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The experience of enchantment in human–computer interaction

John McCarthy, Peter Wright, Jayne Wallace and Andy Dearden

1 Introduction

In this paper, we examine one particular variety of user experience in detail and reflect on its relevance for the design of interactive systems. We describe this experience as ‘enchantment’.

As human–computer interaction (HCI) and interactive systems design have developed a sense of people living with and through technologies, our concerns have broadened from usability to include wider qualities of people’s experiences with technology. User experience has become a focal interest in leading HCI textbooks, e.g. [1], monographs [2–5], edited collections [6] and even the websites of leading manufacturers. There have also been specific technical proposals for enhancing people’s experience with computers. For example, Garrett [7] proposed a conceptual integration of information design, information architecture, and interface design to improve user experience of websites. Design principles and guidelines promoting transparency, seamlessness, and tangibility as enriching user experience have also emerged. Such technical responses may be premature. Before embracing any technical response, clear understandings of user experience are required. We argue that, despite recent attention, the concept of user experience is still underdeveloped in HCI.

One way of working with the richness and complexity of user experience in HCI is to develop conceptual frameworks for design and analysis that attempt to express aspects of it [3, 8]. Another is to document varieties of experiences with technology. In this paper, we examine the experience of enchantment through this second approach.

It would be unremarkable to view a film, concert, or book review that described the experience as enchanting. Such events in art and literature, which challenge and engage the whole person, may be designed to enchant. In contrast, it could be argued that functional tools cannot be judged by similar criteria. But, in our view, experience of interacting with technologies such as a treadle sewing machine, a great piece of architecture, or a classic motorcar could also be described as enchanting. However, as enchantment and interactive systems do not go together so easily, some justification for even using the term is required.

Let’s start with a personal experience. Enchantment precisely describes one of the author’s first encounters with a personal computer and his more recent encounter with Apple’s Titanium G4 Powerbook. Both radically challenged assumptions about what computing is and can be and particularly about relationships between aesthetics and function. The G4 Powerbook, for example, evoked space travel, weightlessness, artistic creativity, and even television or cinema screen culture. Not associations he had previously made with computers and computing. Other people are enchanted with the Internet, cell phones,

cyber-communities, or computer games. At the very least, HCI needs to tangle with the concept of enchantment in order to understand people's affective attachments to particular interactive systems. But more than that, it needs to recognise enchantment as an experience that people may desire in the systems they use—especially when that use is discretionary. In what follows, we seek to develop an understanding of enchantment that can usefully be applied to the analysis and design of interactive systems.

2 The enchantment of technology

We begin by examining previous accounts of the general phenomenon of the enchantment of technology. What happens when we find ourselves affectively attached to technology? And how is the particular experience of enchantment different from other affective responses?

According to the anthropologist Gell [9], enchantment with technology involves being carried away by the power behind the technology. Gell worked mainly with people from pre-industrial societies such as the Trobriand Islands. One aspect of their lives that interested him was their use of art—for him a kind of technology—to enchant their enemies. The Trobrianders' construction of the prow-board of the Kula canoe is a case in point. The board is a visually intricate display or surface designed to dazzle anybody looking at it and put them off their stroke for a moment. Gell attributes the power of the canoe-board not to its visual appearance per se but to viewers' interpretations of the visual effects as evidence of magical power behind the making of the board.

While Gell's analysis provides a useful starting point for our exploration of enchantment, it seems to offer limited value to interaction designers, suggesting that the complexity of a technology might, in itself, be sufficient to lead to enchantment—contradicting much that is known about the interaction of humans with technology. Gell's analysis also lacks the sense of charm, delight, and pleasure that enchantment could connote, and his description of enchanting experience renders the viewer passive and helpless. In contrast, our interest in enchantment with cell phones and G4 Powerbooks seems more like an active engagement with the sensory qualities of the artefact.

Bennett's [10] description of enchantment is more helpful. She sees enchantment in terms of being “both caught up and carried away” (p.5). One aspect is certainly a sense of being disoriented, but this disorientation is not necessarily wedded to fear. For her, the disorientation is associated with a pleasurable sense of fullness and liveliness that charges attention and concentration. This combination of emotional attachment together with a sense of something not yet understood leaves us feeling disrupted but also alive, attentive, and curious.

Enchantment does not necessarily imply that the object of enchantment must be novel or extraordinary, rather that the person sees how rich and extraordinary the everyday and familiar can be. In the prosaic world in which we live, all encounters contain the possibility of something unexpected. Fisher [11] points out how remembering and explaining can be antagonistic to this sense of wonder. Relying on our memories of what a situation is like, rather than engaging directly with it, inhibits wonder and enchantment. Focusing on ready-made descriptions and explanations forecloses on the potential in a situation. In a way then enchantment describes what we often miss in the ordinary, everyday, world because we

have already defined and finalised it in our minds, neglecting to look more closely. Because of this, we fail to notice the essential creativity of our relationship with everything that is ordinary. Bettelheim's [12] exploration of the enchantment of fairy tales for children draws attention to this creative process and also warns against explanation. He argues:

“Explaining to a child why a fairy tale is so captivating to him destroys, moreover, the story's enchantment, which depends to a considerable degree on the child's not quite knowing why he is delighted by it. ... Adult interpretations, as correct as they may be, rob the child ...” (pp.18/19).

In summary, we view enchantment as an experience of being caught up and carried away, in which, although we are disoriented, perception and attention are heightened. To the extent that it awakens us to wonder and to the wonder of life, it is enlivening. In contrast, if our first thought on encountering a new interactive system is that ‘... it is *just* like ...’—just like another system, or just like our bosses to impose this on us, or just like this software manufacturer—there is little chance of being enchanted. Moreover, even when our first response is to wonder at the newness and unexpectedness of a system, if as soon as we explore the system we meet reductive explanation, the opportunity for enchantment is again closed off.

An object or interactive system that is likely to evoke enchantment should offer the potential for the unexpected, give the chance of new discoveries, and provide a range of possibilities. The greater the opportunity it offers for finding new aspects or qualities, the longer the enchantment may last. We can think of these characteristics as conferring *depth* upon a design.

To the extent that designers of interactive systems are interested in the experience we have described above as enchantment, they must consider how the potential for enchantment can be tapped in media-saturated cultures.

3 Finding depth in media-saturated cultures

Unlike the islanders studied by Gell, we live in highly technologically mediated cultures and we have become very knowledgeable about the media in our lives. Given the antagonistic relationship between knowledge and enchantment described earlier, we are bound to question whether enchantment by technology is still possible in media-saturated cultures. However, we would argue that it is not knowledge itself but a knowing disposition that forecloses on enchantment. As Fisher [11] shows, we can continue to be enchanted by a single painting as long as we continue to find something wonderful in it. This suggests that the painting must have a depth to it that keeps viewers involved, indeed the more involved the more they know about it. Conversely, the viewers must remain open to the potential in the painting and not foreclose on what might otherwise be an enchanting experience. These observations lead us to question what constitutes the depth of the painting and how to get such depth in an interactive system. Below we examine two examples where technology appears to have achieved some level of such enchantment even in a modern ‘media-saturated’ cultures.

The cases we have chosen are film and the cell phone. Both are contemporary technologies, and they also differ in interesting ways that might help us uncover variety in their depth.

For a start, while films are designed to enchant, cell phones turned out to be enchanting despite being originally designed as practical information and communication technologies. While film is already a technology always geared towards experience, the cell phone is primarily a tool. And while the depth and potential for enchantment in film can be attributed to the makers, the depth and potential for enchantment with cell phones have been created by users, who make it the means-and-end of perpetual contact for a youth subculture.

3.1 The enchantment of film

The film experience is most readily associated with people sitting in a darkened cinema watching and listening, together and separately, enjoying and making sense of the film before them. However, it is important to realise the extent to which film and a variety of interactive technologies have begun to interpenetrate each other in interesting ways. The viewer has been given far more interactive control over their viewing of digital films, at least on digital television. Moreover, film appears to have become the model for many computer games and aspects of the film experience have been appropriated in applications involving design, architecture, and education.

Although it is by no means common, we all have probably had the experience at some time or other of being enchanted by a film. When this happens we feel with the characters in the film; we are caught up in their world and carried away by the sensuousness of its expression in the film. The depth of a film and the potential for the viewer's enchantment arises when the film evokes a world that seems to have a life of its own, i.e. open to ambiguity and even contradiction, and that resists any easy conclusions that the viewer might reach about it. The film must have a voice, a position or centre from which it speaks, and its distinct voice must participate in the transaction between viewer and film where the otherness of the film resists appropriation to self. Without this distinctive voice and this resistance there is none of the enchantment of being in play with the film. But how does a filmmaker create a world that has depth, that creates a moment of presence, and that reveals more with each viewing?

Boorstin [13], a film writer and producer, explores the complex response of filmgoers that enables filmmakers to enchant with even simple filmic devices. He suggests that the depth of a film and the possibility for enchantment resides in an aesthetic that is at once sensory, intellectual, and emotional. He suggests that people experience or watch movies in three ways, each having a distinct pleasure associated with it. Boorstin refers to these ways of seeing as the voyeuristic eye, the vicarious eye, and the visceral eye.

The *voyeuristic eye* experiences film in terms of the simple joy of seeing something new and the wonderful. It involves viewers looking closely and carefully at the film, but with some scepticism. This scepticism demands a high level of credibility, disengaging when events seem too implausible. What appears on screen must contain both surprise and plausibility to seduce and enchant the voyeuristic eye. However, designers should note that less can be more enchanting as long as it introduces us to new perceptions and wonder, even if in the process the very category of film is put in play. For example, Boorstin describes films by Charles Eames as miniature masterpieces because they make viewers see simple objects like spinning tops in a new way and they do so without story or characters. They stand or fall on voyeuristic pleasure and the visual logic threading through the images.

The *vicarious eye* attends to the emotional quality of a film rather than to its internal logic and plausibility. The emotional quality can enhance the depth of a film because we tend to make allowances for minor illogicalities of a story if we perceive emotional truths behind them. No matter how implausible the action, if we are wholly engaged with the character, we are likely to accept whatever he or she does. For the vicarious eye, the basic unit is not the beat of the story but the moment of the character, and our engagement with their desires, feelings, and anxieties. In great moments, story time stands still. But a film cannot be enchanting if it is made up of great moments alone. The editor has to create a rhythm and movement between the voyeuristic and vicarious to keep us engaged—intellectually, emotionally, and valuationally.

The *visceral eye* is attuned to first-hand experience of thrill, joy, fear, and abandonment. Here, the character is a conduit for the viewer's feelings rather than the other way around. Unlike the vicarious eye, the visceral eye is not interested in characters in the empathic sense; it is interested in having tokens for our sense of thrill or fear. As we feel the thrill and fear of people on a roller coaster ride, we are not empathising with them; rather we are having our visceral experience through their activity, responding to our own sensory reaction.

Boorstin's analysis of film suggests that, in a media-saturated world, enchantment may be possible through a combination of the wonder of sensory experience, emotional response, and direct playful engagement. Most significantly, it is through the dynamic interplay between elements engaging these different perspectives that the potential for enchantment emerges.

3.2 The enchantment of the cell phone for teenagers

Our second example is the enchantment of the cell phone. In particular, we consider European teenagers' relationships with this technology. In this case, we point to the depth that emerges in the cultures and practices that surround the artefact rather than anything manifest in the artefact itself. A review of the literature on teenagers' attachment to their cell phones reveals a number of characteristics that each goes some of the way towards accounting for the enchantment.

Fortunati [14], on the basis of surveys in Europe and especially in Italy, argued that the cell phone contributes to dissolving traditional separations between the intimate and external, the public and the private. Intimacy is traditionally associated with privacy, to the extent that associating it with the public sphere seems paradoxical. However, according to Fortunati, the cell phone allows us to capture the intimacy of interpersonal relations while moving from one place to another in a public space. She found that 28% of adolescents and 26% of 18–24-year-olds reported making and receiving intimate calls on their cell phones.

Fortunati's research also shows that exchange via the cell phone is often an expression of connectedness and perpetual contact with a select group. In this sense, giving a person your cell phone number can be seen as an act of friendship. Exchanging cell phone numbers admits the other into your life in a more substantial way than giving them a landline number for the house you live in. Much of the energy of adolescence is put into and generated by social interaction. Adolescents work at and are energized by being available to friends and knowing what their friends are doing. According to Ling and Yttri [15]

“accessibility is an expression of their status and it is cultivated and developed” (p.150). Some extracts from their interviews exemplify this.

“It is stressful not to have my mobile telephone because I don’t know what is happening” (Arne, aged 17).

“If I get a text message I am curious. I want to be included, so, like if I am in the shower and I get a message, I you know, have to read it. If I write a message and don’t get a response immediately then it is like, you know, eh-hh ...” (Bente, aged 18).

Clearly there is a mix of instrumental and expressive use of the phone here. It is not just a matter of coordinating everyday activities for teenagers but also of coordinating emotions, friendship, membership, and loyalty.

Perhaps the most surprising enchantment of the cell phone for those who do not use it regularly is the SMS text message. In Finland, Kasesniemi and Rautiainen [16] identified practices such as collecting messages, chain-message circulation, and collective reading and composing. In England, Taylor and Harper [17] also found many cases of message exchange and message collecting. Teenagers read messages to each other, circulate messages among friends, compose messages together, and even borrow messages or parts of messages from each other. Sharing messages can even involve swapping cell phones to read each other’s messages. Allowing other people to read messages is often a sign of trust and friendship, or even intimacy. Interviewees told Kasesniemi and Rautiainen that it tends to happen between couples and very close friends. Some couples look back over messages together to re-visit good and bad times in their relationship. These researchers also found that some of the teenagers attach strong emotional significance to keeping the messages in their original form. As one put it:

“.. it’s not the same having them written down .. cause it’s not from him anymore ..”

For her, transforming the electronic messages into her own handwritten form loses something of the specific sensuousness of the message and the particular signature of the sender. Taylor and Harper suggest this view of messaging is best interpreted as a kind of gift giving.

Cell phones embody a number of paradoxes that offer up the opportunities for finding new ways of living with paradox that many teenagers thrive on. They provide these teenagers with the potential for combining various aspects of interpersonal contact in original and creative ways, of carving out a cultural medium to distinguish them from older generations. These properties appear to give cell phones the depth that is required for enchantment. Although they provide a means for communicating with others, a social activity, they are also private and personal. Although they use public communication networks, they are intimate objects often trading in being fashionable and playful. And although they provide primitive devices for text messaging, those text messages are treated like gifts.

4 Sensibilities for designing for enchantment

Following our analysis of writing on the enchantment of technology and of interactive systems that enchant in a media-saturated culture, we now suggest some sensibilities for a HCI interested in enchanting interactive experience. By using the term ‘sensibilities’, we

wish to suggest that these are issues to be considered or perspectives to be used when exploring and evaluating designs. We opt for ‘sensibilities’ over alternatives such as ‘guidelines’ to point up the salience of sensual, emotional, and affective sense making in judgments of enchantment. When it comes to experiences, such as enchantment feelings are as important as thoughts, sensation is as important as cognition, and emotional consciousness is as important as will. Indeed, sensibility at bottom indicates a sensitivity to or readiness to respond to sensory stimuli, which as we have seen above is central to the experience of enchantment. With specific reference to the design, the particular sensibilities we suggest might be thought of as a provisional response to the question: What is the depth in a painting or interactive system that supports the enchantment of those engaged with it? It is a provisional response in the sense that we are sure that this list can never be considered final, not just in the sense that more can be discovered but also in the sense that cultural and historical variation makes for different sensibilities at different times and places. We will state the sensibilities quite briefly here, as they are more amenable to the kind of explanation through example that we offer in the context of interactive jewellery design later.

The specific sensuousness of each particular thing Enchantment engages closely and intimately with the particular object of affective attachment absorbing its specific appearance, texture, sound, and so on—and noticing how the specific sensuousness of the object marks it out. Bennett [10] for example elaborates on the enchanting power of chants and of the sonorous dimension of language. Fisher [11] draws attention to the power of a corner of a painting, a colour, line, or pattern observed there for the first time, to still the mind and limbs even as the senses continue to operate all the more acutely. Enchantment is not even imaginable without the acute sensory activity that notices the sensuousness of every thing.

The whole person with desires, feelings, and anxieties Enchantment engages with the whole intellectual, emotional, and sensual person, acknowledging and recognising their anxieties and aspirations without ever trivialising them. The distinctive, resistant voice of an enchanting film does this, while the patronising voice of some films fractures this holistic engagement. Although the sensory is particularly salient, it does not preclude the other faculties, rather it enervates them so that they are not understood as functioning in a disengaged manner.

A sense of being-in-play Enchantment is playful, engaging with each object as both means and ends, and exploring its qualities and possible descriptions of it. Jokes and games can be playful in this sense but the sense of being-in-play that we are describing here is not limited to these kinds of examples. It includes the sense of familiar categories and values being challenged or put into play by a film including, for example, the sense of the very category of film being played with by Charles Eames’ miniatures. Or, in the case of cell phones, the category ‘intimate conversation’ being played with by conversing in a public space.

Paradox, openness, and ambiguity Enchantment engages with paradox and ambiguity, putting ‘being’ in play in an open world. This contributes to creating depth in a system or object that allows it to contain within it the possibility for complex, layered interpretation even the kind of interpretation that surprises the person interpreting. Even the kind that allows traditionally separate categories of experience, for example intimacy and extraneousness or instrumental and expressive, to live together in a creative response to new technologies.

The transformational character of experience. Enchantment is at home with change, transformation, and openness or unfinalisability. Encountering change in what appears to

be stable can be enchanting, as can encounters with what Bennett [10] calls ‘crossings’ or movements between what we tend to think of as natural categories such as human and machine. And providing primary sites for enchantment, transformation is also an outcome of enchantment, with person and object changed by the experience.

In the next section, we relate these sensibilities to interactive systems design with an example that is in itself enchanting, interactive jewellery.

5 Contemporary and interactive jewellery

Contemporary jewellery design is primarily concerned with creating objects that are worn or relate to the body and that have emotional content. The fact that jewellery is connected physically or conceptually to the body often situated within the wearer’s personal space, gives it a particular intimacy. Some jewellery makers develop this emotional quality by creating pieces that have personal significance. For example, much of Iris Eichenberg’s work consists of small objects that draw from memory and childhood (Fig. 1). In this piece a knitted container is connected to a silver twig; playfully connecting remnants of events in a way that provocatively challenges existing categories. The unification of the knitted and silver elements creates a particular sensory experience that opens up the very category of jewellery, creating paradox and ambiguity that draw the viewer in. Enchantment is born from the unfinalisable qualities of the piece—it remains a paradox. We can no longer take for granted preconceptions about what jewellery is and we are left wondering about that. Beyond that we are drawn into a very personal story of which we only have fragments. Moreover, wearing the piece can be seen as an active identification with its sensual, emotional, and intellectual quality and with the process of jewellery ‘becoming’. Of course, these layers of engagement, even enchantment, can only start if we respond to the object in such a way that it holds us in a moment of pure presence.



Fig. 1 ‘Afbeelding Omslag’ 1998. Brooch. Wool, silver. Iris Eichenberg Image courtesy of Rob Houdijs, Galerie Louise Smit, Amsterdam

Another piece, *Eyelashes* by Jayne Wallace (Fig. 2), also shows sensitivity to the sensibilities of enchantment but in a quite different way to Eichenberg. The eyelashes made from silver and stainless steel relate to the sense of sight. When worn, their weight stops the wearer from opening her or his eyes. The aesthetics of the piece offer a notion of femininity and of dressing up that suggests personal choice. The process of applying the eyelashes evokes a sense of ceremony taking place in a private, intimate space. This sense is strengthened sensually by the gentle and delicate feel of the objects. Moreover, the sense of private, intimate ceremony is complemented by the theatricality of wearing jewellery

that masks a sense. A playfulness like the playful masking of the sense of sight to minimise distraction and create a rich space for concentrating on the self. The pieces were designed to counter the idea or experience of fear related to masking a sense by presenting masking pieces that were visually beautiful and comfortable—indicating choice rather than enforcement in wearing the forms.



Fig. 2 'Eyelashes' 1999. Jayne Wallace

We can see from these two examples of contemporary jewellery that their design has attended to the sensibilities of enchantment. The embodiment of each piece is in its specific sensuousness, a sensuousness that, in both cases, opens up our categorisation of jewellery. There is a playfulness and theatricality about both pieces that engages with the aspirations and anxieties of their wearers. And this play extends to the definition of jewellery itself as something intimate and decorative, emotional and conceptual. The scope for continued enchantment is not only in the beauty but also in the depth of paradoxes each piece embraces about the sense of self and space we create for ourselves in contemporary society and in the strong voice for intimacy even in public spaces that is embodied in these pieces. Interesting though these pieces are the more challenging question for HCI is the extent to which digital jewellery could accomplish the same enchanting depth.

A number of design groups are now considering the relationship between digital technologies and jewellery. Organisations, such as IBM, Phillips Design, and IDEO, have presented concepts that seek to combine technology and jewellery, with mixed results from the perspective of enchantment. Some examples seem to focus on getting more functionality into pervasive devices, e.g. a necklace with a microphone built in, and earring with an earpiece, and a ring with a trackpoint. Not surprisingly the focus on functionality to the neglect of the emotional, sensual, and playful potential in jewellery has (in our opinion) resulted in disenchanting commodities, no more challenging or transformative than some high street jewellery.

In contrast, the product design company IDEO has produced proposals for digital jewellery that seem more sensitive to what it means to integrate an object into your appearance by wearing it. For example, they have proposed a Toe Ring (Fig. 3) that acts as a signal transmitter, facilitating navigation around a city. Their design considers wearing and using the object in an integrated manner such that the Toe Ring is both comfortable and attractive. However it stops well short of being enchanting. It lacks emotional and intellectual depth and because of that limits the opportunity for any transformative

experience. For example, the sensual aspects of the design are limited to functionality, comfort, and ease of use, ignoring the wider sensory possibilities explored in the contemporary jewellery described above.



Fig. 3 'Technojewelry' 2002 Wearable Technology Concepts. IDEO <http://www.ideo.com>

In a final pair of examples, we see information technology used by jewellers firstly to facilitate acts of expression in human communication and secondly as an exploration into the possibilities of technology and material integration. Gratiot Stöber's jewellery (Fig. 4) reacts to interaction between people through sensors causing an illumination when the object is touched. The way these pieces react to touch emotionally and sensually echoes how humans communicate with each other. It expresses the intimacy of human tactile contact where to touch is to be touched. The pieces are paradoxical in that they are deliberately showy in form, yet there is a subtle quality through the 'holding of hands' which connects the two pieces. Manipulation of the light in the piece, for example directing it, allows the jewellery to be both decorative and personal and to explore the boundaries of public and private space by making a private gesture into a very public display. The pieces are relational and social: highlighting that the wearer is a relating being as the pieces only become 'interactive' or make sense when one person interacts with another. Christoph Zellweger's 'Light Jewellery' (Fig. 5) reacts to touch by emitting different pulses and colours of light through a synthetic stone. The motivation for this piece was to make the light itself the jewel and indeed the enchantment of the piece is in the almost hypnotic attraction of the light pulses rather than the form itself.



Fig. 4 'For Two Rings' 1994. Magnets, stainless steel, Perspex, LEDs with electronics. Nicole Gratiot Stöber © 1994 all rights reserved



Fig. 5 'Light Jewellery' 2001. Precious metal, synthetic crystal, LEDs with electronics. Christoph Zellweger with Peter Russell Clark, Scintillate Ltd and Imperial College, London. Image courtesy Christoph Zellweger

The combination of these last two pieces shows how contemporary jewellers are exploring the space of interactive jewellery with sensitivity to the themes we raise here and although perhaps still lacking the depth of contemporary non-digital jewellery; Stöber's work, and others we have looked at, show signs of the beginnings of an enchanting digital jewellery. Having already overcome the earlier obsession with function when dealing with digital technologies, practitioners are now beginning to engage with the sensual, intellectual, and emotional language of digital jewellery. For example, ongoing practice-based research by jeweller Jayne Wallace is exploring how digital technologies can be integrated within enchanting contemporary jewellery. Wallace aims to create a collection of unique pieces that take into account criteria related to the particular and personal significance of the pieces for individual participants.

"Sometimes our dreams and memories visit us..." (Fig. 6) is a necklace, made from enamelled, etched copper, and synthetic silk, made in response to fragments of personal significance for one particular individual involved in Wallace's doctoral research. The form and digital potential of the piece refer to objects, memories, human connections, and experiences, which are described as personally precious or meaningful by the participant.

These fragments are shared through a set of ‘stimuli’, which draw influence from ‘Probe’ sets [18] and project ‘KPZ-02’ (see Bartels and Lindmark-Vrijmann, 2002 at www.projects2realate.net/Interface.swf).



Fig. 6 Necklace “Sometimes” 2004 Jayne Wallace

The piece is not made to challenge the often tested and consequently ever expanded boundaries of (un)wearability, scale, form, body reference, manufacture or materials within contemporary jewellery, but to contribute to and challenge the emergent concept of digital jewellery, the potential of our interactions with jewellery objects and our wider environments encountered when wearing ubiquitous computing.

The piece uses the traditional perceptions and conformities of the notion of a necklace as a backdrop for a jewellery object which is in concept recognisable, not overtly challenging physically or sensually and which refers in part to traditional methods and materials of production. The aesthetics and detailed surface of the form may evoke objects and tastes of previous ages. The piece appears to show signs of wear and to be old; not a contemporary object. The painterly markings and use of enamel may suggest handcrafted characteristics relating to the manufacture of the piece. In contrast, the digital potential of the jewellery is to trigger a small number of silent image sequences, of personal significance to this particular wearer, on digital displays in the near radius to the necklace. The digital potential is future focussed, where these sequences could occur in a personal or public environment. The necklace was made with the intention of creating a comfortable, subtle, and calm object, to be worn as often as was wished. The digital occurrences facilitated by the piece, conversely, are not intended to be frequent; they will only happen rarely and in randomised succession.

The form and digital potential are sensitive to and echo elements of the participant’s life, which are felt to be significant that have personal meaning. There are connections to objects now aged and frail through years of attention and use: the delicate beauty of an old costume doll’s ragged skirts, the worn aesthetic of a mouldy plaster bear, the white enamel of children’s milk teeth, and of glass feathers. There are references to objects once treasured and now lost, to current human relationships and to dreams. The piece references organic disarray, but also calmness through the gentle feel of the object and the visual and aural quietness of the digital interaction. Sensually the enamel surface of the piece is a smooth matt glass, reminiscent of skin to the touch and the hair-like strands which attach the form to the body are soft, smooth when touched, reflecting tactile elements shared by the participant. The object can be held in the hand when worn at its full length; this means that it can be seen by the wearer when worn and perhaps will act as a trigger to the objects

and experiences it as a reflection of, or to the wonder of when it will digitally activate a 'visit' in the locality.

When these events do occur, the result may be an environment where, for a few seconds, the surroundings appear to be paying particular attention to the wearer; the locality is literally acknowledging something personally meaningful, these moments are for and about the wearer. The quietness of both the jewellery piece and these interactions means that the hustle and bustle of a location are not altered, only the imagery draws attention to the event, indeed the 'digital visit' may be missed entirely or glimpsed as it fades. Visually, the images will cause juxtaposition with other objects and events in the surroundings when they appear, similarly the different ways of encountering the 'visits' will add a layer to the interpreted meaning of the interaction by the wearer.

To acknowledge that it is important enough to create an environment where personally significant aspects of a person's life can be referenced and paid attention to is to engage with and respect the concerns and hopes of another person. This piece is not about sentimentality, rather a balance between personal value systems and an interpretation of these personal significances resulting in a new experience.

The potential experiential qualities of the interaction with the jewellery piece, when digitally responsive or dormant, may lead to an enchanting interaction through the reflections of personal significance and fragmentary connections to familiarity. The random sequences, rarity of the 'visits' and unpredictable occurrences are all related to enchantment through a sense of surprise and being in play. By wearing the necklace, the person is entering into the spirit of a game to take the chance that today may be a day when the necklace prompts 'visits' in the environment. The idea of values being challenged is important here as the 'visits' may well occur in public, or shared spaces and although the trigger of these events and their specific meanings are only known to the wearer, the event of one occurring creates an experience where personal meanings are projected into public spaces. There is a creation of a private place within the locality of the digital 'visit', but this also challenges our sense of what is private or public. The sense of being in play could extend through interaction with this piece by the wearer on occasion searching for 'visits', to be alert to their occurrence, a readiness to see them as and when they occur, or even guessing when a visit will happen. In another way this sense of play relates to the personal knowledge of the digital potential of the necklace; is this kept as personal knowledge or shared with others, is the piece worn only by the person for whom it was created, or does this person allow others to experience the piece through wearing it? Similarly, the imagery will have a particular meaning for the wearer, but the images will have their own meanings for other people who see them. There are many possibilities for complex, layered, and often paradoxical interpretations of the piece through the mix of references in the form and digital 'visits' and through the different tactile and visual elements of the object. The aged form is at odds with our current vocabulary of wearable digital objects. The necklace has an ambiguity of function; there are no buttons, no obvious ways of controlling the digital aspects of the piece, and in extension to this the necklace remains visually dormant using other digital devices and displays as vessels for the visual interactions. The digital 'visits' are examples of a disruption to the stability of what we expect to see on the digital displays we are used to interacting with. In encountering the digital 'visits' our well-trodden paths or daily journeys may reveal a pleasantly unexpected gift; the experience may leave us feeling disoriented initially, but may also offer new, personal, and unique ways of interacting with our environments.

6 Conclusions

In an effort to engage with the richness and complexity of user experience, we have examined enchantment as one of the variety of experiences that people have with technology. Our exploration of the literature suggests that in order to support a lasting enchantment, an interactive system has to have depth. Furthermore, our analysis of two technologies that many people find enchanting—film and cell phones—highlights a number of sensibilities that may be useful in exploring and evaluating designs with specific regard to their depth.

In this paper, our particular approach has been to explore relationships between people and technology in a number of cultural contexts, from the pre-industrial culture of the Trobriand Islanders to the media-saturated youth sub-cultures of Europe, with a view to documenting their enchantments with technology. From the perspective of HCI and Interaction Design, this has proved useful. For example, identifying the depth of a design as central to the experience of enchantment and provisionally characterising depth in terms of a set of sensibilities facilitated our exploration of digital jewellery. It heightened our perception of qualities, such as paradox and being-in-play, in contemporary non-digital jewellery, which are not yet well developed in digital jewellery. In addition to contributing to the design of enchanting digital jewellery, we can see this approach and the specific sensibilities identified being useful in other interaction design projects where the experience of enchantment is important. It could, for example, be useful in the design of other evocative objects and spaces such as historical artefacts in a virtual museum. In more commercial settings, it could be useful in projects such as the development of wearable technologies and the evocation of products like books in E-shopping.

Of course, enchantment is not the only user experience of interest to interaction designers. However, as discourse on enchantment features enriched experience, affective attachment, and engagement of the whole person, it should have an important place among the variety of experiences to be explored in interaction design. But making the case for enchantment was only one of our objectives in this paper. The other was to demonstrate the value of the particular approach to user experience that we pursued, which, as we indicated in the previous paragraph, involves a close cultural analysis of a variety of experiences. With some exceptions, e.g. [19, 20], such analyses are lacking in HCI, though they may become more prominent with the emergence of interest in literature and art-related approaches in HCI.

In addition to the caveat already entered about the scope for enchantment in design, we want to finish with another caveat to be explored in future work. Although enchantment encourages HCI towards enriching experience and engaging the whole person, enchantment can also transform itself into a passive experience. This can be seen when people let the enchanting object do the emotional work of experience for them or even when their enchantment leads to something like mindless collecting, for example, collecting books that are never engaged with. Here, what could be enchanting interactivity becomes a paradoxically detached interpassivity [21]. An ethically sensitive HCI needs to be aware of that possibility.

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Digital Technologies Research Studentship from Sheffield Hallam University. Permission to use images has kindly been given by the following: Fig. 1, 'Afbeelding Omslag' 1998. Brooch. Wool, silver. Iris Eichenberg Image courtesy of Rob Koudijs, Galerie Louise Smit, Amsterdam. Photographer Ron Zijlstra. Fig. 4, 'For Two Rings' 1994. Magnets, stainless steel, perspex, LEDs with electronics. Nicole Gratiot Stöber © 1994 all rights reserved. Image courtesy Daniel Gratiot. Photographer Christoph Grünig. Fig. 5. 'Light Jewellery' 2001. Precious metal, synthetic crystal, LEDs with electronics. Christoph Zellweger in collaboration with Peter Russell Clark, Scintillate Ltd and Imperial College, London. Image courtesy Christoph Zellweger.

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