quite as well as I should. (F)
17. I can look anyone in the eye and tell a lie with a straight face (if for a right end). (T)
18. I may deceive people by being friendly when I really dislike them. (T)

Keying is given by either T (true) or F (false) in parentheses following the items, with items keyed in the high self-monitoring direction.

This scale is to be found in Snyder, M. (1986). *The Psychology of Self-Monitoring*. New York: W H Freeman & Company, p.179.

The following excerpt is copied from the third page of the thirteen page transcript of the women's discussion while responding to the Self-Monitoring Scale.

(102) P: Making other people like you? Does that mean that you are trying to impress them or do they just like you? It doesn't mean that they just like you immediately, it means that you're having to put on a show or something

S: I'm not sure, I think em, when I looked at the questions like that as well, and I think if we just tick a box quickly and talk about the words afterwards, cos I'm going to write about this as a as a method in itself...if you see what I mean

J: I would probably make a good actor...I mean I have never in my life, but everybody tells me, ((xx)) oh you'd be a good actor, so I shall put yes

I put no

(108) G: Am I an entertainer...? (laughter)

JP/J: Yes yes!

GMc: I have never been good at games at charades

(111) JP: I am not good at making other people like me (laughter), are you on the same question?

GMc: ...changing my behaviour – do I? Do you?

Ch: well that should be yes then if you you're not particularly bothered...

JP: That should be a tick

J: I'm not the person I appear to be...Well we're all like that!

yeah

Ch: I've got crosses against everything!

(114) GMc: oo ah don't know, yes...I do

JP: I hate charades...is that a yes...I'm not good at it

## Social Network Diagrams

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### *Level of associations*

Longer-term friends seem to have a more realistic, or more balanced perception of the number of their associations. GMc perceives herself as having many associations with all of the others, but their perception is of about two thirds the number of associations. Ch, whose relations are constrained rather than supported by geographic contingencies, is the most accurate in assessing her own associations compared to the view of the rest of the group.

	Self perception of level of associations	Group perception of level of associations	average
Ch	60	58	59
P	62	82	72
J	57	75	66
JP	133	153	143
GMc	139	83	111

What do I want to show? The density of the group as a whole; the fact that JP is obviously the motivator for the group; the relative strength of the relationships.

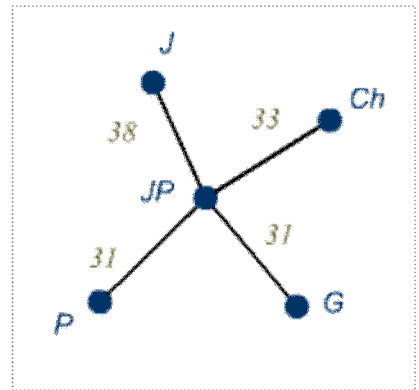
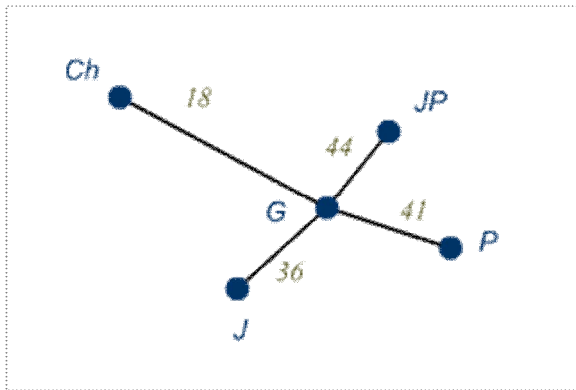
Within that it would be possible to draw graphs for each kind of encounter: spontaneous, ad-hoc and pre-arranged, and for each type of relation, functional and ideological.

	Ch	P	J	JP	GMc	
<b>Ch</b>		5	1	40	14	<i>60</i>
<b>P</b>	2		0	37	23	<i>62</i>
<b>J</b>	5	5		32	15	<i>57</i>
<b>JP</b>	33	31	38		31	<i>133</i>
<b>GMc</b>	18	41	36	44		<i>140</i>
	<i>58</i>	<i>82</i>	<i>75</i>	<i>153</i>	<i>83</i>	

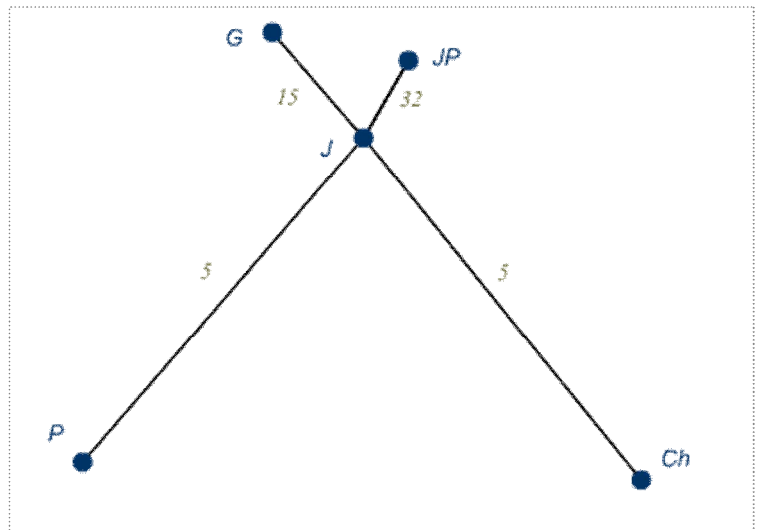
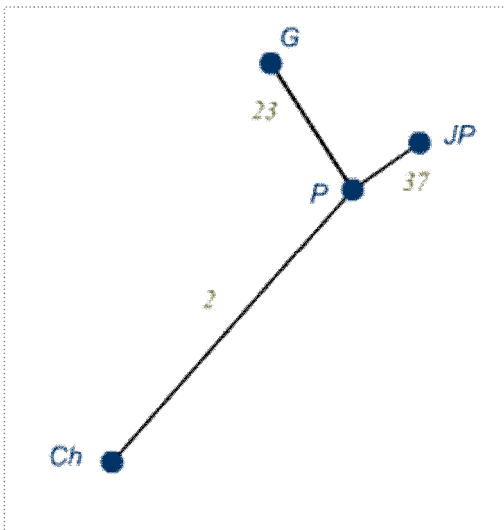
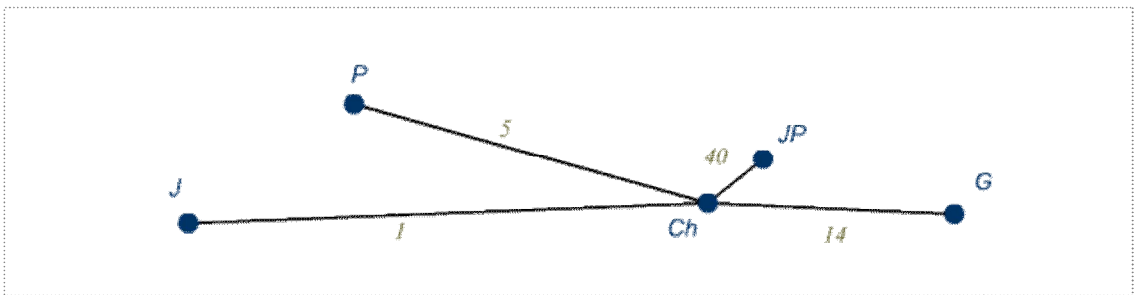
perceived associations (multiplicity)  
in this table, the bold names are the actors doing the ticking.

Combined multiplicity of associations between the women:

<i>association</i>	<i>sum</i>	<i>mean</i>	<i>placement</i>
JP : GMc	31 + 44	37.5	1
Ch : JP	40 + 33	36.5	2
JP : J	38 + 32	35	3
P : JP	37 + 31	34	4
P : GMc	23 + 41	32	5
J : GMc	15 + 36	25.5	6
Ch : GMc	14 + 18	16	7
P : Ch	2 + 5	6	8
J : Ch	5 + 1	3	9
J : P	5 + 0	2.5	10



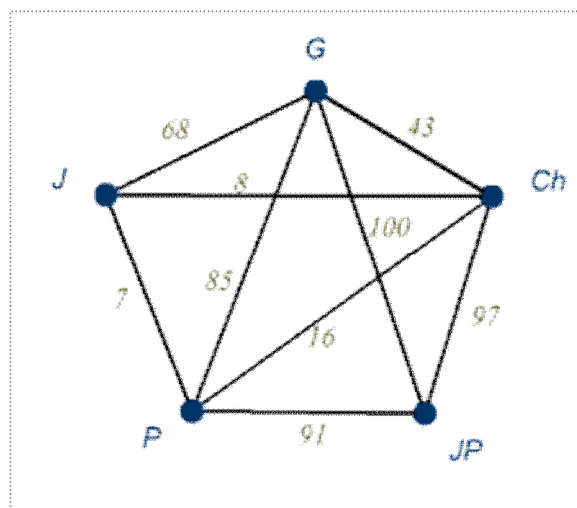
ego-centric stars  
GMc and JP



ego-centric stars  
Ch, P and J



The ego-centric diagrams above give the perception of each of the actors of the amount of interaction they have with the others. The relative length of the line within each diagram approximate the perceived geometric distance, while the value on each has been taken from the number of items checked by the central actor for each of those other individuals. To get an idea of the structure of the whole group will require a socio-centric diagram, below. Because of the nature of the definition of the group, this network has an inclusiveness of 1.0. That is, none of the actors is excluded.



socio-centric network  
valued graph

The density of a network is usually dependant on the number of actual associations compared to the possible number of associations, but this is also at the maximum of 1.0, for the reason above. However, density can also be used with valued graphs, as in this one, although how this should be done is still a matter of contention in the field (Scott 2000 pp.72-73). In

this case, the association with the highest mean score for multiplicity was taken to be the maximum weighting possible, and the others given a percentage relative to that, a method with a precedence in Barnes (1969). This was chosen as an appropriate approach simply because it was felt that the items on the scale had offered enough opportunity for the women to enumerate as many types of association that they would be able to recollect. Certainly, on anecdotal evidence from the women, the top scoring association did not leave much room for any more frequent, or any other types of encounter. JP, as the central motivator of the group, would simply not have the energy to maintain any higher a level of commitment to the group. Therefore, using this method, the density of the network is 0.61, and if a theoretical maximum were preferred, it would be 0.38.

Barnes, J.A. (1969). Graph theory and social networks: a technical comment on connectedness and connectivity. *Sociology*, 3(1969), 215-232.

Scott, J. (2000). *Social Network Analysis; a handbook*. London: Sage

## Pseudo code for the network interaction

---

### Algorithm MKII

(variables)

Nodes = number of pieces of jewellery in network

Outputs = number of output channels available, eg. LEDs, gestures or tones

(notes)

LEDs are three colour; at present there are eight LEDs on each node

(rules)

each node detects other nodes, and gets each other node ID and relative position

each newly identified node is allocated a certain number of outputs (LEDs) on the detecting node

the number of outputs is in ratio to the size of the network – for example, if there are two other nodes, the number of outputs will be divided by two; if there are four other nodes, the number of outputs will be divided by four, and so on. If there are fewer outputs than other nodes, then outputs may change colour and the output becomes shared.

outputs are on when the relevant other node is detected within range

the intensity of output brightness (size, volume) is dependant on proximity: at below 30cm, intensity is brightest; between 30 and 100cm, medium; and over 100cm, dim

if another node stays at the same proximal distance from the detecting node for longer than one minute, the event is recorded and saved

if the same node then leaves that proximal distance without residing in another proximal distance for one minute, and no other nodes are within range, that event is replayed until interrupted by a new event

new events are not reflected in the output immediately, only after the one minute lag

(thinking aloud)

This differs from the original algorithm in that the output LEDs are selected by the Speck rather than preset, allowing network extensibility. Obviously, meaning attached to the output may be badly affected by a high ratio of nodes to available output channels. It also requires an always on state, and so will pose problems for power.....more and more it looks like we should be designing a base for powering up – a jewellery case or something.....other solutions may include using lower power colour LEDs with colour filters over them as part of the jewellery. Other ideas include optical fibres to take light from a single LED to many parts of the jewellery piece, but this doesn't help with reading differentiated meaning into the output....

## Instructions to participants at the museum

---

to check: mobile reception  
what is the cafe like?

Royal Museum/Museum of Scotland  
evaluation session 21st November 2005

### Participants' notes

10am

All meet for a briefing session at the leather seats by the fish in the main hall (researchers and participants).

10.45 - 11.30am

first session in the Royal Museum

11.30 - 12noon

break and discussion

12.15 - 12.45pm

second session in the Museum of Scotland

1pm - 2pm

lunch and debrief

(other documents to prepare: researchers' notes, cards for enquirers, game outlines, questionnaires/core questions for discussion)

10am Briefing session

check list:

the jewellery works, and you can plug and unplug it

you know which core colour you are

you have a list of all participants' core colours

you have met your research buddy

you know where to start the session

you understand the broad outline of the session

you know what to do at the end of the session

you know how to contact Sarah at any time throughout the session

central meeting point ?

I allocate a briefing session -  
they write down?

10.30am each participant/research buddy pair leaves for their start points around the Museum

10.45am research buddies begin recording and participants begin the task as per instructions below

participants' instructions, Session 1, Royal Museum:

your goal is to find all the other participants while visiting the four given sections of the Royal Museum - Art & Industry Since 1850 (ground floor, map 21), European Art 1200-1800 (first floor, map 55), Modern Jewellery (first floor, map 47), and the Ivy Wu Gallery (second floor, map 76).

you may consult your flashing necklace as little or as often as you wish while you do this. It does not matter where the participants finally meet.

at any time you may leave the session without having to give a reason, in which case you should make your way to the main atrium as agreed in the briefing session.

you have a disposable camera with you for your own use, although photos may be used in analysis and for illustration of the research later on. You will not have to pay for development, and will receive the photos at the end of the research, but please save at least 12 shots for the next session.

your research buddy is with you for moral support (!) and to record how you use the flashing jewellery. While alone with your buddy, please think aloud to help us with our analysis.

when the whole group has come together, please make your way to the 'Soupson' cafe at the rear of the museum, where there will be a short questionnaire/interview/discussion.

if, at 11.30am, the whole group has not yet come together, please make your way anyway to Soupson.

participants' instructions, session 2, Museum of Scotland:

this time we will be playing a short competitive acquisition game in the Beginnings - Early People area of the new museum building.

acquisition game: your goal as a pair or individual is to collect as many of the named items below as possible, taking photos as proof, while not giving away their location to the other teams. When you have collected them all make your way back to the start location. The winners are the first team back with all items. All these items are within the Early People area - no need to wander into 'habitat'. Use the jewellery while you are playing to keep an eye open for the other teams.

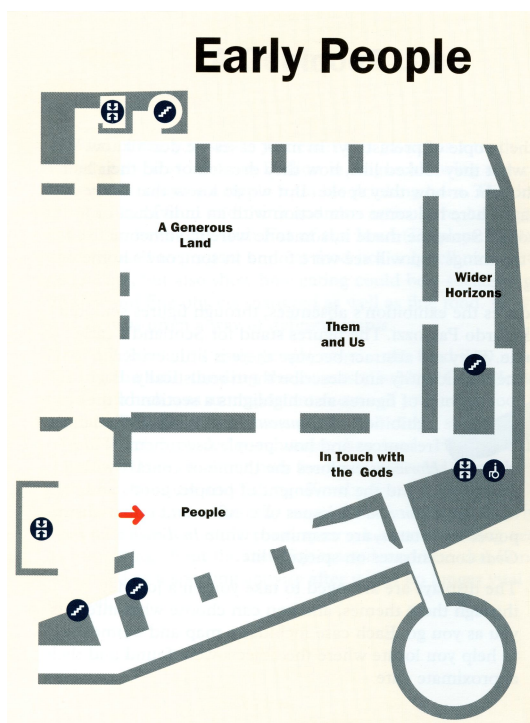
collect at least one of each of the following items:

- cauldron(s)
- 'Hearth' by Andy Goldsworthy
- woollen hood
- gold collar(s)
- Roman altar
- Ballachulish figure (goddess/bogwoman)
- a carynx
- Roman officer's memorial from Crammond

*Again, please discuss or  
write ahead for  
your research buddy.*



fold out museum map detailing exhibition spaces over three floors – spaces to be included in the activity were circled and identified before starting



example of a single floor map: this space was used in the second, competitive task in the newer adjoining Museum of Scotland



**devised method applied to GMc & A**

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g: ((oh there it goes it comes again)) <whispering> d'you want to try down?

\*: (00:36)((hands papers to alan)) (00:37)points downstairs with left hand

a: we ((go and)) try downstairs?

---

g: \4\ (00:43) ooh, 's amazing these would be -

\*: walking downstairs, looking at pendant (00:45)stops briefly and speaks to camera

a:

---

g: as a . as a social thing you know if they could be

\*: (00:46)starts walking downstairs again . stops and looks to right

a:

---

g: made a little bit more. reliable (00:52)and - th- they're not heavy .

\*: holding chain at right shoulder (00:52-00:54)adjusting chain around neck

a: yeah

---

*The conventions used were as follows:*

The symbol \* represents gestures and use of space by the actor directly above, usually the participant member of the friendship group

\*: holding chain at right shoulder

A hyphen indicates an incomplete word or utterance –

(00:52)and - th- they're not heavy .

A full stop shows a short pause (less than 0.5 seconds)

g: made a little bit more. reliable

A dash shows a longer pause

these would be -

Double parentheses indicates doubt about the content of the transcription; angled brackets give extra information

g: ((oh there it goes it comes again)) <whispering>

A double parentheses with double xx indicates un-interpretable utterances

g: (00:24)((xx)) tortoiseshell aswell in these things

An intake of breath is indicate by .hh

a: (00:34).hh ((right))it's pretty - shall

\4\ indicates a four second pause

---

The drawn lines separating lines of transcription mark the 'stave', and indicate that "the lines enclosed are to be read simultaneously (like a musical score)" (Coates 1996)

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## coding

	<b>Notions of art</b>
This began as meaning anything pointing to an aesthetic appreciation of the jewellery in terms of craft, and of its formal properties, which could include how the LEDs appeared as colourful or glowing in the dark, or the notion of the pendant as jewellery. As coding continued, it came to include any affective response to the jewellery.	
	<b>Notions of utility/reading information</b>
This category referred to the conceptualization of the LED readings as information, and the conceptualization of the pendants as tools, or useful in any way.	
	<b>Wearability</b>
Wearability covered anything ergonomic that could be seen in the gestures of the wearers, for example, if they felt the need to manipulate the connections or hold the pendant gingerly. It included the felt experience of wearing the neckpieces, their weight, position on the body, overt nature etc, and could encompass both utilitarian and aesthetic overviews.	
	<b>Blendings of art and utility</b>
It was hoped that there might be some blending of the aesthetic and functional understandings of the pieces as they were experienced throughout the morning, and this category was intended to allow any representations that combined existing mental models to create new ones, as had begun to occur in the out of the box briefing session, where one participant said the pendants “are what they are”.	
	<b>Doing the task</b>
This category was designed to encompass attention paid by the participants to the framing of the task itself, concerns with ‘doing it right’ and so on, in much the same way that researchers have found that respondents ‘do questionnaires’. Interestingly, it appeared in the coding that there was more than one way of attending to doing the task (what Tochon calls higher level premises for action? That is, contextual premises for action, rather than the subsumed procedural premises that are actually of interest). There was the concern to give the researcher what she wanted, or rather, what it was perceived as being that she wanted, that is, a constructive feedback on the pendants as products, and there were the procedures for coordinating action towards doing the task – that is, map reading, asking where they should go next and so on.	
	<b>Ambiguity</b>
The locus of ambiguity was of interest, as one of the notions behind authentic experience for creative engagement was that of ambiguity as a driver for shared conceptualization.	
initial codes	
	<b>Roles and performance</b>
Roles and performance referred primarily to the presentation of the self within the group, and noticeable techniques resulting in this presentation. It also came to include the taking on of roles for doing the task, especially in the turning to camera of some participants when giving their feedback (rather than thinking aloud – a difference between coping, care and reflection perhaps?).	

	<b>sharing displays</b>
Because shared conceptualization around artifacts was considered central to the thesis, and co-experience in the manner of Battarbee (2003), any evidence of using the pendants in this way was important, with particular emphasis on looking at peripheral awareness in the second team task.	
	<b>peripheral awareness</b>
Related to the last category, but used here to mean the awareness in the space of other participants through the use of incidental sound, glimpses through architectural openings, and even perhaps the awareness of the location of the lift, and the knowledge that one of the participants was in a position to have to use it, thus raising the possibility of her proximity.	
	<b>other information artifacts (eg maps, instructions etc)</b>
It became clear when transcribing the video data, that there were a great many artifacts being negotiated in accomplishing the task (both in doing the task, and in the situated quasi-authentic action) – these included a set of instructions, a museum map, and in the second task, a disposable camera. Added to this were the participants' own artifacts such as bags or glasses. How these were physically managed became of interest, in addition to the initial intuition that how they added to the participants' conceptualization of the space for interaction, would be important.	
	<b>researcher as actor</b>
Despite everybody's utmost professionalism, it was clear that the presence of the research buddies impacted on how meaning making was carried out, and on the taking of roles. In other words, no matter how 'objectively' the researchers conducted themselves, the women reacted to their presence and included them in some way in the network of social resources they understood to be at hand for conceptualization. As the analysis eventually showed, roles took many forms for many different contingent reasons, and changed when the premise or frame of the task was diminished. There was a definite change in tenor as regions of formality and informality were alternately performed.	
	<b>mixing information media (pendant and space)</b>
Hutchins and Palen saw space, artifacts and speech to be layered media for representation (1997), and this category emerged during the course of the coding to accommodate the interdependent use of gesture (space) and the artefact (pendant), for example, in using the pendant to point to a physical area of the museum building.	
	<b>merged identities</b>
This referred to the fusing of individuals' identities with their representation on the pendant display, that is the referring to a colour on the pendant face by the name of another member of the friendship group. Instead of making the inference explicit to others (that's red so that's Judy), the inference was sometimes implicit (there's Judy).	
	<b>exhibits</b>
In designing the tasks, it was expected that the women would find the exhibits in the museum galleries interesting, indeed, particular spaces were chosen for their contents based on the researcher's knowledge of the women's interests. It was hoped that the presence of the exhibits would create a quasi-authentic experience for the use of the jewellery, that is, that it would act to deflect attention from the jewellery as a communication device as might be expected in the 'real' and 'everyday' world.	
	<b>artefacts in roles</b>
When artifacts, including maps, exhibits, the pendants, glasses, were seen to be allocated a role, or to affect interaction to a great extent, this category was used. In	

actual fact, if I remember rightly, it wasn't used much, and quickly became superfluous, these issues taken care of by many of the other categories.

 : **presentation of the group as a unit**

Goffman's concept of the social unit as a team was key here. It was expected that the jewellery would draw attention to the wearers from other passers by, and cards with information pertaining to the research project were made available for the research buddies to hand out should the need arise. It was thought that as the group gathered, roles would be modified to take account of the balance of the group members present, and that a sense of collaboration and exclusivity would be made apparent.

 : **shared conceptualizing of the information display**

This category is related to but different from that of sharing the information displays. It explicitly looks for mental models in the discourse of the women, and their shared conceptualization through negotiation of concepts and blendings.

 : **switch between units of actors**

The women appeared to manage different roles in a very sophisticated manner between their familiar group members, and the researchers present (and even in their treatment of the researcher/camera as an entity in its own right). Noticeable switches in tenor of interaction were to be coded here. In fact, the category very soon came to mean the use of a differentiated role for interaction outwith the friendship group, that is, generally with the researchers (and so a recoding needs to be done to normalize this).

emergent codes

the evaluation of the jewellery in use in a public space, informed by the larger concepts of Actor Network Theory and performance. As a result of a first pass analysis based on the four themes of authenticity, wearability, craft, and the everyday, this is followed by a re-conceptualization of the central importance of the task-based evaluation itself. Consequently, the data captured in the earlier discovery stages with the participants is revealed as being of equal relevance, and the analysis of the networked jewellery as a context for authentic experience is extended to take account of this new approach, allowing the analysis to come closer to the 'everyday' aims of the research.

gill and alan session1\_03

- 00:00 g: look at that, there's some fantastic things here aren't there..? [points to cabinet with whole arm movement]
- 00:04 a: aye, that's beautiful isn't it
- 00:04 g: absolutely fantastic
- 00:06 a: don't make em like that any more
- 00:06 g: Sarah should come and see the metal work up here...is that mother of pearl [approaching case]. 'tis isn't it
- 00:11 a: that's probably ivory or bone or
- 00:14 g: yes I'm a cellist and I've got an ivory end to me bow [holds left hand out at hip height towards alan, fingers curled up slightly, palm upwards, moves it up and down slightly] ivory and mother of pearl [moves hand towards the case]
- 00:19 a: ohhh..
- 00:20 g: which is all illegal now of course [moves hand back down to side]. you can get tortoiseshell aswell..there could be tortoiseshell aswell in thee things..they're gorgoeous! [hand back up to glass of case] ...[turns] hmm, right [walks away]..what are we looking for? we can't find anybody..do you want to wal..
- 00:34 a: do you want to try downstairs?
- 00:43 g: ooh, it is amazing, [walking downstairs, looking at pendant] these would be..[stops briefly and speaks to camera] as a social thing, you know, if they could be made a little bit more reliable.[a: yeah]...and [holding chain at right shoulder] they're, they're not heavy..but it's sort of..needs to be more user friendly [stops at landing on stair] I suppose a smaller one would be quite good wouldn't it [adjusting cable, which her arm seems to be through, and leaving the cable loose again]... [lifts cable to look down at pendant face].. have a tiara..
- 00:55 a: uh, it's on..
- 01:12 g: it's, ooh, look at that! [turns to look back up stairs] ..that's, um you see [all to self, unformed sounds]
- 01:20 g: [walking down stairs again] well, it's not causing any great..
- 01:22 a: ohp, oop..is anything happening now, cos

## Transcriptions used in the text

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Chapter Six

6.7.1 (i)

participant	colour ID	buddy
J	white	Ce
JP	blue	Je
Ch	red	M, Si
P	light green	Ca
GMc	dark green	Al

friends' aliases, colour IDs and  
corresponding research buddies

### Segment 1

P: (210) so, is its main function a piece of jewellery or...is it...a useful item...they're going to ask aren't they, what are you using it for...

S: what do you think?

P: (211) at the moment I would say a piece of jewellery, because I mean it is very attractive isn't it, these lights change and...

Ch: (213) a useful piece of jewellery

P: mmm

Ch: (213) that's what I would say, cos its like nothing like anything else, so you could call it useful, because it would have to be useful otherwise there's no point in having it

informal evaluation, Ch's house

## **Segment 2**

GMc: I liked them as interesting beautiful objects actually, they're lovely, and they have uses too. I like things like that, quite different, and I liked all the different shapes, and that it was like a scarf.

GMc: It did feel like I was wearing something special.

GMc: It stands on its own as it is, which is lovely – the lights are very attractive.

debriefing interview; GMc

## **Segment 3**

JP: and are these formica and resin or something

S: yeah, there's no resin, there's formica and perspex



JP: no resin

S: the formica's brown and used back to front, and the others...

?: I didn't know you could still get formica

S: yeah...

Ch: all these things are coming back, all these linos and things are coming back, all these sorts of things

informal evaluation, Ch's house

#### **Segment 4**

P: [walking along the corridor at top of stairs, holding pendant at 45 degrees in front of body] ..see when she go...oh she's gone again [changes direction] so I'm going to go down here maybe [points papers towards lower stairs]

Ch: yup

P: [stopping at top of stairs] of course now she's not coming on either! [small laugh]..she's gone! [begins to walk down stairs]

P: [a fair pace going down the stairs with occasional looks up into the gallery space/stairwell; turns corner on stair] ah yes she's coming back

Ch: oh aye

P: oh here she is, hi Judy [raises papers in direction of Judy, raises level of voice]..I found you!

J: hello!

P task 1, movie 08

### **Segment 5**

?: they're all different

S: there are differences, they're all a wee bit different

J: (130) 'cos I've got more chain, and you've got more wood

J: yours is very similar to Ps

JP: yes yes

P: it's not really

?: ah but no you haven't got the chain

JP: you've got chain also

J: not as much as me

JP: no you have got a lot of chain

informal evaluation, Ch's house

### **Segment 6**

S: and, so basically I just want to get an initial response

Ch: oh wow!

(laughter)

J: oh golly, look at that!

Ch: that's fab, look at it, very lovely isn't it

J: oh Sarah, amazing

?: do you know that's lovely

informal evaluation, Ch's house

### **Segment 7**

Ch: (311) I like the tulips, I don't know if they're supposed to be tulips, but that's what...

Ch: ...but they're nice feely touchy...

JP: yes...they are

J: but I was looking at the side, I like that you know, all the colours...

informal evaluation, Ch's house

### **Segment 8**

JP: [pouring tea for self] I think I must basically be a child at heart, because [smiling as others respond with small laughs] I naturally became quite excited, you know [including more of the others using eye contact]...as if...[] ooh, somebody's here!!!

Ch: well I was too!

JP: .....[retelling own thoughts] ooh, somebody's here!!!

?: yes...

group discussion, end of museum session

## Segment 9

GMc: yes, well, that's oh, they're lovely in this light aren't they

J: oh they are yeah [moving backwards, hand cupped below pendant, palm to the side and up]...let's go further away again...

GMc: and what do you see on the side?..do you think the side should have as much relevance as the front? it should shouldn't it, the whole thing...[tilting pendant from side to side]

AI: yeh I see what you mean

GMc: sort of three hundred and sixty degrees...oh look! look! [holding back of her pendant outwards]..

## Segment 10

GMc: ooh, it is amazing, [walking downstairs, looking at pendant] these would be..[stops briefly and speaks to camera] as a social thing, you know, if they could be made a little bit more reliable.[Al: yeah]...and [holding chain at right shoulder] they're, they're not heavy..but it's sort of..needs to be more user friendly [stops at landing on stair] I suppose a smaller one would be quite good wouldn't it [adjusting cable, which her arm seems to be through, and leaving the cable loose again]... [lifts cable to look down at pendant face]...have a tiara..!

GMc and Al task1 movie 03

## Segment 11

P: (337) it would be quite useful for a deaf person living in a flat, where instead of you know, stand at the door and say its so and so...providing you're wearing one of these, and if she's got one hanging inside her door, she would be able..((xx))

JP: yeah, and if she knows the colour...

JP: (339) yeah that would be a good application wouldn't it

Ch: it would be

GMc: (340) yes, you could do wall hangings, yes, wall hangings

P: (341) you would assume it would still need to be decorative like that too, it would be good – by the door...

JP: and if it's someone you don't want to see, you can pretend you're out!

[laughter]

informal evaluation, Ch's house

## Segment 12

J: this could be her [looks up into gallery space]...yes but I [both move off together] don't know where she is...[stops to look in another direction, and speaks as she moves towards P again] she's obviously not terribly close by [looks through gallery doors with P], well shall we [moving back again] wander back...it's very light that way isn't it [moves away from brightly lit space, walks while consulting pendant]...so J has now disappeared from view...

P: I think she's gone again

JP: [looking down and up] still Ch's flashing...I suppose we could cheat and go near the um [to Je] lifts [small shared laugh]...oh [rounding a corner and turning to Je] the red is flashing very brilliantly at the moment...she must be very...very close by [Je maneuvers herself for a better shot]...[JP walking briskly, looking around, glancing down at pendant, always holding pendant]..[JP looks down a level as she walks past a railing]

Je: she may not be on this floor...

JP: no, she may not! [looking at pendant] in that case it's signaling from quite a distance...away...

JP task 1 movie 02

## Segment 13

Si focuses up to second floor through stairs, and back to pendant]

Ch: I knew she must be up there [raises loosely pointing hand and lowers it again, orienting face to Si and shaking head slightly while speaking]

Si: yeh, yeh

Ch: on the first floor...and I kept getting [pointing down at pendant and lowering gaze, moving pointing finger swiftly back and forth above pendant face] you know....

Si: yeah

Ch: [looking to the right] that's super...

Si: yeah, it's interesting though, you know, when we're here...by the stairway or in the balcony bit...

Ch: [turning to face Si, overlapping 'stairway'] yep

Si: yueh, yeh

Ch: that's right, so it [points loosely down and swiftly up again] you know [points down again and in a continuous sweeping movement, back up to the stairs] obviously underneath the balcony [hand still raised towards stairs] you're still getting it [faces Si and lowers arm]

Ch task 1 movie 02

**Segment 14**

GMc: I like things like that anyway, quite different; I doubt if some other people like things like that though, like P....

GMc: I had a positive view of it anyway – very interesting and innovative, like all the new music, isn't it?

GMc: It stands on its own as it is which is lovely – the lights are very attractive – but without any information, they might become 'seasonal'!!

GMc debriefing interview

## Segment 15

J: so we found everybody then

JP: we found everyone yes

J: ok [moving towards stair down] so we go downstairs

JP: that's us gosh

J: yes

[shared small laugh]

JP: [gesturing as she speaks, towards J, with arms] well I . I had great lights flashing but couldn't see anyone but then with P- she was- we were almost upon each other



J: [turning to face JP for answer while walking downstairs] uhuh [eye contact] yeess..have you been upstairs all the time? [gestures upstairs holding her specks]

JP: no we've been up and down over two floors [using arm moving strongly to show bodily up and down]

J: [concurrs with mirror body movement of arm down] ahh...no, we lost you, we lost you at one stage

JP: yes

GMc: ITV's coming down the stairs!

[shared laughter]

J task 1 movie 04

## **Segment 16**

GMc: ...he was nice! At first, I thought, ooh, what are we going to talk about – I kept trying to find out exactly what he did, you know? But he was very quiet, or at least, he was with me..

GMc: ...he understood what it all was...he was quietly assertive!

GMc:...and he said the right things! You know, when I saw that spider and said, oh no we can't go in here!, he said, AAAHH! [joke scream]

debriefing interview, GMc

## Segment 17

GMc: [...]...it, do you know it really does seem to depend on what light we're in doesn't it?

(05:50)

Ce: it makes a difference

GMc: yes it makes a huge difference

Ce: yes I think so as well yes

J: you see I've green but I think that [pointing to led patch on pendant face]

Ce: ooh! It's just suddenly come on!

GMc: oh there you go!! look! there, ooh that was it, oh look, I've obviously come into your exact range [also pointing]

J: into your....yes...

Ce: [over others] it's working, it's working...into your exact.....range...[on own now] exactly, and it'll be the pillars that are, em...or something like that, yes?yes?

GMc: yes, yes

Ce: or something, I dunno...

GMc: that looks lovely...actually, they're lovely in this light aren't they

J: oh, they are

Ce: yes actually I think they look gorgeous

J: let's just go further away...[walks along corridor, with her back to GMc]

GMc: what do you see on the side? do you think the side should (?)

J task 1

### **Segment 18**

P: I had to be within this distance of her [gesturing with arm to JP while turned to Ca], in clear view of her anyway, before the light came flashing on...

JP: [looking up from pendant as she nears a corner]...I'm flashing green..[sees P...smiles]..I'm flashing green, we've found P again [turns with a comedy smile to camera while holding pendant slightly to face camera also]...and it started to flash before I did see her, so [addressed definitely to camera rather than Je, then turns back to face P], it indicated that P was close by [to camera and then to P again; stops to listen to P]

JP task1 movies 01

### **Segment 19**

Ch: excellent....so, um is she coming? [raised volume to reach others out of shot] where's J now? [looks to pendant, points to led] I've got J [looks to SI]..one two th- [waving pointing finger across face of pendant]

M: [overlapping from 'th'] have you got the full set?

Ch: well, no [opens fingers of right hand palm upwards, above and to the side of the pendant] the white's not there...[points to a specific area on the pendant and repeats open hand gesture]

M: [overlapping second open hand gesture] ahhh [rising and falling intonation]

Si: what's the um, that orange is that just an on...?

Ch: bringing hand in to point again with forefinger] this one? is just on all the time..

Si: ah yeh

Ch task 1 movie 02

## Segment 20

J: you know it's quite amazing, no-one has stopped us

JP: you know I was just saying that to Je

J: no-one

JP: a lot of these young teenage girls upstairs in the jewellery [stopping briefly to indicate upstairs with arm movement]...(?)...[J mirrors brief stop, and turns slightly towards JP]

Ch: [over M] they all seem to be doing they're own thing

J: yes

JP: ...but no-one asked...

J: but you know what I found amazing was no-one stopped us to ask us what they are

Ca: well, maybe they're too polite [small laugh]

Ce: yes, British reserve, yes, yes, if we were in Italy they'd be all pestering you, asking....

J task 1

### **Segment 21**

Ch: what a lovely place to do it in though - this has been lovely!

JP: well it was particularly good in the dark [gesturing with arm roughly in direction of back stairs] the colours were very very bright

?: yes yes very bright it was good

group discussion, end of museum evaluation

### **Segment 22**

GMc: [...]. [walking towards brighter area] now I wonder if it'll go fainter [takes hold of swinging pendant]

Al: 's getting a bit bright

GMc: there! [stops in doorway] maybe 'cos the facing's white [describes oval over the pendant with finger] or pale...when you're in the light...natural light...couldn't be much more natural light than this could it

Al: yeah

GMc task 1 movie 02

### Segment 23

JP: [looking down and up] still Ch's flashing...I suppose we could cheat and go near the um [to Je] lifts [small shared laugh]..oh [rounding a corner and turning to Je] the red is flashing very brilliantly at the moment...she must be very..very close by [Je maneuvers herself for a better shot]....[JP walking briskly, looking around, glancing down at pendant, always holding pendant]...[JP looks down a level as she walks past a railing]

Je: she may not be on this floor...

JP: no, she may not! [looking at pendant] in that case it's signaling from quite a distance..away..[Je: mm] the red colour [walking and looking round corners]...we've lost J completely [coming out into main atrium space]...I wonder if we should try down a floor then? [looking at map again]...shall we try...we're now on the second floor..[moves around, towards balcony, lowers map, raises pendant, walks along]

JP task 1 movie 02

### Segment 24

?: go behind that door, and that might be

?: I wonder where she is, yoo hoo!

?: if she went away, you know, if she went out the front door, it would stop

?: go out the front door!!

?: she's away

(laughter)

?: she's still flashing and she's out the front door!

?: so it's quite a wide range then

informal evaluation, Ch's house

### **Segment 25**

P: yes, you don't get each other round corners but [moves arm up and down]  
you get each other vertically

J: yes but on the second occasion I was getting you I was getting you  
[nodding to emphasise different take]

P: round the corner...

J: yes..

P task 1 movie 14

### **Segment 26**

P: [flapping papers up and down briskly and orienting to GMc?] it worked.. it's very good working vertically isn't it? [looks right up again]

GMc: it is isn't it yes its lovely...lovely place, I haven't been here for ages

P: hmm? [looks back at GMc]

GMc: lovely place..

P: I love the china [raising hand slightly] I wouldn't mind staying there to look at it [grinning]..[looking back to display] she's obviously coming now...oh no, [looking up] is she..(?)

P and Ca session1\_12

## **Segment 27**

M: if you spot anything you want to stop and have a look at just let, let me know

Ch: mhmm, will do, yup

M: [overlap with 'yup'] cos I end up stopping at things I like [shared laughter]

Ch: [overlapping with laughter] well, please do, oh, [looking to left] look at that, that's fab

M: [overlapping with 'that's fab'] look at . that's Elton yep [turns chair to left, Ch smiling] look at that

Ch: that's fantastic

M: yehh [moves chair slowly on]



Ch: yep [camera takes in pink Elvis suit]...that's good [looks down at pendant]  
excellent, ohp, we've got the blue and the, oh no the green's gone...[turning  
head back towards Si] we've got blue

GMc and AI session1\_03

## Segment 28

GMc: look at that, there's some fantastic things here aren't there..? [points to  
cabinet with whole arm movement]

AI: aye, that's beautiful isn't it

GMc: absolutely fantastic

AI: don't make 'em like that any more

GMc: S should come and see the metal work up here...is that mother of pearl  
[approaching case]...'tis isn't it

AI; that's probably ivory or bone or

GMc: yes I'm a cellist and I've got an ivory end to me bow [holds left hand out  
at hip height towards AI, fingers curled up slightly, palm upwards, moves it up  
and down slightly] ivory and mother of pearl [moves hand towards the case]

AI: ohhh...

GMc: which is all illegal now of course [moves hand back down to side]..you  
can get tortoiseshell as well...there could be tortoiseshell as well in thee  
things...they're gorgeous!

GMc and AI session1\_03

## Segment 29

Ce: ...it's absolutely fascinating, fascinating gallery, um...I love it, I think it's full of the most extraordinary things...

[J reading pendant face meanwhile, walking away, looking at passing cases]

J: [smiling, direct to Ce; exaggerating northern accent] shoes, ah love shoes!

Ce: [small laughter]...aren't they amazing! absolutely amazing...

J: [smile fading].....we were at the V and A in London not that long ago, and it was the fashion, oh, and it was amazing

Ce: that is the most extraordinary collection, [j stopping by case, referring to museum map], oh, this is a LOVELY case, isn't it

J: [holding pendant, looking in case] (quietly) gosh, look at that [looks down at pendant]

Ce: by Philip Eglin I think they are, these pieces [as J looks down to read pendant]

J and Ce session 1

## Segment 30

J: [holding onto her chain at chest height, pen in same hand] I think this... is this is..perhaps..quite good [very slightly pulling the chain in a slow rhythm matching her speech rhythm for emphasis]..in that I forgot I had it on, [puts right hand out palm down in a small emphatic gesture marking the pause]

GMc: yes I did too...

S: mmm...did you...

J: [moves hand back to hold chain lightly with finger and thumb]..I felt it was very comfortable and it was only [moving hand off chain again, leans forward into story] when Ce kept saying 'check to see if there's anybody around!' [gets a laugh]..I thought...[shakes head with an exaggerated 'O' shape mouth] oh!...

JP & J, end of second task

### **Segment 31**

P: now, roman altar

Ca: well, all the roman stuff is through this way [points to right while pushing Ch]

Si: oh. are you picking up on anyone?

Ca: oh...yeah..can we check the lights..

Si: oh crikey! they're all around us!

Ch: they're all about..yeh, JP's right behind us, I can see them..oh we're back here again [looks up]

Ca: uhuh, yeah we're ..(?)

Ch: right

Ca: and..there's more roman stuff

Ch: so, we're looking for the roman altar..[looking at instructions]

Ch and P Task 2 movie 09

**Segment 32**

P: I don't know what it is...

attendant: I'll take you to it

P: thank you

attendant:...Romans...it was a a eh war trumpet [holds hands up level with mouth, apart from each other]

Si: ah right, uhuh

attendant: and it was eh, the one we've got was in the forth area [swings arms to the left to indicate direction they should go]

Ch and P Task 2 movie 06

**Segment 33**

Ch: [winding camera on] yes..that must be eh, GMc

P: right come on, we haven't found anything here(!) [moving swiftly away from the display, laughs]

Si: [laughing] heheheyeah

P: [waiting for others, and orients whole body to Ch and others] it's like being back at school [smiles, turns to go on]

Ch and P Task 2 movie 10

**Segment 34**

Ch: ah, there's JP [looking down again]..yes, there's JP..[and looks left again]

Si: she's suddenly appeared

Ch: and GMc [smiles, then looks down], yes

Ch: yes, we can see them,...

Ch: yes, they flashed [pointing to pendant face using pen], yep, they're flashing

Si: maybe we can go this way

Ch: [looks left and laughs towards that direction]

Si: [laughs aloud too]

Ch: are we going that way then?! [points ahead with pen]

## Post evaluation feedback prompt questions

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What did you make of the jewellery overall? How do you think of it now?

How did it feel to wear on the body and in the hand?

How did it feel to wear as a device to be used?

What did you feel about wearing it in public?

Can you imagine wearing it in your normal life?

Would it suit how you normally dress, or perhaps particular occasions?

What you change about it to make it fit into the way you dress?

What do you feel the jewellery communicates? With whom?

How did you feel you worked with your buddy at the museum?

How did it feel when you met with other members of the group again?

How do you think your relationship with the researcher has evolved throughout the last couple of years?

What did you perceive as being the main aims at the museum?

Did you perceive aims in the meeting at Ch's house?

Were you aware of 'wearable computing' at the start of the research?

In what ways are you aware of it now?

What has contributed to this change in awareness if any?

What do you think about wearable computing?

What do you think about the idea of ubiquitous, or networked computing?

Would you describe yourself as visually motivated? Logical?

What was your experience of the second, competitive task at the museum? How did you feel your team communicated and collaborated?

How did you feel the social situation to be different once the tasks at the museum had been done?

What understandings of the jewellery do you think you brought with you from the session at Ch's house to the museum?

Would you prefer the jewellery to be more useful or less?

If you were to own a piece like this, how often do you think you would make use of its function?

Can you imagine wearing it switched just for the lights? Or wearing it switched off?