Digital jewellery as experience

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Abstract

When designing interactive devices or environments the role of human experience is crucial to the depth and sensitivity of that interaction. Increasing attention is being paid within the fields of HCI and Interaction Design to the importance of human experience, how we can learn to gain an understanding of experience and how to use this to inform the creation of environments for positive technological interactions. As computing and technology become more ubiquitous in their conception, designers are looking for methods of bridging technology with the human form.

In this chapter we explore our different perspectives as a contemporary jeweller and an interaction designer focusing on a framework, which has supported and enabled a dialogue of our respective and collective understandings of experience in the area of wearable interactive devices and contemporary jewellery. We use the framework to explore our experience of existing designs of contemporary jewellery and also of interactive jewellery proposals, which lead us to suggest possible ways forward in the design of wearable artefacts, which can truly be described as digital jewellery.

1 Introduction

Designing for the full range of human experience may well be the theme for the next generation of discourse about software design. (Winograd 1996, p. xix)

The design of any interactive device requires sensitivity to multiple disciplines and typically involves input from different people with a range of training and expertise. Psychologists, sociologists, industrial designers, artists and

communications theorists are already widely recognised as important contributors to interactive systems design. As our devices become smaller and lighter, they are increasingly worn and carried, as well as being used. Additionally, there is a growing interest within HCI in emotional aspects of our relationships with technology (Monk et al. 2002; Blythe et al. 2003; Norman 2004; Taylor and Harper 2002). These trends suggest the need for a dialogue with disciplines such as jewellery design, which is centrally concerned with the design of objects that are worn, and with issues of the emotional meanings that we attach to physical objects.

In this chapter, from our different perspectives as a contemporary jeweller and an interaction designer, we explore what our disciplines can learn from each other, and reflect on a framework that has supported our mutual understandings of experience. Based on our investigations we suggest some routes forward to digital artefacts that can truly qualify as jewellery.

In the next section, we present a brief introduction to contemporary jewellery, illustrate how contemporary jewellers seek to imbue objects with emotional meaning and use these objects to communicate with wearers and viewers. This understanding of jewellery can be related to design for experience. In Section 3, we examine Wright, McCarthy and Meekison's (2003) proposed framework for the analysis of experience, and relate it to examples of contemporary jewellery. In Section 4, we examine some recent projects and proposals that explore the concept of digital jewellery, based on the framework, and discuss the successes and limitations of such work. We are concerned with the potential of these projects to establish the emotional quality of relationship between a wearer and an object that we would expect from great jewellery. In Section 5, we examine a number of efforts that indicate possible routes towards the realisation of digital artefacts that truly qualify as jewellery. From our experience, we conclude that the proposed framework is a valuable tool to enable a dialogue between HCI and jewellery, and to support design that can surpass user expectations and create opportunities for rich experience.

2 An introduction to contemporary jewellery

2.1 Beyond jewellery as social signifier

In the context of studies of Upper Palaeolithic societies White observes:

What people wear, and what they do to and with their bodies in general, forms an important part of the flow of information – establishing, modifying, and commenting on major social categories. (White 2002)

Traditionally jewellery has been used to symbolise wealth, social status and cultural positioning, and has focused on the use of rare materials. In the past century, the power an object has, especially one worn on the body, to exemplify and express broader concepts, has advanced jewellery beyond this traditional role.

In the post-war period, the modernist movement, with its promotion of technology, machine industrialisation and a distinct aesthetic, led many jewellers to reappraise the methods and materials they used. The *New Jewellery* movement heralded a radical departure in the period from the mid 1960s to the early 1970s. Emmy Van Leersum and Gijs Bakker went far to establish the basis of how we perceive the breadth of the potential role of jewellery today. They protested against the use of expensive materials, the limited translation of the meanings jewellery could represent and conservatism in the form and placement on the body. Their work deliberately questioned the social and cultural politics of jewellery consumption and pushed the perimeters of what is accepted as jewellery. The influences of an industrial aesthetic are clear; the pieces reflect a feeling of the "future", technological accomplishment and possibility (Figure 1). The forms were minimal and the scale was often challenging.

Fig. 1. *Large Collar* 1967. Aluminium. Gijs Bakker. From http://www.gijsbakker.com

Following the work of these early pioneers, public conception of jewellery has moved significantly in the past four decades, accepting a much broader range of forms and materials.

2.2 Jewellery as comment

A controversial phenomenon from the early 1970s is *Conceptual Jewellery*.

(Conceptual Jewellers)…don't necessarily consider jewellery an adornment, but rather a message mediator. (Riklin-Schelbert 1999, p. 111)

The value of this type of jewellery is perceived to be in the thought process or concept of a piece, rather than in the materials used or the form. The intended site of these pieces was often the gallery rather than the street. For conceptual jewellers, the intention of a piece is to provoke and stimulate reactions from wearers and viewers.

Otto Künzli extended this approach, using jewellery to make direct social or political comment. One piece (Figure 2) titled *Gold Makes Blind* consisted of a black rubber armband completely concealing a gold ball. The piece challenges us as viewer in a number of ways. We must consider whether or not there is a gold ball within the piece. If we accept this, do we perceive the piece to be of greater value because of the gold even though it is not visible? The piece also invites us to consider the way gold bullion is stored in underground vaults, protecting the world economy and to reflect on the importance of South Africa in gold production (where apartheid was still in operation), and question our willingness to use the products of such regimes.

British jeweller Hazel White has produced a number of pieces that comment on modern gender power relationships, for example, *Defence Mechanism #4* (Figure 3).

The aim of these pieces is not adornment, but to engage the viewer intellectually and emotionally. McCarthy and Wright (2003) examine the notion of enchantment, the sense of personal captivation in an experience. These conceptual pieces aim to enchant the wearer or viewer and through that enchantment, stimulate the viewer towards a new awareness of the issues the jeweller addresses.

2.3 The emotional content of jewellery

Whilst jewellery has departed from the notion of value based on the rarity of the materials used, many of the forms used in contemporary jewellery reflect a concern with preciousness. The fact that jewellery is worn close to the body, within the wearer's personal space, gives it a particular intimacy that may be absent from other tools or devices that a user encounters. There is a further reflection of intimacy through the symbolism used in some pieces where the maker handles personally significant subject matter.

Since the anticipation of the Millennium and beyond many jewellers have been exploring issues of identity, memory and notions of presence and absence. The jewellery of Iris Eichenberg reflects many of these issues (Figure 4).

Her work consists of small objects seeming to draw from memories and childhood, telling fragments of stories. For Eichenberg the elements of preciousness seem to be the memories she is working with and the connotations they bring to her work. Writer Louise Schouwenberg says of Eichenberg's work

At first they don't strike one as jewellery at all. (…) Iris Eichenberg is fascinated by invisible systems; there's a strong suggestion of machinery at work, but it remains concealed. Likewise the puzzling functioning of a human being captivates her. (…) Just as

her jewellery objects can be read as a figurative language, all parts can be read as images loaded with references. (Schouwenberg 1998, p. 2)

Underneath its (the jewellery's) filmy skin a silent battle takes place in which all details matter, in which every single part carries its own specific meaning. (…) A knitted container is connected to a silver twig. Fruit trees are in full bloom, a child observes; the expectant energy flows back through the tiny twig. (Schouwenberg 1998, p. 2)

Fragments of memories are isolated by Eichenberg and then used in these pieces to create a piece of parts and a new interpretation from them. A memory is presented here not as a warm and cosy environment, but as a strange connection of remnants of events. They form a puzzle, a codification. The unease these pieces may present for a viewer could be viewed as a strength of the piece. They present a challenge, a provocation to find a way to interpret the piece personally where the narrative and structure are not easy to follow.

Jewellers Hiroko Ozeki (Figure 6) and Lin Cheung (Figure 5) have both used specific events from their own lives in their jewellery dealing with their feelings of loss and as a way to comment on the situation; the resulting pieces bring something beautiful and poetic from their experiences.

Both jewellers made mourning jewellery. Memoria is a neck hoop made by Cheung of which she says…

In memory of my Mother. Whilst sorting through her belongings, I came across several ear scrolls that did not belong to an earring. After putting her affairs in order, I gave the lost scrolls a meaning once more in the form of new jewellery. (Marzee 2001, p. 25)

These pieces are intended to evoke strong emotional responses from those who encounter them. These designers are not merely designing a form; they are seeking to design a rich experience for an audience. Enchantment, in the sense of McCarthy and Wright (2003) is as much a part of their trade as it is for the conceptual jewellers examined above.

2.4 Jewellery: A multilayered experience

Contemporary jewellery is a rich discipline that has extended the vocabulary of the three-dimensional language of form by embracing new materials, new inspirations and by challenging preconceptions of jewellery and its role in society. Jewellery is about positioning things: in a culture, in a space, on the body, in a time frame. Many jewellers characterise their work by describing it using the following layers; one layer is the object itself, the aesthetics and materials of the piece, which relate to the cultural, social and personal resonance of the jewellery. A second layer is the text or narrative accompanying the object, often in the form of a title. A further layer is how and where the piece is presented and a final layer is the mode of physical interaction, how it is worn, comfort and where it is placed on the body. Personal attention is paid by the jeweller to the significance of each of these elements in order to achieve the desired qualities. This translation of the production of jewellery objects as a desire to create a "complete" experience is about a dialogue. A dialogue firstly between maker and self through practice and

self-expression resulting in the production of an object and then between maker and audience through this object. Contemporary jewellery is not about High Street fashion and accessories; that is the domain of commercial mass production jewellery, which acts to follow the ideas of fashion, rather than creating its own discourse. Jewellery as accessory, heirloom or symbol of social status is often how the non-specialist encounters it. In contrast contemporary jewellery explores relationships: between self and object, individuals, groups, maker and audience and maker and practice. As such it is part of human communication. The skilled contemporary jeweller is part of an ongoing conversation, using a rich vocabulary of forms, materials and concepts to enhance human experience.

3 Understanding jewellery as experience

As we have shown above, contemporary jewellery is not simply an issue of adornment or aesthetics. Rather, contemporary jewellers seek to communicate with their wearers and viewers. The concern of the jeweller becomes the potential experience of the viewer or wearer in response to the piece and its setting.

3.1 A vocabulary for analysing experience

Wright et al. (2003) suggest a framework for the analysis of "experience" exploring the ways in which users make sense of experience. Here, we draw upon one part of this framework to offer a vocabulary for discussing jewellery: namely the four "threads" of experience. These threads are each explained briefly by Wright et al., and below we offer a paraphrase of their descriptions, as we understand them.

> The *compositional* thread deals with the part-whole composition of the experience and the relations between components. In an interaction, the narrative structure, the options of action, notions of agency and explanations of cause and consequence of actions may be included. In our experience of a work of art or jewellery, examination of the juxtaposition, the setting and relationships between elements would be aspects of the compositional thread.
> The *sensual* thread explores the aesthetics and physical qualities of an event, encounter, object or image etc. This sensual thread is experienced through sensory perceptions: sight, sound, smell, taste and touch – our sensual engagement with the situation.
> The *emotional* thread covers the experience of different states of being through empathy. Wright et al. justify their distinction of emotion from sensation, giving the example of the way that control over sensations such as fear or anxiety may be used to support emotions of fulfillment, satisfaction or fun. Watching a horror movie or climbing a dangerous mountain peak highlight this distinction.

Fig. 2. *Gold Makes Blind* 1980. Armband. Rubber, gold. Otto Künzli

Fig. 3. *Defence Mechanism #4* 1995. Aluminium, body, C-type print. Hazel White
Image courtesy of artist.

Fig. 4. *Afbeelding Omslag* 1998. Brooch. Wool, silver. Iris Eichenberg
Image courtesy of Galerie Louise Smit, Amsterdam. Photographer Ron Zijlstra.

Fig. 5. *Memoria.* 1999. Neck hoop. Silver, gold. Lin Cheung
Image courtesy of Galerie Marzee, Netherlands. Photographer Michiel Heffels.

The *spatiotemporal* thread relates to aspects of time and space, and our perceptions of them, within the experience. Our perception of the spatial and temporal qualities of an experience, of pace or proximity, can vary in response to emotional, sensual or compositional threads. Conversely, notions of public and private space, boundaries between self and other may have an impact upon the compositional, sensual or emotional threads.

It should be noted that Wright et al. present these threads as intertwined perspectives on a holistic concept, recognising both the conscious and unconscious aspects of experience, not as reductionist "components" to be considered in isolation. In what follows, we shall use these threads to provide a vocabulary for discussing existing approaches to digital device design, and tentative steps towards digital jewellery.

3.2 Examining Wright et al.'s framework in relation to examples of contemporary jewellery

How does contemporary jewellery attend to the four threads of experience as denoted by Wright et al.? Here we use four examples to illustrate the experiential dynamics at play. Think of your encounter with these pieces of jewellery as an experience.

Hiroko Ozeki's *Tear Collector* (Figure 6), made following the death of her father, is a silver representation of a rose petal, cupped in shape and small enough to fit in the palm.

Sensually, the piece is light in weight, similar to a real petal, and has a soft finish. The composition as a petal provides connotations of beauty. The piece is presented to us here away from the body, floating on a black background. This presentation is intentional, and composed with the title *Tear Collector*, it offers a narrative of solitude and sadness, contradicting the connotations of the rose. The black background suggests isolation and absence and along with the title leads to questions about the cause of the tears, or perhaps engages the viewer in an experience recalling their own tears. Thus the piece calls on the viewer to empathise with the maker, or communicates the maker's empathy to the viewer.

This empathy can offer a form of closure for the viewer of the piece, a way to gain a personal understanding of it. Brenda Laurel (1991) links empathy to the notion of catharsis in theatre. Catharsis and empathy therefore are vehicles through which we can connect with an experience, that is, a play, a piece of jewellery, or a piece of software in a personally significant emotional way. Catharsis allows us to identify with the experience and then to reinterpret it to fit it into and relate it to our own lives.

Eyelashes (Figure 7) and *Touch* (Figures 8 and 9) by co-author Jayne Wallace were made as part of a series of five pieces based on the individual. The pieces are worn by one person and involve individual experiences of the five senses. The communication experienced and commented on in these pieces is between the individual and his or her own body.

The eyelashes, made from silver and stainless steel, metals used medically with the body, are too heavy for the wearer to open her eyes once worn. The presentation and aesthetics of the piece offer a notion of femininity, of "dressing up", which suggests personal choice compositionally and sensually. Through the process of applying the eyelashes there is a sense of ceremony spatiotemporally, a private space, an intimacy, which is strengthened sensually because the objects feel gentle and fragile. The wearer found the eyelashes to be soporific. Although they mask a sense the eyelashes are very comfortable to wear and the silver quickly warms to the temperature of the body. The approach was to make quiet and theatrical, beautiful forms; by doing so the aim was to create an appearance of choice, not enforcement. The spatiotemporal and sensual qualities of the piece involve the sensations of wearing something in close proximity to the body which bars a sense. The sense of touch is often associated with intimacy and personal space, yet the sense of sight is often how we evaluate these phenomena. In excluding the sense of sight the wearer can exclude visual distractions and concentrate on the self. The main motivation of this collection of five pieces was to emotionally engage the wearer with the experience through self-reflection.

Touch are silver forms worn covering the pads of the fingers, made by casting a person's fingerprints. These pieces as with *Eyelashes* are presented on the body and offer a way of masking a sense. The compositional structure of the work suggests a gentle unity of form and body. Sensually the forms are cast from the body creating an intimacy through this personalisation. They have a satin surface texture akin to flesh and fit perfectly for one individual only, tracing the contours of the fingerprint and the nuances of the fleshy finger pads. The emotional thread is engaged with both through wearing the forms (the notion of hiding an element of identity is intensely personal) and through not wearing them. There is a transition from private to public space in removing the forms as this intimate element of an individual, the fingerprint, is then disclosed. In and after this act of revealing, spatiotemporally the physical marker can act as a visual memory, the memory of a touch or a trace of someone.

Christoph Zellweger's *Body Part VII* (Figure 10) is made from expanded polystyrene and chrome. The piece is presented to us on the naked human form indicating that this is its intended locus, or this is to what it relates.

These compositional qualities link to the spatiotemporal thread offering a very intimate location for the jewellery. The form is not only presented to us on the body, but it fits into the cavities shown in a specific way. This presentation of intimacy, physical "fit" to the body and the title of the piece give a strong idea that the jewellery is being absorbed into the human form in some way. This piece wouldn't "make sense" as a form alone without the compositional makeup of the presentation, or image. The aesthetics of the image, choice of material and form all strengthen the attention to the sensual and emotional threads. The expanded polystyrene is vastly different from a human body, yet at the same time the amorphous form and surface dimpling are evocative of human skin and inner organs. Most of us will have come into contact with expanded polystyrene; it is a throwaway material. The location of the material so intimately on the body may feel uneasy to the viewer, something so disposable and chemically produced

depicted akin to body parts. However, polystyrene is a non-biodegradable material and therefore more lasting than gold. The material is used as a precious commodity in this work; its permanence and fragility provide juxtaposition to exploit. Zellweger understands this tension and uses references of chemically produced, manmade materials alongside the body to infer the sculpting and surgical implanting procedures we are increasingly turning to with our bodies. This idea of absorption of something inorganic into the human form illustrates one strand of comment making through his work.

These examples all illustrate how relatively complex pieces of contemporary jewellery relate to the four threads of experience. These examples are used here to open up the possibilities of what jewellery is and to explore and show how experientially rich an interaction with an object can be. The importance of our examples does not rely on the complexity of objects, however, in the attention to the different threads of experience. To illustrate this point, as a final example, we offer what is perhaps the most familiar form of jewellery: the wedding band. Compositionally it is made of one form, usually in a durable precious metal, seamless to represent a narrative of continuity. The wedding ceremony, the act of giving or placing the ring on the hand and the story of two people declaring their feelings for each other all act to strengthen the composition. The form of the ring is comfortable sensually, it is usually worn constantly and the physical act of placing the ring on the finger during the ceremony adds to the sensual thread. The ring is within our personal space constantly and acts as a representation of the event of marriage, the partner and the status of the wearer. This form of jewellery has a designated place on the body; it is important that it is worn on a particular finger which gives it a socially recognised meaning. Another interesting point spatiotemporally and sensually is that because the form is simple, non intrusive, comfortable and worn constantly, it can become part of us to the point that we forget we are wearing it. It is when we lose it or remove it that its presence is felt. Jeweller Lin Cheung reports:

I have made a discovery that I think comes much closer to my true feeling about the ring. After taking the band off, there is a very distinct ridge left on my finger. I find this more intimate and meaningful and closer to the real meaning of our union than that of the object that created it. But this impression would not appear without first the existence of the ring and the time it has taken to create it physically. (Cheung and Potter 2003, p. 6)

The wedding ring is one form of jewellery which is sometimes passed on through the generations connecting us to family histories. Compositionally and spatiotemporally this is a very strong form of jewellery, yet it is a paradox sensually and emotionally. It is one of the most emotionally laden forms of jewellery because of what it signifies; yet it is a common form, usually the simplest a ring can take. Its power emotionally and sensually is, initially, in what it represents, but over time the form grows into something different: a unique ring with scratches and marks indicative of the years of wear. The emotional thread is evident when someone chooses to wear the ring after the death of a partner as a constant reminder.

4 Existing approaches to digital jewellery

The increasing ubiquity of technology has led many design groups to consider the relationships between mobile digital technologies and jewellery. Organisations such as IBM, Philips Design and IDEO have all presented concepts that seek to combine technology with wearable jewellery. In this section, we shall consider some of these efforts, and assess the degree to which they offer rich multilayered experiences as sought by the makers of jewellery.

4.1 IBM's digital jewellery project

IBM research at their Almaden site has been working on the development of digital jewellery.

Cameron Miner, the founder of the design lab and lead scientist on the digital jewellery project states that

If you have something with you all the time, you might as well be able to wear it. (Miner, in Infoworld 2002)

The jewellery was created by Denise Chan, a graduate of mechanical engineering. The thinking behind digital jewellery is that as you push more functionality into pervasive devices, they are getting harder to use: smaller screens, tiny inputs, or just trying to talk and input at the same time; all these become a challenge. By taking the interface apart, putting it in the appropriate places, and allowing them to communicate wirelessly, IBM thinks it has a practical way to solve the problem. So we have a microphone on a pin or necklace, an earpiece on an earring or ear cuff, and a ring with a track point. There's a bracelet with text entry or dialling capability as well, or it might even have a small display. (Infoworld 2002)

This approach to design as "problem solving" with a focus on getting more functionality into pervasive devices to the neglect of the emotional, sensual, and playful potential in jewellery has resulted in commodities that are (in our opinion) no more challenging than some High Street jewellery. Turning to jewellery because "you might as well be able to wear it" offers a very narrow interpretation of what jewellery is, and naiveté in this case to the problems that may need solving.

In allowing function (voice communication) to lead the concept, the perceived issues or problems are potentially shallow and the resulting designs (again, in our opinion) echo this. The more important significant issues of why such devices should be made, or how such devices could enhance deeper levels of human communication are not evident in these pieces. The result is an experience for the wearer that may succeed in compositional and spatiotemporal terms, but is likely to provide little within the sensual and emotional threads of the experience.

Fig. 6. *Tear Collector* 2001. Silver. Hiroko Ozeki
Image courtesy of the artist

Fig. 7. *Eyelashes* 1999. Silver, steel. Jayne Wallace

Figs. 8 and 9. *Touch* 1999. Silver. Jayne Wallace

Fig. 10. *Body Part V11* 1997. Expanded polystyrene, chrome. Christoph Zellweger
Image courtesy of the artist

4.2 Phillips "New Nomads" concept

Research and Design at Philips has produced concepts for the integration of technology in our communities, homes and clothing. Philips is an example of a company with a number of approaches to the design of digital devices. They take a user-centred approach stating,

The traditional design disciplines are integrated with expertise from the human sciences and technology through a multi-disciplinary, research-based approach that makes it possible to create new solutions that satisfy and anticipate people's needs and aspirations. (Philips Corporate 2003)

Figs. 11 and 12. *New Nomads*. Wearable Electronic Concepts. Philips Design
Images courtesy of Philips Design
http://www.design.philips.com/smartconnections/press/index.html

New Nomads (Figures 11 and 12) is an exploration of Wearable Electronics. Philips suggests that

As new technological developments advance they become better and smaller as we use refined, miniaturised technology. But there are limits to miniaturisation. It can help make products smaller and easier to use, but the ultimate dream is not to have easier tools: it is not to have to bother with tools at all! The step forward then is the integration of functions into objects that we do not feel clutter us, which are part of our life. (Philips Design 2003)

Philips' aim seems to be to create objects that are small enough to be unobtrusive, and worn within clothing, which are with us constantly in order to satisfy the need for ubiquitous connection. Their approach shows an openness to form and mode of interaction; their proposed devices often suggest playful ways of interacting with the systems and there is a tentative attempt to acknowledge the lack of sensory attention in current product design, by creating a "kimono"…

which is able to disperse an electrostatic charge via the fibres inside. The aim was to 'develop clothes that incorporate materials that help to de-stress the wearer.' (Philips Electronics 2000, pp. 125, 124)

Philips presents a pioneering spirit in their *New Nomads* concepts but the objects they propose lack intimacy. Consequently, they suggest an interesting offering only compositionally, sensually and spatiotemporally. The concept of integrating "de-stressing" functions into a garment that is enveloping and that may be associated with "serenity" suggests an attempt to address the emotional thread. However, it is not clear from the available images of this garment to what extent this has been achieved.

4.3 IDEO

Product Design Company IDEO has produced *Technojewelry*: proposals for wearable digital appliances, which intimate notions of jewellery. Figure 13 is an example called *GPS Toes* which are toe rings that act as signal transmitters, communicating to a GPS receiver kept in a bag or worn on a belt, which facilitates navigation around a city through the use of satellites.

    IDEO describes their use by stating,

Wearing one on each foot, the GPS Toes device will guide the wearer to a preset destination by vibrating and lighting up to signal upcoming direction changes. The left toe ring will indicate left turns and the right toe right turns, whether driving on the highway, walking on city streets, or hiking on the mountain trail. (IDEO Corporate Web site)

Technojewelry is part of IDEO's exploration of the relationship between people and wearable technology. The focuses of the appliances are the hands and feet described by IDEO as

… non intrusive locations for useful innovations, these concepts prove that new devices needn't look alien to your person and that we can make technology adapt to our lifestyles rather than the other way around." (IDEO Corporate Web site)

This proposal shows a more sensitive understanding of what it means to integrate an object into your appearance by wearing it. The attention to the spatiotemporal

quality of the designs is strong, IDEO seem to recognise that the device needs to echo aspects of when and where it is going to be worn. The notions of someone wearing an object and someone using an object are considered in unison and yet we suggest that the *GPS Toes* do not offer such strong connections to the sensual, emotional and compositional threads of the experience they are creating. Compositionally and sensually the forms of the toe rings do not exploit the potential situation of being located on the foot. Although the notion of using the feet as receivers of information when walking is compositionally interesting, the devices are static forms, situated on the body, rather than acting with it, which do little to echo the organic shape and movement of the foot. There is an interesting element sensually and emotionally in the behaviour of the devices; how would it feel for toe rings to vibrate and flash to indicate direction? Sensually there is potential for enjoyment or irritation; emotionally there is the potential for playfulness or unease. The critique we offer is that these emotional and sensual qualities of the interaction are secondary to or a byproduct of the functionality and spatiotemporal aspects of the design.

It is evident in much wearable appliance design proposals that functionality and personal interaction with that function are explored intensively. However, what follows in terms of exploring the intricacies and opportunities of working with an object which is designed to be worn is limited and often naive. The fact that these considerations follow the functionality of a design is one key to the problem.

5 A new approach based on experience

How can we use the framework proposed by Wright et al. along with the specific perspective of contemporary jewellery to inform the conception and production of digital jewellery? What is the specific contribution of a contemporary jeweller to the design of wearable technology and digital jewellery?

Here we offer examples of progressive proposals for digital jewellery from product designers and contemporary jewellers. We suggest ways in which these proposals are contributing to a wider, more holistic approach to the conception and production of digital jewellery.

5.1 Progressive proposals from product design

The "Kiss Communicator" (Figure 14) by Heather Martin was developed as an RCA and IDEOlab research project with Duncan Kerr.

(Kiss Communicator)…is a hand held device which allows lovers to blow each other kisses across distance. It works by blowing into the central "mouth" of the object, where electronics translate the impulse into a series of randomly lit LEDs, which are then transmitted as a slow glow to your partner's equivalent device far away. (…) If picked up and squeezed, your partner's device will repeat the message in complementary colours, but if left untouched, the glowing message will fade quickly. (Myerson 2001, p. 120)

Kiss Communicator translates the idea of sending a message to someone through a very beautiful metaphor. Relating the Wright et al. framework to this piece we can suggest that the communicator relates strongly to the emotional thread of experience through the imagery of blowing a kiss to someone. The act of blowing into the device, or squeezing it to reciprocate the gesture of sending a kiss, provides a strong sensual element. Emotionally it is significant that the device reacts differently depending on the way in which the user blows the kiss. This opens the possibility of pairs of users each developing their own shared language. Spatiotemporally the form itself and the visual exchange of the act provide a substitute for the "other person", a physical representation of him or her. However, the spatiotemporal thread is weakened because there is no clear relationship between the object and the person blowing the kiss – where does the object reside or how is it carried when not in use? Compositionally the form does not echo a kiss. The form is a generic pod shape, which could be used to signify myriad ideas, but none specifically. The generic pod form lacks intimacy and individuality. However, it should be noted that Kiss Communicator was an early prototype, with a clearly pioneering concept exploring the exchange of emotional meaning between individuals through a behavioural ambiguous mode.

It aimed to explore new ways in which emotionally laden content could be exchanged via an intermediating technology when two people are separated by great distance. …This project sought to explore products that would facilitate new, more expressive, ways of communicating remotely. We asked the question: What would be the digital equivalent of a wave, a wink or a kiss? These are "messages" that are low on factual content, but laden with emotional value. (Heather Martin in www.interaction.rca.ac.uk/alumni/96-98/heather)

The compositional and spatiotemporal limitations of this design could be addressed effectively in further development, taking advantage of the fact that the size of the device could be significantly reduced using current technology.

The next examples from IDEO are the second of the *Technojewelry* concepts, *Ring Phone* (Figure 15).

Ring Phone is a concept for a mobile phone where the earpiece and mouthpiece telephony are embedded in finger jewellery. The cell phone rings unite an action of imitating a telephone with your hand with the actual function of the finger components. IDEO describes the use of the phones by stating

Calls can be initiated by raising the hand to the proper position, and voice-activated interaction will allow instant communication. The little-finger units will vibrate to indicate incoming calls and the thumb unit will beam the sound towards the ear when the hand is held in the listening position. (IDEO Corporate Website)

Emotionally the gestural quality of the concept is a strong element of the piece as it connects to play and childhood representations of the phone through mimicry signifying a phone. There is also a sensual quality to the gesture itself as the hand actually forms the structure of the phone in this intimate gesture. This affinity of function, the gestural representation of the phone and the way the rings are worn show a strong attention to the emotional, compositional, sensual and spatiotemporal threads. However, the forms of the rings as with the Kiss

Communicator do not reflect the concept, but they suggest a more imaginative interpretation of digital devices.

5.2 Progressive proposals from contemporary jewellery

Technology was used to express ideas of human communication by jeweller Nicole Gratiot Stöber (Figures 16 to 18). Her jewellery reacts to interaction between people using sensors and light sources, which illuminate when the forms are touched.

The body responds to the jewellery and the jewellery responds to the body. (Gilhooley and Costin 1997, p. 12)

Stöber's work regards technology benignly, as a medium for communication and self expression. Transmitters and information interfaces operate without male gendered buttons. Switches and probes; clasps, sockets, chains and piercings are noticeably absent in works that pass by the sadistic baggage of jewellery and further blur the distinction between decorative and artistically autonomous objects. (Gilhooley and Costin 1997, p. 12)

The way the pieces react to the touch of an individual or collection of people shows a very human-centred handling of the technology used, reflecting all four threads of the framework. The focus of the pieces is human contact; they are about relationships and about touch.

A series of works that make visible an exchange of that which is normally not seen. Each brooch responds in different ways when touched by one person, and passed to another. (Description accompanying images, Daniel Gratiot 2004)

Compositionally the narrative structure reflects the notion of relationships in the way that the pieces "come to life" technologically through touch or through connection. The rings only illuminate when the two people wearing them hold hands.

Combining magnetic attraction, and warm red light, these rings individually are only forms. When the two wearers bring the bases into contact, they are attracted to each other, and form a circuit that activates the light in both rings. (Description accompanying images, Daniel Gratiot 2004)

Emotionally and spatiotemporally this is very strong; the private gesture of holding hands or physical contact is amplified by the illumination of the jewellery thus making a private gesture very public. The pieces highlight the thrill of a touch and also the potential embarrassment of the public display. The functionality of the work acts emotionally to echo how humans communicate to one another through touch. To touch is to be touched; in the glow of a light in response to this contact it is as if the object is returning your gesture. This is also reflected in the sensual quality of the pieces; the ambiguity of use invites playful exploration. Stöber stated of her own work:

My work with light invites reaction. If the light is directed, it may appear decorative as well as personal, or even indiscreet. Light itself can therefore underline or replace the personal touch. (Gilhooley and Costin 1997, p. 108)

5.3 A way forward

In the foregoing discussion, we have used the framework set by Wright et al. as a lens through which to explore experiences of various objects. One key element of our critique is that when we sense a proposal to be unsuccessful there is a failure to satisfy and entwine all of the four threads of the framework. This could be described as a sense of incompleteness in the work analysed. Some proposals offer strong compositional and spatiotemporal contributions, but neglect the sensual and emotional threads. Alternatively, when analysing non-digital pieces of jewellery many could be said to be "complete" in this way because they attend to and intertwine these four threads. This is not true for all contemporary jewellery, but many pieces do act to constitute environments rich in emotional content and do fulfil the criteria of the threads in this framework. We do not want to suggest that all four threads need to be equally strong to create an experientially rich interaction, but it is important that all four threads are acknowledged and considered. We are conducting further work using the four threads to inform our design in order to test this hypothesis.

As many of the previous examples illustrate, jewellers frequently emphasise the importance of details and layers of a piece. It may be that contemporary jewellers aim to envelop the viewer with their work, by paying attention to the nuances of the many layers of the jewellery object as "an experience". This viewpoint gives us a grasp of what it means to create an opportunity for emotionally, compositionally, sensually and spatiotemporally rich experience. It is not sufficient to simply meet needs and avoid interaction breakdowns; interaction design should seek to surpass expectations and elevate experience.

6 Conclusions

From our different perspectives as researchers in contemporary jewellery and in HCI, we have found that Wright et al.'s (2003) framework for the analysis of experience has offered us a way of describing digital objects and jewellery. It has acted as a translation tool, enabling us to discuss our differing interpretation of our experiences of three-dimensional forms. It allows us to discuss an analysis of our experience through different, but ever-connected elements and has formed the basis for a dialogue, in our situation, between different disciplines. In particular, it has allowed us to recognise aspects of our unconscious or tacit responses to objects and draw them into our conscious awareness in a way that may assist us in reflectively analysing our own design practice.

Figs. 13 and 15. Closeup. *Technojewelry*. 2002 Wearable Technology Concepts. IDEO
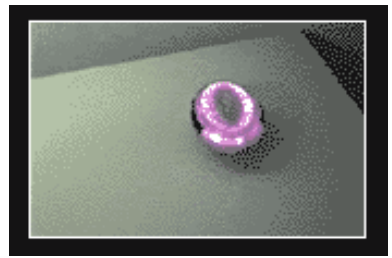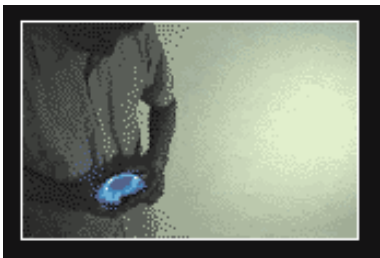http://www.ideo.com

Fig. 14. Closeup. *Kiss Communicator*. 1996. Heather Martin.
Technology Concepts. IDEO lab research project with Duncan Kerr
http://www.ideo.com, http://www.interaction.rca.ac.uk/alumni/96-98/heather

Figs. 16 and 17. *For Two Rings* 1994. Magnets, stainless steel, Perspex, LEDs with
electronics. Nicole Gratiot Stöber © 1994 all rights reserved.
Photographer Christoph Grünig. Image courtesy Daniel Gratiot

Fig. 18. *Light Brooches* 1994. stainless steel, plastic. LEDs with touch-sensitive electronics,
magnets (for holding separate wire clothing pins).
Nicole Gratiot Stöber © 1994 all rights reserved.
Photographer Christoph Grünig. Image courtesy Daniel Gratiot

Through the formulation of a critique using the framework we have achieved a development of each of our individual criteria of what constitutes a successful enriching experience. The framework then enabled us to share not only the critique, but our personal criteria as well. This method of understanding the experiential components of an object along with the transparency of personal criteria constituting "completeness" of experience may enable an understanding of how to design experientially rich interactive objects. In the context of design, if design is a shared activity, then it becomes necessary to discuss our individual implicit criteria within experience and to do so we must be explicit. In the conception and design of digital jewellery this framework is a valuable tool, which we are incorporating into our practice as designers in different fields. Our experience leads us to recommend it to other interaction designers.

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