Fabric(ated) Ontologies:
the biopolitics of smart design in clothing and jewellery

Keywords: design / technology / biopolitics / wearables

Abstract

This paper explores the biopolitics of smart design as it is realised in contemporary smart clothing and jewellery. The discussion hinges on our understanding of the meanings of technology and of the relationship between technology and human ontology, i.e. human being. It begins by exploring the assumed relationship between clothing and skin - that clothing is a form of skin, a second skin - which leads us to explore the ways in which skin operates as a technology. My argument is that skin is not a form of technology, and that making this assumption leads to a re-invocation of the mind-body split, which makes human subjects susceptible to ordering by their own technology. Instead the paper argues for recognition of clothing (and jewellery) as technology, and the examination of wearables as a more technical form of an existing technology. This enables us to explore the ways in which human being is modified and transformed by this new technology and to choose applications that enhance the potential of individual subjects.

Smart

Smart design is design that uses the capabilities of new materials such as CSIRO's nanotube materials, Napier University's Speckled Computing, and new electronic fibres that can be up to ten kilometres in length, are strong and able to be woven. These materials are currently being used in a range of applications but this paper is concerned with the development of different forms of wearable technology, primarily clothing but also jewellery.

In order to explore the power and value (the biopolitics) of this design this paper conducts two explorations. One concerns the nature of clothing and jewellery as technology (along with a study of the meaning of technology) and how technology affects human being or ontology. This differs from the notion of clothing as skin – a commonplace idea with apparent roots in the human use of animal skins for warmth and protection – and its extension into an argument for skin as a form of technology.

The other exploration concerns specific examples of smart design, including the U.S. Army's prototype for the military uniform of the near future, FutureSoldier – an application that is

closer to Robocop than any current uniform. At the other extreme is CuteCircuit's HugShirt, a shirt designed to hug its wearer – not for defence or attack, but for interpersonal communication and intimacy. I also briefly consider the jewellery of Sarah Kettley, designed to provoke and enhance communication and sharing between wearers. In each case my concern is with how these specific applications of new technology, and indeed of smart design, inform our understanding of this field – and of ourselves.

Skin

Latvian-born, London-based designer, Zane Berzina explored the concept of clothing as skin in her thesis, *Skin Stories: Charting and Mapping the Skin* (2004) in which she maps the properties and power of skin, physically or somatically, as well as culturally and socially. Berzina identifies the ways in which skin is understood and treated - in medicine, biology, psychoanalysis, aesthetics. And she also explores its imaginary function in both art and science, as a basis for the elaboration of new ways of conceptualising human life and experience. This is reminiscent of Samuel Delany's accounts of radical prosthetics in *Babel-17*, which now seem not so bizarre after all.

Berzina then maps a range of contemporary technical, technological and smart materials processes (e.g. biomedical textiles, high-tech fabrics) and their 'Skin-related aspects' such as protection, memory, comfort, identity, communication, and alongside them the conventional textile and technological processes with which they are associated, such as screen and transfer printing, layering and bonding, coating, dyeing and mixed media. She identifies this set of practices as "Reworking the Skin'.

Berzina's thesis is a compelling piece of work, with many exciting ideas that she has realized in her own projects, such as *Archeology of Skin* (2006-2007), *Systems* (2006), *Skin Stories* (2000-2004). However, I would like to make an intervention at this point, at this identification of skin and technology - and I want to do this by reference to the common thread (literally) between the two - which is textiles.

Clothing

In many everyday and scholarly discussions textiles, processed as clothing, are identified with or as skin. As noted earlier, there is a kind of assumed genealogy of clothing that goes back to early humans using animal skins as a form of protection and source of warmth – a form of second skin. Hence what we now call clothing is a later, more industrial version of that earlier second skin; we've replaced crude animal skins with textiles manufactured from various source materials that are cut and shaped into garments and sold to customers as

the end-product of a complex and now global industry. More recently still we have begun to deploy sophisticated industrial technologies to transform the textiles we use – in clothing and in other applications, including medical treatments and art- and craft-works. So clothing is also recognized as an application of technology.

Basically we have a form of syllogism along the lines of: clothing is a form of skin, clothing is a form of technology; therefore skin is a form of technology. And this identification is often deployed, as Berzina and others have noted, in architecture, with the walls of contemporary buildings conceptualised as skins that can be marked and elaborated (tattooed, scarred and striated) in various ways. This is a seductive metaphor, allowing us to re-think the role and function of architecture - and particularly, following on the excesses of neo-brutalist architectures, to enable us to understand and inform the return to more sensuous architectural forms - many of which are enabled by CAD software.

So designers and scientists study the properties of skin in order to develop similar properties in their smart materials and/or to enable their smart materials to enhance the properties of skin. And the assumption that is repeatedly made is that skin is a form of technology; as Berzina notes, it enables communication, comfort, protection and a whole range of other practices/properties. Which elides a fundamental property of skin - you can't take it off: skin is not a technology of our bodies; skin <u>is </u>us.

Politics

Constituting skin as a technology is a re-deployment of the mind/body split in that it constitutes skin as a practice of the body - a techne or poesis - rather than as part of the body. We repeatedly do this when we reconceptualize ourselves in relation to our technology - as we do when we start thinking of our brains as 'memory banks' or databases; when our bodies become 'wetware' - to use William Gibson's terminology in *Neuromancer*. So rather than the sin-ridden quagmire or swamp of Christian ontology, or the cunning deceiver of Platonic thought, the body is the organic technology supporting the essential self, which is the mind – the contemporary, high-tech version of Cartesian logic.

My argument is, rather, that clothing is a technology but not a skin. Even when clothing was made of skin, it was not our skin; it was a technology we used to protect, warm and comfort our skin, which is to say ourselves. So the kind of critique we need to understand the significance of smart materials and of the clothing derived from it, is not a bio-politics of embodiment – as it would be if clothing were a form of skin – but a bio-politics of technology.

The importance of this distinction is to be found in the deployment of smart materials - and nowhere more so than in FutureSoldier.

FutureSoldier

FutureSoldier was discussed at the Smart Materials Forum in London in 2006 at which one of the speakers, Colonel Silas Suchanek from the Ministry of Defence referred repeatedly to the needs of 'the biomechanical platform'. Realizing many in the audience were puzzled by this term, Colonel Suchanek explained: "that's what we in the MOD call the contemporary soldier". So for the MOD the contemporary soldier is a piece of contemporary information technology (platform) that is built on and powered by a musculoskeletal system (biomechanical). The MOD's interest in the Smart Materials Forum was to elicit assistance in developing products that would enhance the effectiveness of 'the biomechanical platform'. I don't think I was alone in finding that request quite chilling and my response was not simply a knee-jerk liberal reaction to the MOD's boldly iconoclastic terminology; it was because it constituted the embodied being of the soldier as a piece of technology. Not as an individual embodied subject.

This construction of the soldier enacts Heidegger's nightmare scenario of the standing reserve, whereby human beings are incorporated into a process that treats them as a resource, not as individual subjects with autonomous being. Once that takes place, then those individuals can be used, deployed and disposed of as the process demands. Heidegger described this as instrumental thinking, whereby the technology that we have ourselves designed comes to order our own thinking. It isn't the only possible role for technology, which can also act as a bringing-forth or revealing; that is, technology can be a creative process that reveals the nature of a thing, process or society in the doing, the poetics (or techne).

One of the assumptions that allows or enables this particular use of the technology is that human beings can be considered technology at all - and that this assumption is rooted in the mind/body split deployed as noted earlier to describe the body as the wetware, the platform, which supports the mind - identified as/with the essential self.

The MOD description of the "biomechanical platform" is analogous to the 19th century transformation of the factory worker from a skilled artisan into the "hand" of the machine. That industrial practice caused the deaths and maiming of workers, who were exposed to unsafe machines and work practices until unions were organized to fight for workers' rights.

In the same way many people have concerns about current technologies and their effects on users.

With clothing and associated applications the questions raised are not so much about the immediate aim of the adaptation. Uniforms that incorporate carbon nanotubes that will close around a wound and staunch blood-flow; or inbuilt sensors that can warn the wearer of environmental contaminants; or communication devices that enable the wearer to get help if lost or hurt (which has military and sporting applications) are all positive applications that benefit their human wearers. However, we also need to ask how these potentially beneficial outcomes will be deployed

Ontology

Without context; without a concept of being-**in-the-world**; there is no way to make ethical decisions; to understand the impact of individual and collective actions on societies and cultures (and individual embodied subjects). Bruno Latour writes that this is where science makes itself obsolete, by losing touch with the community it is there to serve. His figure for this is the mind-in-a-vat; the mind isolated from the body that is its being-in-the-world. Worse, for Latour who is a scientist, it's even bad science because it cannot actually account for the reality of scientific and technological research and development.

This notion of contextualised and embodied knowledges is one of the fundamental differences between structuralist and post-structuralist thinking; modernism and postmodernisms; conventional and new science. And it is not reducible, as is sometimes claimed, to accounting for the role of the observer - whether this is a scientist or an ethnographer. It means taking into account the multiplicity of power relations, institutional practices, individual investments, cultural and ideological coercions operating at a particular site - in order to understand why a particular practice occurs and what it means. This is the grounds on which the analysis of smart materials and their applications must take place – in order to both situate their contemporary meanings and impact and to project their future potentials.

So the significance of FutureSoldier goes far beyond the development of a military uniform that is self-healing, wired for communication, has an exoskeleton capable of lifting half a ton, has environmental sensors. All of those capabilities may assist the individual soldier at some stage of her or his performance: however, it does not explain why such capabilities are necessary. Nor does it account for the fact that at the turn of the 20th century casualties in war were 80% military, but at the turn of the 21st century casualties are 80% civilian - in

other words, it is the civilians who need these uniforms, at over a million dollars per suit. It does not address the question of whether the money put into the development of this armoury would be better put into negotiation and learning, so that wars stop happening. The mind-in-a-vat thinking that characterizes the mind/body split does not regard such matters as within its purview; it is isolated from the community, from the body, from life.

And again, this returns us to the MOD's description of 'the biomechanical platform'. This is the point at which the embodied subjectivity of the individual soldier ceases to exist and she/he is incorporated into a military-industrial process as what Heidegger called 'standing reserve' – a source of energy, not an individual embodied subject.

For a number of contemporary designers, however, the development of smart materials has opened up quite different potentials for human engagement. In fact, they are quite specifically engaged by the possibilities smart materials offer for enhancing individual being through interpersonal interaction.

Hugs

One of the most striking examples of recent years is CuteCircuit's Hug Shirt, designed by Francesca Rosella and Ryan Genz and nominated in 2006 for Time Magazine's Invention of the Year, won by YouTube (Grossman 2006). The Hug Shirt is described on the CuteCircuit web site in this way:

> The Hug Shirt is a Bluetooth accessory for Java enabled mobile phones. Hug shirts don't have any assigned phone number, all the data goes from the sensors Bluetooth to your mobile phone and your mobile phone delivers the hug data to your friend's phone and it is seamlessly transmitted Bluetooth to his or her shirt! Sending hugs is as easy as sending an SMS and you will be able to send hugs while you are on the move, in the same way and to the same places you are able to make phone calls (Rome to Tokyo, New York to Paris).
>
> The system is very simple: a Hug Shirt (Bluetooth with sensors and actuators), a Bluetooth java enabled mobile phone with the Hug Me java software running (it understands what the sensors are communicating), and on the other side another phone and another shirt. If you do not have a Hug Shirt but know that your friend has one you can still send them a hug creating it with the HugMe software and it will be delivered to your friend's Hug Shirt!
>
> …

When touching the red areas on your Hug Shirt your mobile phone receives the sensors data via Bluetooth (hug pressure, skin temperature, heartbeat rate, time you are hugging for, etc) and then delivers it to the other person. (CuteCircuit, on-line)

CuteCircuit describe their philosophy via an engagement with human embodiment, referencing the work of phenomenologist, Maurice Merleau-Ponty. For Rosella and Genz the attractive feature of technology is its power to facilitate communication between people and to reinforce interpersonal relationships. So the Hug Shirt is conceptualised as benefiting both the individual and the collective of which that individual is a part. Further they situate the need for bodily contact that the Hug Shirt services within a range of contexts, noting

The Hug Shirt is not meant to replace human contact, but to make you happy if you are away for business or other reasons and you miss your friends and loved ones! It also has some very interesting applications in the medical field with the elderly and children. (CuteCircuit, on-line)

For CuteCircuit the Hug Shirt's contact is always predicated on an existing relationship between self-aware actors; the application is incorporated into a human process, rather than the human incorporated into a technological (military-industrial) process. The Hug Shirt hug is designed to remind the recipient of interpersonal relationships in which they are engaged; to use technology to augment the potential for interpersonal relationships through tactile communication over distance – whereas now we are limited essentially to verbal and visual communication over distance.

Francesca Rosella explained that one of the major properties of the Hug Shirt was its occupation of time - that the sender and user of the hug are both engaged in a specific choreography of space-time. The sender has chosen to initiate the contact and so has taken this time to choose and transmit a specific configuration of hug to the receiver (there is a taxonomy of hugs designed by Rosella and Genz, based on focus group research). The receiver accepts the hug (a step that is necessary to prevent cyber-gropers) and chooses to experience it. Together they create a unique moment of space-time during which they share this experience of the hug. And implicit in this shared experience, too, is the body memory of hugs shared by the pair in the past (personal communication, 2006).

CuteCircuit's invention of the HugShirt is embedded in an understanding of interpersonal relationship, community, and human subjectivity. On their web site they explain their understanding of the role of technology:

Interfaces and systems must be intuitive, natural, and compatible with our

emotional status. Combining emotion and technology should be part of every design process. An increasing mobility of humans throughout the globe, due to business or study reasons, has brought family members to spend most of their time apart from each other. Humans need physical contact with each other. Technology should allow for a pleasant Human-Human Interaction. (CuteCircuit, on-line)

Technology, for them, is meant to augment embodied experience - and they indicate this by reference to the emotions. Their focus is not the technology itself; nor how the technology can incorporate individuals into a system or process. Rather it is how the technology can be used to enhance 'Human-Human interaction'.

Sharon Baurley of Central St Martin's College of Art and Design (CSMCAD) has been working on a similar project – mobile-phone activated clothing that physically caressed the receiver, using tiny pleats that open and closed and warming pads that heated up to give the sensation of human body heat. Like CuteCircuit her experience was that users were delighted with the experience of this technology, again describing this in terms of the communication and shared experience that it enabled. In the words of one of her focus group members:

Just the fact that you are linked, you are communicating and you are linked through several senses. If you are facing someone you have visual, tactile, spoken word, etc. And when you are remote you can't see that person all you have is text, spoken word, but if you can see things are happening to this person at the other end, you feel closer to that person.(Baurley 2006)

This user is quite explicit about the value of sensory engagements, noting that distanced senses like sight and hearing don't create the same intimacy as touch – even, or especially, when that touch is at a distance. This is the mutually choreographed hug that Francesca Rosella described and its function, as for CuteCircuit, is to enhance interpersonal intimacy. Both the HugShirt and Baurley's wearables are designed to enhance the bodily experience of the individual as a member of a social group (family, couple, friendship group, etc) and in so doing to augment or enhance the embodied being of the user – not to transform her or him into a platform for technology.

Jewellery

I want to finish with a few words about jewellery, which is another kind of wearable technology. Wearing jewellery is a deliberate choice; it can't be dismissed as simply essential to going out in public, as clothing might be. So it is already a social and cultural

technology; a way for the individual wearer to construct an identity - create an effect, indicate membership of a group.

Sarah Kettley is an Edinburgh-based jeweller and a practitioner in human-computer interaction, who has used her expertise in computing to create interactive jewellery. She describes her interactive work, *ensemble* in this way*:*

> Participants were invited to try on and play with objects and jewellery, and to comment on how they felt about them on themselves and on others. The feedback this session generated was very rich in terms of understanding the power of lifeworlds to delimit choices in adornment, and gave insight into how proprioception, the feeling of being in our own skin, is changed by the introduction of new objects as actors in the body's space. This data fed back into the design process to inform the build of the final interactive pieces. (Kettley 2007)

Kettley's description locates the jewellery as a technology that alters our body's perception of its own being – in her thinking, through its appeal to the touch sense of proprioception or location in space. She also identifies the choice of jewellery as related to more than the specific piece itself but to what she calls lifeworld, a term derived from the writing of phenomenologist, Edmund Husserl. With this term Husserl was attempting to capture the embodied nature of everyday being, rejecting the split between mind and body that characterized so much of western philosophy. For Kettley the jewellery has the reflexive function of both making the wearer aware of her or his body in space <u>and also</u> of making her or him aware of the role of our social and cultural assumptions in how we use the objects – applications and technologies – that we encounter.

Jewellery is in some ways the limit case for wearables because it is a choice; we can choose not to wear jewellery but not clothes, if we are to function effectively within society. As such it is more obviously a social and cultural technology, which deconstructs the role of clothing as also a technology, even before it is embedded with technological objects and practices. Clothing, like jewellery, is not a skin that covers our skin but a technology that enables us to live in the kind of society we live in - and which effectively is part of creating that society as it is and of creating us as we are.

Technology

The etymology of the word, technology (as Heidegger and others have traced) is two Greek words: *techne* meaning art, skill, craft or the way or manner a thing is gained, and *logos* meaning word or utterance by which thought is expressed. We now commonly use the term

to mean a set of objects and practices (applications) associated with specific disciplines such as computing, nuclear physics and medicine. When we talk of clothing as wearable technology, we generally are referring to this latter meaning, with the understanding that this is clothing that deploys technological objects and knowledge in some way.

But we also have the more politicized meaning of technology, derived from the work of Heidegger and from that of Michel Foucault. This is technology as a set of practices, disciplinary and coercive, that position human beings to act and be in particular ways. And, as this discussion has argued, different uses of technology, creating different kinds of wearables, also generate different ontological possibilities - more or less focused on the embodied being of the individual.

Clothing has always operated as a social and cultural technology, in this politicized sense. It has identified the class, gender, ethnicity, age, and sexuality of wearers, located them within specific sub-groups, created a sense of membership or alienation in the wearer. We can take off and change our clothing, unlike our skin, so it can also be a way of exploring different identities and ways of being; of gaining access to group identity, or declaring oneself independent. The enhancement of clothing's technical capabilities should make us even more aware of its status as a technology – in all senses – and of its potential positioning of us as subjects.

It is, after all, no accident that Heidegger's work on technology is central to both contemporary critiques of technology <u>and</u> to contemporary writings on subjectivity because the two are, and always have been, fundamentally related. The technology of a society defines the possibilities and the potentials for being within that society.

Biopolitics

The biopolitics of smart design must address more than the capacity of a single application or isolated device; it must consider the context in which the application is used and how that context creates potential ways of acting and modes of being for individuals and communities. Wearables have great potential for enhancing human being and human society; in Heidegger's terms they may be a revealing of new possibilities for being. However, they also have the other potential, to become a form of ordering which situates human subjects within a process or practice that suppresses individual creativity and being. The challenge is to remain clear about which technology and design practice we are supporting.

At the 2006 Smart Materials symposium in London the underlying theme for the day was supposed to be ethics, but the ethics was lost amid the excitement about the technology. Technology is seductive; it offers human beings power over each other and the world around them – at least until the individuals and the environment fight back. New technology and new applications can seem inevitable, inscribed within a progress narrative we are helpless to resist. In time they effectively become invisible and their effects on us and the world we live in are not visible to us – at least until a crisis arises. Global warming, for example.

Even the Smart Materials field is already facing its own potential crises. At a recent seminar at the London College of Fashion (12 December 2007) Raymond Oliver of Centre for emerging Nanotechnology, Micro and Photonic Systems (CENAMPS) at Newcastle upon Tyne described his research into the potential problems caused by the premature release of fabrics coated in nanotube materials that might peel away from the fabrics in the wash, attach to other clothing, and subsequently enter the bodies of other wearers (Oliver 2007).

Smart materials may offer us a Brave New World – with all of the ambiguities and complexities that Huxley predicted in his dystopian masterpiece. Which is not a repudiation of technological development. Rather it is a plea for the kind of engaged design for which Latour argued when he put the case for science that is communally-oriented, not the product of mind-in-a-vat thinking. In a sense the abstraction of the mind-in-a-vat is too easy. It is too easy to design technologies that people should fit themselves to or into. To insist that we transform our voices into affectless, robotic voices so they can be read by voice recognition [sic] software, rather than designing software to fit the quirks and inconsistencies and eccentricities – and difference – of human being.

Both FutureSoldier and the Hug Shirt reveal (and deconstruct) contemporary western society and subjectivity – and they also reveal the potential for so much more. Whether that is to be good or bad, and what that value judgment means, is the biopolitics of smart design. The challenge is to develop a biopolitics that, like Kettley's work on jewellery and Baurley's and CuteCircuit's work on clothing, engages with the lifeworlds of wearers as it is from this engagement that even more creative design possibilities may evolve. Furthermore, this engagement may make wearers even more aware of their own individual embodied being, including the social and cultural (including economic and political) factors that influence their choice and deployment of technologies and applications; it can make us, not only our design, smart.

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