4.0 UNDERSTANDING EMERGENT TECHNOLOGIES

Moving on from methodological concerns, this chapter introduces the broadest subject of my dissertation and presents a set of theoretical perspectives that inform my subsequent analysis. In the first section I begin by providing a necessarily selective overview of pervasive or ubiquitous computing as a human-computer interaction research agenda that has spanned the past 20 or so years. Most often characterised as a "post-desktop" computing paradigm that seeks to seamlessly integrate computation into the very fabric of everyday life, early proponents claimed that its effects would be calming rather than overwhelming and frustrating. However, skepticism and criticism almost immediately arose both within and outside the immediate research community. Understood as having the potential to become totalising and oppressive, critiques have generally centred on systemic risks to privacy and other Western civil liberties. However, a small but persistent segment of researchers has more recently advocated a focus on 'seamful' rather than 'seamless' computing, where infrastructure is rendered transparent and interaction is based on user appropriation, as well as a shift from 'calm' to 'engaged' computing, where users are seen as active rather than passive.

Before moving on to the specifics of urban computing and locative media as sub-sets of pervasive computing—the subject of Chapter 5—the remainder of this chapter addresses how sociology might productively engage with such emergent technologies. The second section presents an overview of research in the areas of emergent technologies and actor-network theory, and how they relate to notions of social and spatial complexity. Here I advocate using a combination of

theoretical approaches based on processes of translation, association and transduction, and on metaphors of flow.

The third section builds on this foundation to include a discussion of the role of expectations and affect, as well as the question of temporality, in a research agenda that is primarily oriented towards a proximate or near future. Rather than treating contemporary rhetoric as predictions for the future, ubiquitous computing visions are seen to be most active in ordering present relations. In this final section, emphasis is placed on the actual complexity of the issues and the cacophony of voices that arise around shared concerns. Ultimately, urban computing and locative media are positioned as emergent practices and processes that hinge on tensions between hope and despair over particular technological futures.

4.1 INTRODUCING UBIQUITOUS OR PERVASIVE COMPUTING

Excerpt from *Ubiquitous Computing* Wikipedia entry

http://en.wikipedia.org/wiki/Ubiquitous_computing (Redirected from Pervasive computing)

Ubiquitous computing (or "ubicomp") is a post-desktop model of human-computer interaction in which information processing has been thoroughly integrated into everyday objects and activities. As opposed to the desktop paradigm, in which a single user consciously engages a single device for a specialized purpose, someone "using" ubiquitous computing engages many computational devices and systems simultaneously, in the course of ordinary activities, and may not necessarily even be aware that they are doing so.

In the opening keynote presentation at Ubicomp 2006, science fiction writer Bruce Sterling (2006) explained that ubiquitous computing appealed to him

because of "the majesty of the ideas and the lyricism of the language.” I take this as an aesthetic judgment—but surely a writer also chooses his words carefully, and a list of related technologies, applications, services, and theory objects does seem to suggest impressive scale and imagination:

> Ubiquitous Computing, Pervasive Computing, Mobile Computing, Smart Phones, Wearable Computing, Calm Technology, Spimes, Internet Protocol v6, Invisible Computing, Seamless Computing, Wi-Fi, Ambient Intelligence, Augmented Reality, Mixed Reality, Radio-Frequency Identification, Intelligent Environments, Internet-Of-Things, Physical Computing, Networked Objects, Smart Dust, Things That Think, Global Positioning System, Tangible Media, Mixed-Reality Games, Thinglinks, Body Area Networks, Blogjects, Context-Aware Computing, Cell ID, Spychips, Everyware, Participatory Panopticon, Smart Homes, Ambient Findability, Geospatial Web, Sensing Technologies, Physical Metaverse, Locative Media, Pervasive Play...

But more so, and especially in its inevitable partiality, *this* list demonstrates the complexity I found when I attempted to describe this particular domain of research practice at the end of 2007. As Sam Kinsley (2007) so aptly put it in his geography research blog, "How does one summarise the background to a research project when it makes up an entire research agenda in a different discipline?"

But the people behind the words in the list above include scientists and engineers, governments and policy makers, entrepreneurs and corporations, designers and artists, citizens and activists. If the myth of new technologies being developed solely by experts in laboratories still holds any sway—and there is plenty of evidence to suggest this has never actually been the case—then ubiquitous or pervasive computing may bring about its final demise. Still, for the purpose of this introduction I will concentrate on ubiquitous or pervasive computing as it has been defined by human-computer interaction (HCI) researchers—although it should also quickly become clear that this research community is neither homogenous nor stable.

In a 2001 column written for the HCI research community, Gregory Abowd attempted to reign in some of the complexity hinted at above:

> Do these different names really represent different research agendas? No! We have this proliferation of names because of our individual desires to have an identity as researchers, not because we are looking at very different phenomena. The names we use do not matter. What matters is the overall goal of our separate research endeavors. Rather than argue about the appropriate name for this movement, I want to focus attention on what the research agenda should be about (Abowd 2001:3).

The pursuit of scientific knowledge over individual interests has long been considered one of the ways by which 'good' science is distinguished, although ethnographic studies of laboratories have demonstrated persistent tensions between collective ideals and individual actions in actual practice (see Latour and Woolgar 1986; Traweek 1988; Knorr-Cetina 1999). Abowd's desire to create a shared agenda may be seen as simply pragmatic, but it is also normative and prescriptive. He writes that researchers should abandon their search for the "killer application" and start looking for the "killer existence," or "a suite of applications in service of a population of users" (Abowd 2001:8). In delineating a common research goal, Abowd encourages technologists to create *entire ways of life* rather than singular applications.

This sort of all-encompassing vision is not new to technological roll-out—for example, large technical systems like the railroad profoundly restructured people's understandings of everyday space and time (Schivelbusch 1986)—but its impact on prevailing models of human-computer interaction may evidence a kind of "paradigm shift" (cf. Kuhn 1970) that is of substantial social and cultural relevance. Most notably, by claiming *everyday life* as its purview, things that had formerly been considered the exclusive domain of HCI research became matters of concern for a much broader public and vice versa, a point to which I will return again in the following chapters.

4.1.1 Computing in the 21st century

Mark Weiser's seminal article, "The Computer for the 21st Century," argued that "the most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it" (Weiser 1991:1). He called this vision "ubiquitous computing" and claimed that not only would it liberate people from the constraints of personal desktop computing but, by privileging the social and physical worlds in which we already live, it would free us from equally isolating immersive and simulated virtual reality environments (Galloway 2004a). Weiser envisioned a world in which people no longer interacted with one big desktop computer, but with hundreds of smaller computers embedded in surrounding objects. The aesthetics and ethics of this vision were reiterated in Weiser's "The World is not a Desktop":

> The clock, and the clockwork machine, are the metaphors of the past several hundred years of technology. Invisible technology needs a metaphor that reminds us of the value of invisibility, but does not make it visible. I propose childhood: playful, a building of foundations, constant learning, a bit mysterious and quickly forgotten by adults. Our computers should be like our childhood: an invisible foundation that is quickly forgotten but always with us, and effortlessly used throughout our lives (Weiser 1994:8).

And again in Weiser and Seely Brown's (1997:75) prediction of "the coming age of calm technology":

> Information technology is more often the enemy of calm. Pagers, cellphones, news-services, the World-Wide-Web, email, TV, and radio bombard us frenetically. Can we really look to technology itself for a solution? But some technology does lead to true calm and comfort. There is no less technology involved in a comfortable pair of shoes, in a fine writing pen, or in delivering the New York Times on a Sunday morning, than in a home PC. Why is one often enraging, the others frequently encalming? We believe the difference is in how they engage our attention. Calm technology engages both the *center* and the *periphery* of our attention, and in fact moves back and forth between the two.

In Weiser's view, by the late 1980s information technologies had already encroached enough on the quality of people's everyday lives that something needed to be done. This opinion was not uncommon at the time, and many had begun to call for respite from 'information overload' (cf. Toffler 1970; Klapp 1986). But contrary to the kind of 'common sense' that would call for less information, Weiser and Seely Brown suggested that people be provided with access to *more* information and, crucially, the ability to have that information at the periphery rather than the centre of our attention.

> The result of calm technology is to put us at home, in a familiar place. When our periphery is functioning well we are tuned into what is happening around us, and so also to what is going to happen, and what has just happened. We are connected effortlessly to a myriad of familiar details. This connection to the world around [us] we called 'locatedness,' and it is the fundamental gift that the periphery gives us (Weiser and Seely Brown 1997:77).

The desire to have computing so seamlessly and efficiently embedded in our daily lives is grounded in a profoundly utopian vision connected to cultural and historical notions of technological 'progress' (see Rescher 1980; Lightman, Sarewitz and Desser 2003). It follows a long tradition of technological 'solutions' to social 'problems' or cultural 'needs,' and is allied with the promise of techno-science to improve our quality of life—despite the tendency of technology to reinforce prevailing power relations (Wajcman 1991; Silverstone and Hirsch 1994; Oldenziel 2004).

But it can also be seen as a reaction to failed technologies and actual lived dystopias. The rhetoric favoured by Weiser and Seely Brown is highly evocative

and emotive—if feeling overwhelmed or abused by technology, who would *not* prefer something familiar and calming? This early vision of ubiquitous computing seemed to care for people and it is not difficult to imagine why researchers would want to pursue such a goal. Of particular interest is their emphasis on the value of feeling *located*. Given the particulars of post-911 surveillance (Lyon 2003) and the wide-spread consumer availability of Global Positioning System (GPS) devices today, it is easy to imagine that being located means being *tracked*. But the repeated insistence on the calming effects of this 'new' kind of computing suggests that Weiser and Seely Brown likely meant feeling *grounded*. Quite distinct from artificial intelligence research into machine ability to recognise and process human emotion (cf. Picard 1997), this is affective computing in two interconnected senses. First, it is 'becoming' technology and, second, it seeks to move us.

EXCERPT from *purse lip square jaw* by Anne Galloway

http://www.purselipsquarejaw.org/2004/09/questions-about-ubicomp-and-other.php

Friday, September 10, 2004

Questions about ubicomp and other tales of ordinary madness
Emily Zak is currently researching ubiquitous computing and invisible interfaces at the University of London, and she recently asked me to answer some very complex questions. I've posted some thoughts below:

Emily: With a lack of consensus about what ubiquitous technology is - pervasive, ambient, tangible interfaces, 'Calm Computing,' 'Transparent Technologies' - in your view what is ubiquitous or pervasive computing, where is it located or how is it mediated?

Anne: I'm partial to the terms ubiquitous and pervasive because they get at, what is to me, the core of the mythology: a design and engineering paradigm based on the assumption that computing can, and will, be distributed everywhere (i.e. not just on the desktop). Currently it is, by-and-large, located in laboratories and universities in the

developed world. What I mean is that ubicomp isn't out-there-in-the-world-with-people yet, and likely won't be for decades to come, if it ever manifests itself as projected.

But this question of ubiquity is complicated and should be unpacked a bit. Unfortunately, Weiser's choice of the word "invisible" seems to be responsible for so much confusion; I don't think it was ever meant to be taken literally. The legacy is that ubicomp still tends to be discussed in terms of "seamless" interfaces, despite Weiser's clarification that "seamfulness" would be rather important. Researchers like Matthew Chalmers have tried to revive this concept, but it's a bit unclear to me what that might actually involve. It also seems to conflict with massive funding programmes like the EU's Disappearing Computing initiative.

Recently I've also noticed a shift away from describing ubicomp as allowing "anywhere, anytime" information, and towards getting people "the right information at the right time." A subtle difference but, I think, evidence that we are starting to understand that total ubiquity - or "always-on" computing - is not only technologically difficult, if not impossible, but also socially undesirable. Nonetheless, I think the obsession with "information" still misses Weiser's point about the importance of people.

Emily: Mark Weiser and others describe the drive toward ubiquitous computing as humane - with computers "getting out of the way." Are there assumptions being made about what is innately human and not-human activity and what is the everyday?

Anne: Weiser said that computers needed to move from the centre to the periphery of our attention, and this is, I think, the type of invisibility he imagined. The problem, as he understood it, was that desktop computers are somehow dehumanising, that they isolate us and take too much away from our quality of life. Of course there are assumptions being made in these scenarios about what computers, people and everyday life are - that's one of the things about ubicomp that interests me the most - and these assumptions rarely, if ever, get questioned.

The types of socio-cultural theory and method most often used within the human-computer interaction community include ecological or systems approaches, ethnomethodology and phenomenology. It is not coincidental that all these ways of thinking are ontologically and epistemologically compatible with the general principles of cybernetics - among other things, it makes translation between (and enrollment among) the necessary players much easier.

On the other hand, studies in science, technology and society, as well as cultural studies, critical theory and continental philosophy, including feminist theory, have challenged these ways of understanding human (and human-computer) interaction. Researchers like Donna Haraway, Manuel de Landa, Bruno Latour, and Lucy Suchman have been instrumental in these critiques of technoscience - but the body of relevant literature is huge and I won't get into it here.

Emily: How do concepts of intelligent technology, or discourses increasingly mediated by such technologies, challenge the assumption and primacy of human agency and pose ethical and philosophical questions about the nature of agency and intelligence? Further, how do embodied or situated practices, and networks of agency maintained at the sites of innovation, laboratories and research centres, influence the development and application of new media socio-technologies?

Anne: My own research draws a great deal from the work of people like Latour (especially for his notions about collectives of humans and non-humans), Adrian Mackenzie (for ideas about transduction, space and culture), and Deleuze & Guattari (for notions of mobility and becoming). One thing they all have in common is a blurring of the traditional boundaries between subjects and objects, which automatically reframes the issue of social agency.

Lucy Suchman has written about situated accountability, which suggests some sort of contextual (perhaps bottom-up) ethics will be necessary, but I do tend to agree with Latour that we are far from having a political and ethical position that is adequate for the interconnectedness conjured by his collectives, and technologies like ubicomp. In a world where we still argue about whether it is guns or people that kill people, I'm not quite sure what it will mean - in practice - when we say that neither guns nor people kill, but rather it is an assemblage that can be described as a person/gun that kills.

Connect this to the matter of spatial practice and things get even harder to pin down. I draw mostly on notions of flow - from Deleuze, to Rob Shields, to John Law - in my research. In this way we must also deal with the question of time, and it becomes difficult to say that innovation is maintained at any particular site as, in practice, it flows through many sites.

posted by Anne at 15:14

4.1.2 Seamless versus seamful computing

> *[T]he social impact of embedded computers may be analogous to two other technologies that have become ubiquitous. The first is writing, which is found everywhere from clothes labels to billboards. The second is electricity, which surges invisibly through the walls of every home, office, and car. Writing and electricity become so commonplace, so unremarkable, that we forget their huge impact on everyday life. So it will be with [ubiquitous computing]" (Weiser and Seely Brown 1997:36).*

While heroes and father-figures like Mark Weiser are still prevalent in techno-scientific cultures, it is also generally acknowledged amongst practitioners that 'breakthroughs' and 'innovations' are not the product of a single person in a single place and time, but the effect of what has been called distributed or collective intelligence (Johnson 2002; Hight and Perry 2006). A vision of "invisible" (cf. Norman 1998) computers has been remarkably influential in the

past decade or so of computing research and design, and has not been limited to the kind of "ubiquitous computing" that Weiser and Xerox Palo Alto Research Center (PARC) researchers advocated. Since the late 1980s and early 1990s, researchers at places like IBM have been working on "pervasive computing" and academics like MIT's Hiroshi Ishii have been working on "seamless interfaces between people, bits and atoms" or what are sometimes called "tangible media" (Ishii and Ullmer 1997). The reinterpretation of Heidegger's (1996) "ready-to-hand" technology can also be seen in "ambient intelligence" (Aarts and Marzano 2003) research and any number of consumer-friendly "smart home" projects. Additionally, since 1998 "The Disappearing Computer Initiative"—part of the European Union's Future and Emerging Technologies Research Programme—has generated almost two dozen, well-funded exploratory research projects with the initial objective:

> To explore how everyday life can be supported and enhanced through the use of collections of interacting artefacts. Together, these artefacts will form new people-friendly environments in which the computer-as-we-know-it has no role. The aim is to arrive at new concepts and techniques out of which future applications can be developed (http://www.disappearing-computer.net/).

This focus on networked and context-aware objects is central to "seamless" computing, both in terms of making it possible in the first place and then offering a necessary corrective. As Weiser and Seely Brown (1997:35) so bluntly put it, "if computers are everywhere they better stay out of the way and that means designing them so that the people being shared by the computers remain serene and in control."

In order for computers to 'do the right thing' in this kind of interaction model, they must be able to sense their surroundings and they need to communicate with other computational objects. This kind of computational *reach* has made "seamless" or "invisible" computing a primary target for privacy advocates—at least in the North American and European cultural settings I have described so far.

Excerpt from *Intel Research Blogs* by Roy Want

http://blogs.intel.com/research/2007/10/youre_not_paranoid_they_really.php

October 17, 2007

You're Not Paranoid; They Really Are Watching You!

The work I am best known for from the '90s is the Active Badge project, which set out to find a way to automatically route telephone calls to the correct place in a building. To a new generation of researchers, this probably seems like a no-brainer; just buy everybody a cell phone!

However, at the time, there were no cell phones, and business phones were almost exclusively based on a Private Branch eXchange service (which many organizations still use). I wanted to automate the process of call-forwarding from an employee's default extension to the extension closest to the person's location. The solution I came up with was to have everybody wear an electronic badge that periodically beaconed a unique infrared signal. A network of low-cost infrared receivers distributed throughout the building would then record the signal, and a central server could collect all the data. A simple network service would let clients enter a name and look up the corresponding badge ID to determine the station where it was last sighted, along with the corresponding room and nearest extension.

As soon as we had built the system, we realized it was part of a far bigger pervasive computing story—thus the notion of context-aware computing was born. As you might expect, when shown publicly, the privacy issue was the main discussion point, inspiring a host of press articles with sensational titles such as "The Boss That Never Blinks" (*San Jose Mercury News*, West Magazine, 8. Mar. 1992) and "Orwellian Dream Come True: A Badge That Pinpoints You" (*The New York Times*, 12 Sept. 1992). Furthermore, all

reporters inevitably asked if we had sensors in the bathrooms and almost seemed disappointed when we told them we didn't. Despite the external jibes at this location capability, the majority of my colleagues weren't deterred from wanting—and proudly wearing—the badges. On the whole, they viewed the project as breaking new ground and embracing the ubicomp vision. Displaying a badge meant you were "in" because ubicomp was "in." The system was certainly useful, but I'm not sure it would have been as successful without the implication that you were also helping to build the ubicomp vision. After all, it contributed to a loss of personal privacy in the office, and individuals might not have considered the value-to-cost trade-off to be worth it. It's hard to know without a control experiment.

The lesson I learned is that our interpretation of right-to-privacy in the context of a new technology is very variable. What makes technology a good or bad thing is dramatically affected by the social setting in which it is used. In other words, there's no absolute standard for privacy that we can record in a rule book and follow when designing something new.

posted by Roy Want

While Want, in the excerpt above, makes it sound as though it was only journalists who had privacy concerns, and computer scientists were only eager to be part of such popular research activities, Stephen Doheny-Farina (1994) and David Porush (1995) wrote cautionary columns about ubiquitous computing for *Computer-Mediated Communication Magazine*. Doheny-Farina (1994:18) worried about the "Orwellian nightmares" that could accompany such intrusive technologies and named four principles to guide future development:

1. The normal state of anyone's computers is OFF.
2. The normal state of anyone's relationship to computer networks is UNCONNECTED.
3. The normal state of knowledge about the location of anyone is UNKNOWN--whether connected or unconnected.
4. Connectivity and location is private information that must be protected by both technological and social policy mechanisms.

Porush (1995:46) was concerned that people would not be able to 'opt-out' of such a world:

> None of Weiser's reassurances that the technology will be implemented only with willing participation reassure me. I know how culture and technology conspire to make non-participation virtually impossible.

But he also disagreed with Doheny-Farina's assumptions:

> If we imagine—shudderingly—some future state where ubicomp is a reality and the rule, then these propositions effectively mean that the *normal state* of citizenship is ANONYMITY and INVISIBILITY. I would argue that such assumptions do more harm than good. Perhaps this is the dark end state of our American obsession with privacy, universal paranoia, but I think it is aberrant and threatens the more valuable and enduring notions of community. The normal state of our self in the community, I would suggest, is ON, KNOWN and CONNECTED ... Frankly, I think trying to protect a theoretical freedom to be lost by suggesting it is the normal state of relationship to the society at large is a form of capitulation to the totalizing and dehumanizing aspects of communications technology ... I'll take my chances with Big Brother rather than face a society whose assumption is that its citizens are monads, atoms, or hermits. Beyond that, there is a lesson to learn about projecting our local and history-bound values onto other cultures, even our own culture of the future (Porush 1995:46).

We will return to concerns about citizenship and publics in subsequent chapters, but for now what is of interest is Weiser's (1995) response. Ultimately, he side-stepped either of their concerns by suggesting two "principles of inventing socially dangerous technology":

1. Build it as safe as you can, and build into it all the safeguards to personal values that you can imagine.
2. Tell the world at large that you are doing something dangerous.

While both assume the inevitability of technology, Weiser recognised that the first principle cannot offer any guarantees and chose to focus more on the second. As part of the aesthetics and ethics of ubiquitous computing, he advocated active

engagement with the issues, a "pulling, pushing, and throwing one's weight into composing the life and culture we lead and will lead in the future" (1995:17)—another matter to which we will return later, as it relates to the multiple publics mobilised around and through pervasive computing.

The same year, at the 1995 ACM Conference on Computer Science, Augustin Araya weighed in on the debate by pointing out that if the "real potential" of information technology could be found in a more socially-aware ubiquitous computing, as Weiser and his colleagues argued, then this potential might be best understood as:

> the power of a technology for expanding itself beyond the limits within which it is currently confined and for unfolding itself to its highest possible degree... [I]n opposition to many other technologies, Ubiquitous Computing is not seen as penetrating circumscribed areas of activities but aims at revolutionizing everyday life itself. In so doing, Ubiquitous Computing is attributing to the unfolding of technology the *right* to drive by itself the way in which certain aspects of everyday life are lived ... [Accordingly] we characterize the thinking underlying Ubiquitous Computing as an emerging form of technological absolutism [and] *an attempt at a violent technological penetration of everyday life* (Araya 1995:236-237 emphasis in original).

Araya (1995:234) further associated ubiquitous computing with an "obliteration" of *otherness*:

> When a book, a person, or any other 'thing' has attached to it a visible or invisible tag which, in conjunction with a ubiquitous surveillance mechanism constitutes what we may figuratively call an 'electronic leash,' the thing has lost some of its otherness. Although in many senses it remains an other, it has lost a fundamental property, namely, the possibility of becoming lost. If due to a malfunctioning of the surveillance mechanism the thing eventually becomes lost, this would only have the character of an anomaly. Normally, the thing is always under surveillance. But things would partially lose their otherness in a more fundamental way. When the surveillance mechanism fades into the background and we are no longer able to experience it, things in general – not just this manual or that tool or those employees – would have been transformed becoming

> for us surveillable things, whether we effectively subject them to surveillance or not. A fundamental category that governs our dealings with the world would have been deeply altered.

Additionally, because everything that is to be disseminated through ubiquitous computing networks "must be mapped into analog or digital signals," Araya (1995:235) suggested that "electronic surrogates" would come to stand-in so successfully for the things that *cannot* be disseminated electronically, that people would forget there is an 'other' world at all.

This question of 'otherness' is particularly important to those interested in social and cultural relations. Just over a decade after Araya first voiced these concerns, the everyday use of mobile technologies has become characterised by a sense of perpetual connection to people, places and things that are already familiar to us. In an early 2008 *Economist.com* special report on "digital nomads" (http://www.economist.com/specialreports/displayStory.cfm?STORY_ID=10950394) sociologist Manuel Castells explains that "permanent connectivity, not motion, is the critical thing" and numerous studies (see for example Katz and Aakhus 2002; Ling 2004; Ito and Matsuda 2005; Ling and Pedersen 2005; Kavoori and Arceneaux 2006) have demonstrated that mobile phones have become instrumental in maintaining "strong ties" but far less successful in supporting "weak ties" (cf. Granovetter 1973). I will return in depth to the question of how urban computing and locative media stand to reshape our experiences with 'others,' as well as related matters of cosmopolitan and cultural citizenship, in Chapters 5 and 6.

Returning to Araya's comments we can see that they share much in common with established phenomenological critiques of technology by the likes of Heidegger (1996), Gadamer (1981) and Idhe (1990), as well as contemporary surveillance studies inspired by both Foucault's disciplinary society (1977) and Deleuze's control society (1997). However, Araya's bold—if a bit reactionary—critique of ubiquitous computing seems to have passed largely unnoticed (or unheeded) by the human-computer interaction research field. One could even make the case that the social and cultural implications of ubiquitous or pervasive computing did not again emerge in HCI discourse with any force until five years later, and it took almost another five years after that before anything like Weiser's "pulling, pushing, and throwing one's weight into composing the life and culture we lead and will lead in the future" became part-and-parcel of ubiquitous and pervasive computing discourse.

EXCERPT from *fredshouse.net* by Gene Becker

http://www.fredshouse.net/archive/000307.html

October 14, 2004

Is Dog Walking Better With Ubicomp?

I'm trying to figure out places in my life where ubicomp would be good to have, and I keep drawing a blank. This may be a failure of imagination on my part, of course. But still, I'm trying. Tonight for example, I was walking my dog Snoopy in the neighborhood, and trying to dream up ways that pervasive tech could make it a better experience.

Well here's the reject list:

1. A leash that displays a real-time news crawl along its length.
2. Wi-Fido self-organizing wireless mesh network deployed on local dogs.
3. An historical guide to my street, annotated by my neighbors, with contextual sponsor

ads for dog food, dog sweaters, and local dog walkers.
4. Sensor- and actuator-enabled trees that pee back.
5. A wearable eyepiece that shows textual and visual information about the moon and stars and houses and bushes, overlaid on my normal field of vision.
6. Sensate sidewalks that tell my doctor how much I weighed tonight after dinner, and how far I walked.

Here are some that could maybe have a tiny little shred of merit, or at least would be kinda cool:

a. Trees and buildings that glow in phosphorescent shades and patterns and then fade as we walk past them. Maybe a little sound as well, if it makes the experience more beautiful.
b. A wearable eyepiece that allows me to see in new modalities, for example a time-lapse view of which animals passed by here and left the apparently maddening scent trails my dog is obsessing over. Or maybe a view that simulates the visual equipment of the dog, so I can see what he sees.
c. Something like Anne's forgetting machine, so I'm not reminded of all the urgent and important stuff on my various to do lists and can thus have hope for a good day tomorrow.

Now here's a test: which ones do you think we're more likely to get?

posted by Gene at 11:40 PM

Explicit attempts to deal with critiques of "seamless" computing came when researchers began recalling Weiser's brief mention of "seamful" interaction, with "beautiful seams" (see for example McColl et al. 2002) and suggesting more visibility for ubiquitous infrastructures and interfaces. For example, after observing users that took advantage of technological glitches like spotty wi-fi coverage and GPS shadows, researchers concentrated on how technological 'failures' could become interaction 'successes':

> Seamfulness is about taking account of these reminders of the finite and physical nature of digital media. Seamful design involves deliberately revealing seams to users, and taking advantage of features usually considered as negative or problematic (Chalmers 2003:1).

Arguing that designers have often accommodated their designs to the available working technology, Chalmers (2003:3) favours design that ensures users can appropriate the technology for their own ends: "Rather than supporting seamless connection and access of devices and services, [one] approach is to enable users to discover and manipulate devices, services and their interconnections." Consistently, he and his colleagues have promoted "designing for appropriation" as a means to empower users of pervasive computing (see also Galloway et al. 2004).

Along related lines, fifteen years after Weiser's seminal article on computing in the 21st century, Yvonne Rogers (2006) claimed that it was time for researchers to "move on" from his vision of "calm" computing. She argued that by focussing almost exclusively on the kind of context-awareness (see Moran and Dourish 2001; Dey 2001; Chalmers 2004; Dourish 2004) necessary for such a vision of computing to succeed, researchers have become overwhelmed by problems that may not have solutions, and all at the expense of other areas of research. She presents a future world where "coziness, comfort and effortlessness" may reign, but suggests that *living* would only ever be at a distance:

> It is as if she glides through life, where everything is done or laid out for her and whenever there is potential for frustration, such as a traffic jam or parking problem, the invisible computers come to her rescue and gently inform her of what to do and where to go. It is worth drawing an analogy here with the world of the landed aristocracy in Victorian England whose day-to-day life was supported by a raft of servants that were deemed to be invisible to them (Rogers 2006:4).

Instead of embedding computation in the environments and objects around us in order to reduce the amount of interaction we have with them, Rogers advocates an approach where

> technologies can be designed to augment the human intellect so that people can perform ever greater feats, extending their ability to learn, make decisions, reason, create, solve complex problems and generate innovative ideas... [as well as] causing us to reflect upon and think about our interactions with them ... Such toolkits should not need an army of computer scientists to set up and maintain, rather the inhabitants of ubiquitous worlds should be able to take an active part in controlling their set up, evolution and destruction (2006:8-9).

This focus on socially engaging, and engaged, technology also appears in Adam Greenfield's second and fifth principles of ethical pervasive computing development, where systems should be *self-disclosing*: "Ubiquitous systems must contain provisions for immediate and transparent querying of their ownership, use, and capabilities" and *deniable*: "Ubiquitous systems must offer users the ability to opt out, always and at any point" (Greenfield 2006). Interestingly, all these recent critiques share much in common with the ones from the mid 1990s described above, but cite none of them as precedents.

4.2 A MOBILE SOCIOLOGY

What I have presented so far in this chapter is a partial account of the values, and critiques, of a *vision* of ubiquitous computing that has been more or less active over the past 20 years. But before I get into the specifics of urban computing and locative media, I want to step back and take a closer look at how we might approach the question of such emergent technologies from a sociological perspective. Given that social studies of science and technology are both well-

established and diverse (see Hackett et al. 2007 for a current overview), I will limit my discussion here to research in the areas of emergent technologies and actor-network theory, and how they relate to what has been called the "complexity turn" (Urry 2005) in sociology—as described in Chapter 2, Section 2.1. The rest of this chapter, then, focusses on how sociologists might productively engage with, and understand, technosocial assemblages as they take shape in space and time.

4.2.1 Translations and associations

Beginning with actor-network theory, or what started as a "sociology of translation," Michel Callon (1986) outlines four moments of translation in scientific research that can help us understand how technologies emerge: 1) *problematisation*, or how ideas and things become indispensable; 2) *interessement*, or how allies are locked into place; 3) *enrollment*, or how roles are defined and coordinated; and 4) *mobilisation*, or how issues are represented to others. The first 'moment' is a double-movement in which a research problem is identified and, more importantly, associated with particular sets of actors. Rather than being reductive, these problematisations comfortably combine humans and non-humans in complex ways (cf. Latour 1999). However, problematisation involves claiming it is in the interests of all the actors for the research to proceed, and the identities of the actors are defined in ways that make the researchers indispensable. Callon calls these material and semiotic associations "obligatory passage points" and notes that problematisation depends on "movements and

detours that must be accepted as well as alliances that must be forged" (Callon 1986:220). The second 'moment' involves submissions to the original plan and refusals to accept the proposed transaction. During periods of *interessement*, actors form and reform identities, orientations and objectives, and their actions attempt to define and stabilise relationships between actors. These actions and devices can be forceful, seductive, practical, and so on, depending on the situation.

Not all problematisations result in enrollment, but if the *interessement* is successful then the actors move to define, coordinate and enroll themselves and each other into particular roles. "To describe enrollment is thus to describe the group of multilateral negotiations, trials of strength, and tricks that accompany the *interessement* and enable them to succeed" (Callon 1986:222). As one might imagine, these devices and actions are of particular interest as this is how relations or associations change and remain the same. And of course, at stake in these scenarios are relations of power; assemblages of identities and objectives are often competing and contradictory.

Negotiations that take place during problematisation, *interessement* and enrollment invariably involve more individuals than a given assemblage claims to, and indeed is able to, represent. This question of representation, or who speaks on behalf of whom, is of clear social, political and ethical concern, and Callon (1986:223) reminds us that this situation also raises the crucial question,

"Will the masses follow their representatives?" If 'spokesmen' (i.e. people, things and ideas) are designated by putting "intermediaries and equivalences" into place, then looking at these things also allows us to see who and what are silenced or denied a place on the playing field.

To reiterate, participating humans and non-humans are displaced and transformed in these processes of representation. Continuing negotiations between the representatives seek to mobilise and commit absent or silent actors, and if the mobilisation is successful then these relations will be accepted as 'real' and sometimes even 'normal.' This mobilised reality—otherwise known as an actor-network—is

> ... a result of the generalized negotiation about the representativity of the spokesmen. If consensus is achieved, the margins of the maneuver of each entity will then be tightly delimited ... But this consensus and the alliances which it implies can be contested at any moment. Translation becomes treason (Callon 1986:225).

If translation is a process always already involving instability, displacement and contingent ordering, a sociology of translation might also productively be referred to as a sociology of association (Latour 2005), a point to which I will return shortly.

4.2.2 Transduction and other complexities

Despite this knowledge, many theories of technological innovation—and visions of ubiquitous computing—seem to maintain an almost contradictory sense of consistency and coherency. Part of this stems from the tendency to discuss new

technologies as representational objects or artefacts, rather than as performative "practices, arrangements and ensembles…which permit certain objects to materialize or solidify and not others" (Mackenzie 2003:3). As information technologies become more pervasive in everyday life, the analytical usefulness of more relational concepts becomes evident, and the concept of transduction provides a further means to refocus our investigations towards performative understandings of technological practice:

> Transduction provides a way of thinking about technologies processually, that is, as events rather than objects, as contingent the whole way down, rather than covering over or reducing contingency … It proposes that both normalizing and generative capacities of technologies can be understood as a process of individuation, as an ontogenetic process which results in individuated things and which involves both ordinary and singular events. Much of what is represented as 'new' is in fact the capture and containment of the processual mode of existence in technology (Mackenzie 2003:4-5).

Applied to ubiquitous or pervasive computing, the concept of transduction allows us to shift our focus from networked objects or artefacts to diverse procedures or performances in which socio-technical assemblages or associations take shape. The primary benefit of this sort of approach is the ability to identify precise moments and locations in which we can intervene and alter the course of events, thereby revitalising the role of social and cultural agency—and the potential for critiques of everyday life—in the development and use of new computing technologies (Galloway 2004a).

Drawing out some of these connections between mobility and stability, Mackenzie (2002) further suggests that technicity (following Simondon) is a transductive way of understanding technology in terms of flow and movements

between abstraction and concreteness, or virtuality and actuality. These and related ontological categories—the virtual, concrete, abstract and probable—have also been explored in terms of intensities and flows by Shields (2003), and the notion of technicity focusses our attention on these fluid relations and a sense of becoming.

> Beyond technical objects, technicity inheres with the relationality of the ensembles or assemblages composed of bodies, institutions, conventions, representations, methods and practices. Read transductively, technical objects evolve over time by articulating diverse realities with each other. Technicity is a transcontextual linkage which can be objectified in context-limited ways, but also exceeds its objectification, stabilization or immutabilization (Mackenzie 2003:18).

Put differently, any given application of ubiquitous technology may be understood to comprise its contexts of research, development, manufacture, sale, implementation, use and eventual disposal. Shifting socio-technical arrangements are negotiated in particular space-times, and it becomes impossible to reduce pervasive computing to discrete (or stable) objects of computation—or to singular representations. And so, in order to begin to understand urban computing and locative media transductively, we must seek out their intimations, or what Van Loon (2002) calls "shadows and resonances," and begin to trace their flows.

Latour (2005:108) argues that actor-network theory is unique in science and technology studies in part because of its methodological stance that the social is "to be explained rather than providing the explanation." Put another way,

Latour's actor-network theory—a sociology of associations—is more properly a methodology:

> [The] 'social' is not some glue that could fix everything including what the other glues cannot fix; it is *what* is glued together by many *other* types of connectors ... [However] it is possible to remain faithful to the original intuitions of the social sciences by redefining sociology not as the 'science of the social,' but as the *tracing of associations* (Latour 2005:5).

Integral to these associations are non-linear movements and changes in trajectory, as well as path-dependencies and obduracies, all of which are particularly difficult to trace during the early stages of a technology's development without also turning to research on global spaces of complexity (Thrift 1999; Urry 2003).

In what Urry (2005:1) calls the "complexity turn" in sociology, "there is a shift from reductionist analyses to those that involve the study of complex adaptive ('vital') matter that shows ordering but which remains on 'the edge of chaos'"—a position which recalls Deleuze and Guattari's (1987) de-territorialisations and re-territorialisations, Law's (2004) perspectives on messes and Latour's enthusiasm for a radical uncertainty that "tackles active, warm and extreme situations" where "controversies unfold all the way" (2005:25). A multi-scale approach—in which the global confronts the local (Ingold 1993) and the macro-micro distinction is replaced with a focus on connections (Urry 2003:122-23)—becomes necessary if I hope to trace particular associations and ultimately represent them here as the infra-reflexive, pleated texts born of "nomadic writing practices" (St. Pierre 2002:59) that I described in Chapter 2.

4.3 EXPECTATION, AFFECT AND THE QUESTION OF TEMPORALITY

Compounding the challenges laid out above, to study urban computing and locative media at this point in time is still largely a future-oriented activity. That does not mean that they do not yet exist, but rather that they act in the present primarily as imaginings or visions of a "proximate future" (Bell and Dourish 2007). For my purposes then, a sociology of translation or association must also become a sociology of expectations.

Just as actor-network theory (Law and Hassard 1999; Latour 2005) has, during the past decade or so, grown in influence both within and beyond science and technology studies, the constitutive, performative and generative qualities of social expectations have increasingly been recognised as playing important and intriguing roles in technological innovation (Brown et al. 2000; Hedgecoe and Martin 2003; Brown and Michael 2003; Borup et al. 2006;). Technosocial expectations are considered to be highly situated in the sense that they occupy particular spatial geographies and demonstrate particular temporal patternings. And yet, as Borup et al. (2006:293) explain, "expectations play a central role in science and technology not least because they mediate across boundaries between different scales, levels, times and communities."

EXCERPT from *fredshouse.net* by Gene Becker

http://www.fredshouse.net/archive/000227.html

August 19, 2004

Why Isn't Ubicomp Sexy?

It's a well-documented phenomenon that new media technologies are fertile ground for sex-related applications; consider the VCR, personal video cameras, cable TV, CD-ROM, MUDs, Usenet, the web, streaming video, mobile phones, and so forth. So if ubicomp is the next great revolution in computing, architecture, media, life, the universe, and everything, how come there's no ubisex?

This is a family show, so I don't want this to seem gratuitously prurient. Nor am I advocating for an expansion of the smut industry into this new territory, given the questionable ethical and moral dimensions of the skin trade. However, I am actually curious if this is a salient question about the state of ubiquitous computing. Does the lack of an erotic underground tell us anything significant about the characteristics of today's ubicomp visions, architectures and designs? The sex industry is creative, entrepreneurial, and quick to recognize new ways to reach into people's lives and wallets. Frequently it is an early if unacknowledged pioneer for mainstream media technology practices and business models. If there aren't any sexual applications for ubicomp now, will there be compelling mainstream applications later?

Maybe ubicomp isn't the right kind of medium. Storage and networks are distribution media, so they have obvious applicability for carrying content of any variety; pr0n just happens to be the early adopter flavor. But ubicomp isn't simply a carrier of bits, it is an embedding of computing and communications into the fabric of life. Nobody expected cars, toasters and alarm clocks to become erotic when digital electronics were designed into them, and maybe ubicomp is more like that – a layer of functionality more mundane than amative.

Maybe it's too early. There are almost no commercial ubi-products, and thus no real channel exists yet for delivering the goods and taking money in return. Ubicomp is still the domain of researchers, and the corporate, government, and university funding sources that support most such research aren't going to be leading the charge in this direction. Museum guides, elder care, memory prosthetics and ornithology, for sure. But how about teledildonics? I'm sure there's scope for some very stimulating work in networked wearables and tangible media, but not under *my* NSF grant, thank you.

Then again, maybe we haven't reached the right level of sophistication in our thinking about ubicomp's potential imprint on the sensual fabric of society. I like to think that one of the great applications of ubiquitous computing will be immersive, social storytelling, where communities of people will build persistent, multisensory story environments that combine audiovisual tapestries of media, many to many communication, and physical talismans and places, into deeply engaging experiences. It would be a true new medium, with potential for great expressive power.

Within such a medium, I suspect we would find strong new modes of erotic expression. Ubicomp could be more than just another vehicle for the repetitive, exploitive and profane depictions of sex that are so common today; ubicomp could become *sexy*, in the best and most powerful sense of the word.

posted by Gene at 11:48 PM

A sociology of expectations looks to the affective roles of imagination and desire (i.e. the capacity to be moved) in shaping technological change. Like the complex relations hinted at earlier, expectations are generative in the sense they:

> ...guide activities, provide structure and legitimation, attract interest and foster investment. They give definition to roles, clarify duties, offer some shared shape of what to expect and how to prepare for opportunities and risks. Visions drive technical and scientific activity, warranting the production of measurements, calculations, material tests, pilot projects and models ... They play a central role in mobilizing resources both at the macro level, for example in national policy through regulation and research patronage, and at the meso-level of sectors and innovation networks, and at the micro-level within engineering and research groups and in the work of the single scientist or engineer (Borup et al. 2006:286).

And expectations are performative in the sense that they attract interest from potential allies, define roles, and "build mutually binding obligations and agendas." As a sociology of translation would also have it, expectations are "central in brokering relationships between different actors and groups" (Borup et al. 2006:289), and this scenario raises interesting questions about relations between imagination, materiality and embodiment in technological innovation. It also explicitly ties expectations to affect, as affective contagion (or lack thereof) increasingly plays a central role in processes of translation.

EXCERPTS from *Gumption* by Joe McCarthy

http://gumption.typepad.com/blog/2006/09/ubicomp_2006_da_1.html

September 21, 2006

UbiComp 2006: Day 2

Yvonne Rogers, soon-to-be formerly-associated-with Indiana University, gave the most provocative presentation of the day, on "Moving on From Weiser's Vision of Calm Computing: Engaging UbiComp Experiences", in which she revisited the original vision of Mark Weiser for calm computing, reviewed some of the ways ubicomp has attempted

to achieve that vision, and raised serious questions about the capability -- and desirability -- of computers to act on our behalf. I was reminded of the distinction between "strong AI", which seeks (sought?) to imbue computers with intelligence so that they could *replace* humans, vs. "weak AI" which seeks to enable computers to *augment* humans.

Adam Greenfield was invoked, yet again, in observing that much ubicomp can be characterized as "daring to intervene, clumsily, in situations that already work reasonably well". Yvonne issued a call for a Kuhnian-level shift from *calm* technology to *engaging* technology, requiring a broader scope and new agendas, themes, questions, frameworks … and adjectives. Ubicomp should be exciting, provocative, stimulating, visible, engaging, playful and even uncomfortable, enabling people to be active creative and reflective in their work, learning and living. Amen.

posted by Joe McCarthy at 08:29 AM

http://gumption.typepad.com/blog/2006/09/ubicomp_2006_da_2.html

September 21, 2006

Ubicomp 2006: Day 3

The field seems to be moving beyond "technology in search of a problem" (an early rant, or concern, of mine) and appears to be reaching a consensus on some problem areas: location, location and location ... and so I might recast my earlier concern as "technology in search of an application" within a problem domain. I am glad to see so much progress being made on location sensing and tracking technologies, and I do share the underlying intuition that these technologies will support useful applications. I am even happier to see a few (more) examples of ubiquitous computing applications in the service of instigating and supporting engaging interactions among people, and I hope that we will see even more examples of technosocial engagement in the future ... so that rather than -- or in addition to -- having presentations being motivated by speculative "imagine, if you will" scenarios, future UbiComp conference(s) will offer more opportunities to "experience, if you will..."

posted by Joe McCarthy at 10:53 PM

While pervasive or ubiquitous computing, like all computing, can be seen to be historically embedded within complex global assemblages of military, industry, government and public interests—including a fundamental belief in technological progress—it also currently occupies spaces that hinge on a future yet to happen, or futures that *may not ever* happen. Borup et al. (2006:285) claim that "novel

technologies and fundamental changes in scientific principle do not substantively pre-exist themselves, except and only in terms of the imaginings, expectations and visions that have shaped their potential." Or as Latour rather elegantly explains,

> To say something is constructed means that it's not a mystery that has popped out of nowhere, or that it has a more humble but also more visible and more interesting origin. Usually, the great advantage of visiting construction sites is that they offer an ideal vantage point to witness the connections between humans and non-humans. Once visitors have their feet deep in the mud, they are easily struck by the spectacle of all the participants working hard at the time of their most radical metamorphosis ... Even more important, when you are guided to any construction site you are experiencing the troubling and exhilarating feeling that things *could be different*, or at least *they could still fail*—a feeling never so deep when faced with the final product, no matter how beautiful or impressive it may be (2005:88-89).

All of this reinforces the idea that pervasive computing involves persistent tensions between pasts, presents and futures that make certain identities and objectives possible or probable, and others impossible or improbable. Expectations can be positive or negative, and especially in the case of techno-science, are often put in terms of utopian or dystopian futures. Expectations in such cases are also associated with the belief that technoscientific progress is both a requirement and a promise, where practitioners, advocates and adversaries of pervasive computing assume a certain technological inevitability and feel obligated to deliver the best possible product, service or alternative solution in response.

EXCERPTS from *fredshouse.net* by Gene Becker

http://www.fredshouse.net/archive/000122.html

February 23, 2004

Yet Another Vision of the Ubi-Future

Not sure how old this is, but Vodafone has put together a very slick, high production value Flash site showing their R&D lab's vision of the mobile, ubiquitous computing future. It's definitely worth a look, although you'll need some patience to get through it; there's a lot of moving parts and the designers are overly enamored with animated transitions.

So far I've gone through the entertainment scenario, and I haven't seen anything truly novel. It appears to be yet another variation on the theme of context-aware/situation-aware computing, spontaneously federated devices, new I/O peripherals, ubiquitous connectivity, and social media. Maybe I'm a bit jaded, but it's all starting to sound suspiciously like received wisdom. Is the pervasive computing/ubicomp vision held by so many researchers our modern version of the "personal jetpack" from the '50s?

So there's a good challenge to consider, for which Vodafone's vision is simply a convenient stalking horse: Given what we know about the tremendous advancements in the underlying technologies of computation, communication, I/O, etc, combined with our collective understanding (ahem) of human culture and society, can we create more imaginative, more insightful, more believable scenarios of the future? Can we articulate a world where ubiquitous golly-gee-whiz technologies become dull and commonplace, and the resulting long-term patterns of change in people's lives become evident? Can we take a step beyond shiny happy corporate sales tools, to consider the complex and ambivalent nature of ubicomp's impact on our lives, as these new technologies become truly pervasive and embedded in the fabric of the world?

I think it's time to re-evaluate assumptions and goals.

posted by Gene at 09:55 AM

http://www.fredshouse.net/archive/000159.html

April 05, 2004

Prada Epicenter Revisited

…Ubicomp is hard, understanding people, context, and the world is hard, getting computers to handle everyday situations is hard, and expectations are set way too high.

I used to say ubicomp was a ten-year problem; now I'm starting to think that it's really a hundred-year problem.

posted by Gene at 10:22 AM

To question ubiquitous computing today is to visit a few ruins and a host of construction sites, as well as to follow "future abstractions [and] expectant projections that alter the now" in ways that involve "the future working back on the present" (Borup et al. 2006:289). As these "wishful enactments of a desired future" are made real—or actualised—through a range of embodied interactions and material objects, "promissory commitments become part of a shared agenda and thus require action" (Borup et al. 2006:289). In these ways, future-oriented visions of pervasive computing can be seen to primarily work in the present to shape current relationships and provide particular orientations towards the past, present, and future.

4.3.1 Affecting hope

Put another way, technoscientific uncertainty is often countered by certain values and desires. Somewhat ironically, the failure or modification of a technological vision over time is not only common but also commonly expected. Techno-scientific and techno-social expectations increasingly involve tensions between what Foucault (1980) calls "regimes of truth" and what Moreira and Palladino (2005) call "regimes of hope."

> 'Truth' is to be understood as a system of ordered procedures for the production, regulation, distribution, circulation and operation of statements. 'Truth' is linked in a circular relation with systems of power which produce and sustain it, and to effects of power which it induces and which extend it. A 'regime' of truth

> (Foucault 1980:133).

A regime of hope, on the other hand, involves similar processes that evoke, and invoke, hope. This metaphor is most often associated with, and indeed very well-suited to, emerging biotechnologies that stand to redefine life and death. As Moreira and Palladino (2005:67) summarise,

> the 'regime of hope' is characterized by the view that new and better treatments are always about to come, being tested, 'in the pipeline'... The 'regime of truth', on the other hand, entails an investment in what is positively known, rather than what can be.

Brown (2006) more explicitly draws out the political and ethical dimensions of this parasitic (cf. Serres 1982) relationship between regimes of truth and hope. He claims that biotechnologies are not currently debated in terms of evidence or truth, but instead involve discussions about "abstract future-oriented values representing a shift towards more aesthetic and symbolic references ... [and] from authority to authenticity" (Brown 2006; Brown and Michael 2002). This suggests that new biotechnologies are increasingly positioned not as evidential problems but as affective ones, where many different actors are assembled to negotiate affective roles. While urban computing and locative media are obviously different kinds of technoscience, the metaphor of hope plays an important role in managing expectations in those domains as well.

As Brown (2006:9-10) continues,

> There is an emerging moral space developing here where failure to invest now may result in moral recrimination later. Futures and expectations are, by and large, shared attributes that in some circumstances can become embedded in

> what we might call 'communities of promise' ... Communities of promise are highly complex and multi-authored enterprises. It is rarely ever possible to ascribe responsibility for expectations to one actor rather than another ... [D]ifferent participants in a community of promise 'conspire' or 'collaborate' in the authorship of a future ... Agency is also complex across time as well as across present communities of promise. There are no 'first causes' but rather a long and complex prefiguring of expectations through events, practices, statements and promises stretching through time.

And as discussed earlier, these prefigurings refer to particular interests invested in the present, or in present potentials: "To enable hope requires the coordination and management of the conduct of individuals and groups so that a particular future may come into being" (Novas 2006:291). If a particular translation has been successful, certain identities and associations become irreversible, or path-dependent. If truth can be loosely tied to materiality, and hope to imagination, then expectations can be seen as relational objects that act as 'bids' or tenders on the future (Berkhout 2006). These bids and expectations are understood to be conditional and flexible, and are integral to the complex material and symbolic transformations that occur in processes of translation and bring about particular associations.

EXCERPT from *Boxes and Arrows* by Adam Greenfield

http://www.boxesandarrows.com/view/all_watched_over_by_machines_of_loving_grace_some_ethical_guidelines_for_user_experience_in_ubiquitous_computing_settings_1

December 1, 2004

All watched over by machines of loving grace: Some ethical guidelines for user experience in ubiquitous-computing settings

Ubiquitous computing is coming. It is coming because there are too many too powerful institutions vested in its coming; it is coming because it is a "technically sweet" challenge; it is coming because it represents the eventual convergence of devices, tools

and services that became inevitable the moment they each began to be expressed in ones and zeroes.

[…]

It should be clear that ubicomp represents a substantial raising of stakes over the Web case, the PDA case, the mobile-phone case, or other scenarios we're accustomed to; that its field of operation is by definition total; and that its potential for harm if poorly implemented is such that the user experience is too important to leave to chance, or the discretion of developers.

[…]

This is not an indictment of engineers. They are given a narrow technical brief, and within the envelope available to them they return solutions. It is not in their mandate to consider the social and environmental impact of their work. From our vantage point as user-experience professionals, however, it is clear that there have always been emergent properties of systems that are designed with a given end in mind – and that sometimes, those properties and effects are of much greater consequence than the intended result.

If ubicomp applications are rushed to market and allowed to appear as have so many technological artifacts in the last thirty years—i.e., without compassionate attention to the needs and abilities of all sorts of human users, without many painstaking rounds of iterative testing and improvement in realistic settings—then they will present those users with a truly unprecedented level of badness.

Imagine the feeling of being stuck in voice-mail limbo, or fighting unwanted auto-formatting in a word processing program, or trying to quickly silence an unexpectedly ringing phone by touch, amid the hissing of fellow moviegoers—except all the time, and everywhere, and in the most intimate circumstances of our lives. Levels of discomfort we accept as routine (even, despite everything we know, inevitable!) in the reasonably delimited scenarios presented by our other artifacts will have redoubled impact in a ubicomp world.

Even if for this reason alone, we must ensure that this class of products and services is designed better, with more sensitivity and compassion, than others in the past.

[…]

It is my sense that the time is apt for us to begin articulating some baseline standards for the ethical and responsible development of user-facing provisions in ubicomp applications, before our lives are blanketed with the poorly-imagined interfaces, infuriating loops of illogic, and insults to our autonomy that have characterized entirely too much human-machine interaction to date.

posted by Adam Greenfield

The situatedness of associations should also compel our attention to the situatedness of expectations. As Hayles (2005:132 & 148) points out in regard to artificial intelligence research paradigms,

> Whether or not the predicted future occurs as it has been envisioned, the effect is to shape how 'human being' is understood *in the present* ... [T]he relation between humans and intelligent machines thus acts as a strange attractor, defining the phase space within which narrative pathways may be traced. What becomes difficult to imagine is a description of the human that does not take the intelligent machine as a reference point.
>
> [...]
>
> The future echoes through our present so persistently that it is not merely a metaphor to say the future has arrived before it has begun. When we compute the human, the conclusion that the human being cannot be adequately understood without ranging it alongside the intelligent machine has already been built into the very language we use.

Returning to the case of pervasive computing, such a perspective suggests that contemporary expectations about urban computing and locative media have more to do with present technosocial concerns—especially social networking and security—than serving as future predictions. Likewise, expectations about urban computing and locative media shape how we approach research in these areas today, along with our very definitions of—and how we understand relations between—humans, computers and everyday urban life.

Since this suggests that tomorrow's expectations and today's associations are bound up in rather complex (i.e. non-linear, unpredictable) ways, it may help to recall Gibbons et al. (1994) concept of "Mode 2" knowledge regimes that depend on a surplus of producers, distributors and audiences that create more and more

heterogeneous and heterarchical knowledge claims. Along with the kind of inter-disciplinarity that historically underpins much research in ubiquitous computing, networked technologies like the internet, and new media formats like blogs, enable associations that rely on complex inscription devices (cf. Latour and Woolgar 1986) and other attempts at material and semiotic translation across traditional boundaries. This slippage between professional and other concerns is further complicated by the multiple roles that researchers and others take in everyday life.

For example, at the time of writing, both Gene Becker and Joe McCarthy—whose blog posts I included above—work in ubiquitous computing research and development for Hewlett-Packard and Nokia, respectively. However, both researchers distinguish their personal opinions, posted on their personal blogs, from the opinions of their employers—and sometimes even from the work they do for them. It appears that in pervasive computing research today, not only does laboratory work open up to include more public spaces of investigation and experimentation, but so too the private lives and thoughts of scientists and engineers are folded into public discourse through weblogs and other publically accessible documentation. In these ways, technoscientific knowledge is emerging in both 'top-down' and 'bottom-up' ways.

This returns me to my earlier claim that a primary means by which all this complexity is managed is through affective relations—or the capacity to affect and be affected by others. Accordingly, affect must be approached from two

interconnected perspectives: one of technological 'becoming' and one of 'hope' for particular technological futures. In the first sense, affect refers less to emotion than to what Massumi (2002) describes as the potential, indeterminant and emergent—and as Clough (2000:4) explains, "it is its participation in the virtual that gives affect its autonomy–its escape from the particular thing that embodies it." On a related note, we might also see affect as one of the means by which different scales or situations are bridged.

Anderson (2006) also explains that hope emerges from particular encounters, and in the case of urban computing and locative media, I am most interested in the hope that emerges from people's fearful encounters with pervasive computing's capacity to produce a profoundly dystopian future in which three models of power—Foucault's panopticon (1977), Deleuze's control society (1987) and Agamben's bare life (1998)—come together under the mandate of machinic protocols to improve everyday life. Like Lyotard before him, Jameson (1991:67) refers to the postmodern sublime as the "simultaneous apprehension of ecstasy and dread," and what becomes particularly interesting, I think, is how urban computing and locative media both emerge from, and enact, particular combinations of hope and despair.

4.4 SUMMARY

In the first part of this chapter, readers were introduced to pervasive or ubiquitous computing as an emergent agenda in human-computer interaction research characterised by tensions between seamless interaction and calming

effects on one hand, and more transparent infrastructures and active appropriation or engaged use on the other. I showed that from its earliest debates, researchers have been divided on whether such a technosocial future would be profoundly dystopian or utopian.

In order to better engage these tensions and other intangibles of emergent or future-oriented technologies, elements of actor-network theory along with notions of transduction, as well as sociological approaches to expectations and affect, were positioned as the most promising ways for social researchers to understand and account for the complexity of the processes at hand. A sociology of expectations looks to the affective roles of imagination and desire in shaping technological change, and expectations are seen to be performative in the sense that they attract interest from potential allies, define roles, and "build mutually binding obligations and agendas" (Borup et al. 2006:286). Such a perspective requires we ask how pervasive computing involves persistent tensions between pasts, presents and futures—and how that makes certain identities and objectives possible or probable, and others impossible or improbable.

In this chapter, I set a position from which I seek to claim that contemporary expectations about urban computing and locative media have more to do with present technosocial concerns than with future predictions. Likewise, expectations about urban computing and locative media can be seen to shape how we approach research in these areas today, along with our very definitions of—and how we understand relations between—humans, computers and

everyday urban life. The following chapters draw out the implications of these claims, as I examine how research in these areas shapes understandings of new technologies, urban spaces and social relations.