**UNIVERSITY OF CALIFORNIA,
IRVINE**

Urban Aesthetics: Reframing Mobility for Ubiquitous Computing

DISSERTATION

submitted in partial satisfaction of the requirements for the degree of

DOCTOR OF PHILOSOPHY

in Information and Computer Science

by

Johanna Marie Brewer

Dissertation Committee:
Professor Paul Dourish, Chair
Professor Donald Patterson
Ken Anderson

2008

Portions of Chapters 4 & 6 © 2008 ACM

Portions of Chapter 7 © 2007 IEEE

All other materials ⓒ 2008 Johanna Marie Brewer

The dissertation of Johanna Marie Brewer
is approved and is acceptable in quality and form
for publication on microfilm and in digital formats:

_____

_____

_____
Committee Chair

University of California, Irvine
2009

DEDICATION

for my family

TABLE OF CONTENTS

LIST OF FIGURES

ACKNOWLEDGEMENTS

While it is universally true that no student can complete their PhD without their advisor, I owe the deepest thanks to mine. From our first chance meeting until today he has expressed a confidence in my work that has propelled my scholarship to new heights. Without his cheering and challenging this dissertation would not be the achievement I had always hoped for. Our years of epic intellectual debates have truly been the most inspirational fights of my academic life; I feel incomparably prepared for my journey ahead. I have spent these years admiring, emulating and arguing with my advisor and I sincerely hope that in repayment for his patience I have made him proud today. As self-assured as I might seem, I could never have made it this far without you, Paul. Thank you.

I also owe a debt of gratitude to my academic family at UCI. My early days were guided by the wisdom of post-docs Rogerio and Charlotte (my dear trailer buddy); I could not have asked for better role models. If it were not for sled and meta, my dear housemates, confidants and closest friends of 168 ½, I would never have survived my new life in post-suburban California. For helping me stay sane, thank you. Finally, to all the other academics I've had the privilege of coming to know, especially Silvia & Judy, for their caring hearts and sharp minds, and Irina & Janet, for their empathy and intellect, I want to thank you for giving me a home away from home.

To my Greek family at Boston University, especially Niky, Panos, and Jef (an adopted member), I want to thank you all for your support during my difficult time of realization and decision. And for helping me escape a bad situation while there was still time, let Kate Mullen be thanked.

To my extended international family in London, I appreciate you all more than you know. Thank you for taking a cheeky American on as one of your own. You always will find a home with me wherever I am.

Alla mia Arianna, mi hai insegnato motlo più di quello che avrei mai pensato mai di poter imparare. Grazie per essere stata paziente con me; grazie per essere là per me. Cercherò sempre di fare lo stesso per te. Ti amo.

Finally, I could never thank my family enough for everything they have done for me. My grandparents, aunts, uncles and cousins have always supported my crazy dreams as unusual as they might have seemed. My brother is one of the smartest people I have ever met; from childhood we have been partners in intellectual crime, scheming the most amazing plots, and I am sure my curiosity would never have lead me down this path without him. I am lucky to have a little genius brother and I hope he knows how inspirational he is. And to my mom and dad, I want to say that I could never have asked for more support. You always told me to be whoever I wanted to be. From the little girl with her box of very important floppy disks full of programs to the Ph.D. student traveling the world, my parents have always believed in me, whether or not they should have. I would never be the scholar, the woman, the daughter, I am today without them. I hope I have made my family proud; this dissertation is for them.

Financial support for this work was provided in part by the National Science Foundation under awards 0133749, 0205724, 0326105, 0527729, and 0524033, and by Intel Corporation.

CURRICULUM VITAE

Ph.D. Information and Computer Science: University of California, Irvine, 2008

M.A. Computer Science: Boston University, 2004

B.A. Computer Science & Philosophy: Boston University, 2002

ABSTRACT

Urban Aesthetics: Reframing Mobility for Ubiquitous Computing

by

Johanna Marie Brewer

Doctor of Philosophy in Information and Computer Science

University of California, Irvine, 2009

Professor Paul Dourish, Chair

This dissertation expands the understanding of the relationship between mobility and technology for ubiquitous computing. Beginning with an examination of urban mobility, I propose and illustrate new ways researchers might study and design for this complex field by first looking for insight from a different discipline, cultural geography. Building on this foundation, I present two ethnographic studies done on the public transportation systems of Orange County, California and London, UK, which investigate the aesthetic aspects of urban journeys. An analysis of this ethnographic work gives rise to a series of inspirations for design, which act as new avenues for technological explorations of urban mobility. Drawing from these principles and ethnographic material, I will describe two very different design concepts envisioned for use in the London Underground: a mobile music sharing system, *undersound*, and an augmented Oyster Card wallet, SeeShell. A reflection upon these interrelated pieces of research will serve to highlight new, actionable directions, for further ubiquitous computing work relating to mobility.

1: Introduction

Every day, billions of people journey through the hearts of cities across the world. The endless, ever-changing, pulse of urbanites gives life to the places they live, and they carry with themselves, and encounter, a vast array of technologies. But what drives this current of humanity, what is mobility really all about? Through the course of this dissertation I will undertake an examination of urban mobility, proposing new ways to go about studying and designing for this complex field. I specifically choose here to describe "urban mobility" as the focus of my dissertation, rather than, for instance, "urban spaces," "mobile technology" or "city dwellers," because the site of my research lies at the intersection between people, the places which they move (or don't move) through, and the technologies which the bring, use, find, and leave in these places. Researchers in ubiquitous computing have so far mainly focused on the household, on the workplace and, to some degree, on what Oldenburg calls "third places" [1989]. Though this body of research has led to a better understanding of the socio-cultural context for which new technologies are designed, it only addresses a narrow range of people's daily experience. More specifically, the transitions, both temporal and spatial, between culturally valued activities that structure people's lives as a continuous flow rather than a series of discrete moments have not been greatly considered. Though "mobile computing" has become and increasingly important site for research activity, the question of what "mobility" actually is remains relatively under-explored. This dissertation, then, will seek to provide a deeper understanding of the relationship between people's mobilities and the technologies which support them.

In keeping with the bipartite nature of the topic, the product of this dissertation is likewise somewhat of a hybrid. While ubiquitous computing has traditionally taken a linear approach moving through ethnography (often more accurately described as

requirements gathering), to design, to prototyping, and finally evaluation [Dourish, 2006] this dissertation will serve, in part, as an active reconsideration of the relationship between these "phases." While I do not intend to make methodological considerations the focus of my dissertation (though that would surely be a worthwhile project), they will play a significant role in the evaluation of my work, and as such I intend for them to be a contribution to both designers and ethnographers. Consequently, this work will serve to explore how a more open dialogue between design and ethnography might benefit ubiquitous computing.

More concretely, this dissertation seeks to explore how ubiquitous computing researchers account for the experiential, rather than the purely functional, aspects of mobility. The results of this inquiry comprise the four contributions of this dissertation. First, I will present a conceptual framework which utilizes both cultural geography work and an ethnographic study which I conducted on the Orange County bus system to expand our understanding of the relationship between mobility and technology within ubiquitous computing. Then, using this framework, I will present an ethnographic study conducted on the London Underground which explores the aesthetic side of urban journeys. Thirdly, I will present a series of inspirations for design which draw from the results of this study. And finally, I will discuss two conceptual designs which I created in response to these guidelines.

These interrelated contributions are primarily intended to be of interest to both ubiquitous computing researchers carrying out design work as well as those conducting ethnographic studies. The guidelines and the conceptual designs act as exemplars of how we might begin to craft designs which explore not only the functional side of urban mobility but the experiential one as well. Likewise, the conceptual framework along with the ethnographic studies suggest that further urban ethnographic inquiries might be beneficial not only for design, but also might help to broaden and deepen our

understanding of the multiplicity of mobilities at work in our cities. Further, these interrelated pieces, when taken together, represent a small example of the dialogue between ethnography and design. While there has been significant consideration of the variety of research methodologies drawing from both social science and design (e.g., [Laurel, 2003], [Zimmerman et al., 2007]), my dissertation does not seek to pose a radically new methodology. Rather, it attempts shed light on the cyclic relationship between ethnography and design as it is borne out in the course of a long-term research engagement. By conducting an ethnographic study of a specific setting, developing a set of inspirations for design derived from this study, and creating two conceptual design pieces, I am able to deeply reflect on the relationships between these contributions precisely because they have been conducted within the same scope. The coherent nature of this dissertation, then, serves to demonstrate the depth of exploration which can be achieved when both ethnographic and design work are carried out in the same setting. Instead of presenting the research of this dissertation as methodology to be followed, then, I intend it to contribute to the ongoing discussion of the relationship between ethnography and design as they are brought together within ubiquitous computing by identifying new areas for exploration.

With both my contributions and audience in mind, in the remainder of this introduction I will provide a more detailed overview of the research which will be presented herein. This dissertation will present and answer three interrelated research questions. In the coming chapter I will explore the way in which mobility was initially conceived of (and often still is) within ubiquitous computing in an effortt to answer my first research question: *What relationship between mobility and technology is posited by ubiquitous computing and what is left out of that relationship?* Beginning with an overview of the concepts of *dislocation*, *disconnection* and *disruptions* which represent the ways in which ubiquitous computing has a tendency to problematize mobility, I will then introduce literature from cultural geography as a counterpoint. From this second body

of work I will describe an alternative view of mobility which centers around the idea that people are not only affected and influenced by the spaces they reside in, but they actively produce and maintain these spaces through their daily actions. By outlining this foundational cultural geography material I will demonstrate that it would be worthwhile for ubiquitous computing to recognize that spaces are made legible in a multitude of (often competing) ways through the use of a variety of technologies.

Following on from this literature review of Chapter 2, I will describe an ethnographic study mounted in order to try and find an empirical answer to the second part of the first research question. This study will be the topic of Chapter 3. Here a specific kind of mobility will be discussed – bus riding in Orange County – in a probative study which attempts explore what it would mean for ubiquitous computing to consider the non-problematic and multi-faceted nature of mobility. In Chapter 3, then, I will present a preliminary ethnographic study conducted on the Orange County Transportation Authority (OCTA) bus system. Through this study I will focus on a particular, physically-describable instantiation of mobility, and explore how this means of moving through space encompasses a wide variety of mobilities. I will highlight two key axes along which riders differed in their ways of using the bus system. First, I will explore the ways in which bus users spanned a gamut of levels of expertise in riding, and yet, this expertise was quite separable from the frequency with which they used the bus system. And second, I will highlight the variety of self-perceptions that riders developed in the context of using the bus, and the differing ways in which they came to conceive of the other riders around them, often through self-projection. These findings will suggest that there is not a "single mobility" to describe riding the OCTA bus and that ubiquitous computing overlooks in its construction of the relationship between mobility and technology the fact that there are multiple forms of mobility even with respect to a single (broadly conceived of) technology, and that that technology need not be used for a purely instrumental purpose.

The work in Chapter 3 will illustrate that while ubiquitous computing might currently overlook a particular aspect of mobility, there is the possibility for this gap to be filled in a practical sense. With this understanding that there is a potential to address the way in which ubiquitous computing currently posits the relationship between mobility and technology, I will introduce my second research question in Chapter 4: *How can we expand (through conceptual resources) the relationship between mobility and technology in useful ways?* The findings from the OCTA study will law the groundwork for a potentially rich area for further exploration: examining the ways in which an understanding of the experiential quality of journeys could be employed for the design of new technologies within ubiquitous computing. Consequently, Chapter 4 will describe the development of, and methodology for, a study which I conducted in the London Underground, entitled Aesthetic Journeys. I will outline the conception of the study and the ways in which this ethnographic inquiry was mounted in order to begin to answer my second research question.

Before presenting the findings from this study, I will employ another means of approach to my second research question. By presenting a second body of both ubiquitous computing and cultural geography literature, I will both provide a context for the results of the ethnographic work, and create a conceptual resource through which ubiquitous computing can expand its view of the relationship between mobility and technology in a concrete direction. This literature review centered around the variety of aesthetic and experiential aspects of mobility will be presented in Chapter 5. This chapter will first draw attention to the fact that there is both an instrumental and aesthetic component to interaction with spaces, and that there is a gap between the theoretical view of a plurality of mobilities, how the experiential component of these are investigated and how the design of technologies for this area is carried out.

Chapter 5, then, will set a conceptual stage set to present the analysis from the Aesthetic Journeys study in Chapter 6. There three themes which I identified that relate to the aesthetics of London Underground journeys will be presented: *Platform for Art*, *Ecology of Objects*, and *Emergent Sociality*. This chapter will present how these findings can be used to posit an extension, for ubiquitous computing, of the relationship between mobility and technology – specifically one which takes into account non-functional aspects of both mobility and technology. Pursuant to this study I will then outline a series of inspirations for design which are rooted in the findings: *Designing for Engagement*, *Designing for the Expert Journey*, *Designing Ecologies*, *Designing for the Buzz* and *Designing for the Flow*. These principles will serve to introduce an answer to my final research question: *What principles can we create for a reformulated ubiquitous computing view of mobility and technology?*

This dissertation will be an attempt to explore not only how the view of mobility and technology might be expanded for ubiquitous computing, but to do so in an actionable way. Consequently, it will be important to understand if the aforementioned principles can lead to the creation of new designs which also serve to reinforce this expansion of the relationship between mobility and technology. In Chapter 7, I will discuss what, precisely, designing for the diversity of the aesthetic experiences that people have of mobility might entail. I will present *undersound,* a situated peer-to-peer music sharing application which is comprised of a mobile phone client as well as a series of visualizations and access points within the Underground; and I will describe the ways in which the design attempts to reflect the principles proposed.

While *undersound* will highlight the principles of a reformulated ubiquitous computing in one way, in Chapter 8 I will describe another design, SeeShell, which takes a very different approach to the same set of principles. SeeShell is an augmented Oyster Card (the RFID-enabled Underground ticket) holder which displays, over time, the journeys a

rider has taken. While the design of *undersound* represents a system which derives its meaning from the exchanges, and possibil the subtle interactions, of a large group of users, SeeShell will act as an example of a much more personal technology that, nonetheless, speaks to the design principles brought out in Chapter 6 in a very different way.

I will conclude this dissertation with an examination of the ongoing dialogue between ethnography and design found within the coming pages. I will do so in an attempt to further reveal the ways in which the various pieces of this research serve to reinforce and reinterpret one another, ultimately closing the circle of ethnography and design, allowing us to reflect more broadly on the potential future directions for this work. In the final chapter, then, I will first discuss the ways in which the theoretical foundation presented in Chapter 5 served to influence the analysis of the Aesthetic Journeys study. Then, I will go forward and reflect on the ways in which the design presented in Chapter 7 was influenced by not only the design principles presented in Chapter 6, but by findings of the ethnographic work itself. Finally, I will explicate the ways in which the work presented in Chapters 7 and 8, when taken together, begins to define a new space for not only design, but future ethnographic work as well.

2: The Relationship Between Mobility & Technology

In this chapter I will present the work which relates to my dissertation topic, urban mobility. This works spans two bodies of literature, ubiquitous computing and cultural geography, each of which I will address in turn. I will begin by first tracing the history of the concept of mobility within ubiquitous computing. In order to do that, though we will first look at where mobility began to enter Human-Computer Interaction (HCI) in general, that is, at the workplace. The first discussions of mobility as a topic of study for HCI can be found within the sub-discipline of Computer Supported Cooperative Work (CSCW). CSCW has as its focus interactions with and through technology in the workplace. As this field began to expand more complex work scenarios were considered. Heath & Luff were among the first to address the movements inherent in any workplace [1992]. In their study of London Underground control rooms they stress the failure of a variety of technological systems to account for the situated nature of work practices. They argue that the workers are not only responsible for completing job-related tasks, but that the undertaking of such tasks must be made visible to their co-workers. The movements, then, that make up work are not merely ends in themselves; the ways in which people move through space (albeit in this case a somewhat confined work environment) create meaning for the other people around them.

Building on such studies of the informal, but nonetheless vital, aspects of collaboration, Bellotti & Bly began to more explicitly tackle the role of mobility in the workplace [1996]. In their study of a distributed design team, they focused on what they call "local mobility," that is, the movement between various rooms of an office, or between several buildings at a given site. They describe mobility in terms of motivations; here, people are described as moving around in order to seek out two kinds of resources, centrally

located office equipment (e.g., a printer) and colleagues (for the purposes of communication). In this early work we begin to see the emergence of a particular way of conceiving of mobility, that is, as means of rectifying the problem of a lack of certain resources. While Bellotti & Bly do make the bold conclusion that designers must design for mobility, rather than against it, the mobility that is described here is one which is purely functional, one that arises to cope with problems. Indeed, this notion is echoed in subsequent work, for instance, by Bertelsen & Nielsen in their study of a wastewater treatment plant [1999]. One of the five dynamics which they highlight is the movement of people around the treatment plant, and here their mobility is spurred on by the need to collect samples and monitor various equipment which is vital to the operation of the facility.

When mobility was first addressed in CSCW it was framed as a means for people to grapple with problems which they encountered in the workplace. As the field began to address this area of study further, however, mobility soon became seen as a problem in itself. In their study of the ground personnel involved in air traffic control management, Juhlin & Weilenmann, describe the host of coordination problems faced by a team of distributed workers [2001]. In order to clear snow from runways for incoming planes, it is essential that the ground crew man separate ploughing vehicles. Radio communication amongst the ground crew, and with the traffic control tower is used to organize their efforts and avoid accidents. In their study, they highlight the difficulties of coordination faced by this distributed group of workers, who sometimes are unable to communicate well given the physical limitations of their radio systems. Here then, the individual mobility of the workers, though necessary to complete the clearing of the runways, is seen as the cause of the problems for effective coordination.

Following on from this work, Nilsson & Hertzum studied how a group of home-care workers aligned and coordinated themselves, with the help of PDAs, in both space and

time [2005]. Here, they discuss the ways in which home-care workers must negotiate between the individual rhythms and routines of their clients (e.g., the need to take medications at certain times) and the larger rhythms present in the workday (e.g., meeting colleagues and coordinating the move from one client to the next). Mobility is the essential nature of the home-care workers here, and it is of "paramount importance" that they are at the right places at the right times. Again, though, we can see that mobility is described as a fundamental problem that must be faced to achieve work-related goals.

As mobile work garnered increasing focus within the CSCW community, HCI at large began to incorporate some of these concerns in the designs of new systems. Satchel, for instance, is a system which seeks to provide "mobile document workers" with access to electronic files while they are out of the office [2000]. The system, which is built around a Nokia 9000 Communicator, seeks to overcome a host of problems faced by the mobile worker, not the least of which include finding a plug for a laptop and the location of the nearest printer. The designers had as one of their chief goals that documents in the system be accessible at any time and from anywhere. This work, then, represents a particular trend in HCI towards solving the problem of *disconnection* brought on by mobility. In this case the *disconnection* is from resources normally found at the office (i.e., documents).

Others, including Perry et al., stress the variety of resources mobile workers may need access to [2001] and indeed ways to solve the problem of *disconnection* takes on many forms. Hubbub, for instance, is a mobile instant messaging client for PDAs and PCs [Isaacs et al., 2002]. When a user is away from their desktop, in this case, they become *disconnected* from their computer-based chat clients, and effectively, *disconnected* from colleagues who they might want to chat with. Hubbub seeks to address this problem by providing a mobile chat platform.

As HCI began to nurture this emerging topic, researchers began to look at mobility outside of the work environment. Academic campuses provided a convenient test bed for new applications. The campus provides a relatively contained environment with plenty of people who are often already accustomed to technology, and so the thinking goes that it is a convenient proxy for public space. After their study of a system called ActiveCampus [Griswold et al., 2004] Barkhuus & Dourish conclude that generally this is not the case [2004]. The situation of the academic campus affords, and perhaps necessitates, different sorts of mobility than an urban setting. Particularly, they noted that undergraduate students who lacked a "base" (i.e. an office space of their own) should more properly be described as nomadic. Here again, though, this form of mobility is described in terms of the practical problems which it presents. These student nomads must deal with concerns of weight (of the technology they are carrying) and reliability of infrastructure (e.g. regular access to power outlets to recharge their laptops).

Another system, Campus Aware, focused on creating an experience for both prospective and current students [Burrell et al. 2002]. A location-sensitive tour guide which allows current students to annotate the physical space around them to better contribute to the campus tours which prospective students follow, Campus Aware focuses on solving the *disconnection* between these two bodies of students. However, in this case we can begin to see the notion of *disconnection* transforming into one which is better described as a *dislocation*. Rather than being separated from a stable work environment, the students here a moving through the environment itself, and are separated from one another; they are out of place. Only a handful of current students act as tour guides and speak with prospective candidates, and so the system seeks to open that dialogue to larger numbers. Here mobility is seen as creating a social form of *dislocation*, and the problemitization is so deeply ingrained in the techno-centric views of ubiquitous

computing that the authors assert that their system allows people to "leave traces in a physical space that would otherwise have no record of who was present and what went on before" [ibid., 3]. No credit is given here to the lived aspects of the various campus locations; wear patterns across the grass, graffiti, abandoned refuse, and so on, are not considered as valid records of habitation. For now, though, we will put this discussion of legitimacy aside to return to it later on.

Expanding this type of inquiry beyond the campus environment, Brown et al., proposed a system for "co-visiting" which allows remote and present people to share the virtual and physical experience of visiting a city square [2005]. Here the *dislocation* is again social, but rather than being primarily functional (e.g. motivated by the need to recruit prospective students) it centers around the desire to participate in leisure activities from afar.

Indeed, interest in this specific leisure activity of tourism, has proven to be an important area for research focused on mobility. One of the first systems designed to support tourists was the Cyberguide [Abowd et al., 1997]. This system was envisioned as a location-aware tour guide, containing all of the information of a typical Lonely Planet, allowing guided navigation and pointing out sites of interest to the user as they passed by. Cyberguide, and systems like it, open up a new arena of problems for mobility. Here the *dislocation* is not from friends or fellow students, instead it is a disorientation and a difficulty with navigation. Tourism is the quintessential example of being out of place, and systems like Cyberguide seek to re-place users by giving them local knowledge. Other work following on from Cyberguide, like the GUIDE system [Cheverst et al., 2000], grappled with some of the more practical, and indeed challenging, problems faced by real-world deployments of these types of interfaces (e.g., intermittent wireless connectivity). However, no credence is paid by these groups to the pleasure of being lost in an unfamiliar city, of exploring, of not knowing. This type interaction with the tourist

site is seen as incorrect; the right way to be is to know. Indeed Cheverst et al. say that during the field trials of the GUIDE system they, "felt acutely aware that [they] would be impinging on the leisure time of tourists." Though it could be argued that most designers feel this way from time to time when evaluating their prototypes, this statement is nonetheless telling. There is an underlying tension between the desire on the part of the designer to "solve" the problem of tourism and the desire of the tourist to enjoy the act of wandering. And while some, like Brown & Chalmers for example, do acknowledge the fact that tourists like to engage in leisurely wanderings, in their framework even this facet of the tourist experience is open to "solutions" in the same way that navigation is [2003].

Axup et al. [2007] conducted a study which tackled both sides of the issue of *dislocation* raised above. By investigating the concept of creating an interface which would pair backpackers and allow them to exchange information about their travels, they addressed the ways in which one could be simultaneously socially and spatially *dislocated*. Here the backpackers are seen as repositories of situated information, and the problem is how to successfully pair them in order that they might exchange knowledge in an effective way. This approach is sensible in that sometimes one might prefer to speak with a more well traveled backpacker in order to get some much needed advice, yet placing the focus so heavily on information exchange, rather than the more experiential qualities of hostelling (e.g., sharing a meal, griping, etc.), leads to a set of design implications that separates efficiency from pleasure.

Pairing strangers for the purposes of interaction also raises a host of issues about context-sensitivity. Axup et al. suggest that those people who are most knowledgeable about a given situation will be in high demand, and it will be undesirable to recommend that they meet up with every novice backpacker in the vicinity. Here then, we can begin to see a third category of problem emerging, that of *disruption*. Although it might

desirable to have resources available at any time and from anywhere, if you yourself are made available in a similar fashion, this could become taxing. Similarly, if my mobile technologies are always on and always with me, they might behave in a way which I consider undesirable in a certain situation (e.g., when my mobile phone rings during an opera). Systems which attempt to address this problem of *disruption* attempt to automatically tailor their functionalities to a variety of contexts or locations, so as not to be intrusive.

Agre outlines several examples of such systems [2001]: for instance, a mobile phone that silences itself when it enters a theatre or a device which automatically powers down when in an airplane that is leaving the gate. Alternatively, there have been several projects dealing not with mobile people carrying personal mobile devices, but mobile people interacting with stationary public interfaces, particularly public displays. Russell & Gossweiler designed a display that serves up personalized content when a user approaches it [2001], and O'Hara et al. created a situated meeting-room reservation display which, among other things, afforded people with more contextual information about the appropriateness of interrupting a meeting that was underway [2003]. These stationary technologies are sensitive to the changing social context around them, and attempt to tailor themselves to these contexts to avoid a rupture between the functionality they provide and the setting they are deployed in.

Here then, we have charted how many researchers within ubiquitous computing conceive of mobility as problematic. Beginning early on with research in CSCW on mobile work, researchers attempted to address the problem of *disconnection* from centrally-located documents and colleagues. Later, in work on academic campuses and with city tourists, researchers tackled the problem of *dislocation*, of being out of place. Finally, researchers have addressed the *disruptions* technologies can cause when they behave inappropriately in a setting into which they have been moved.

Within ubiquitous computing, then, people are often conceived of as being affected by the spaces they move through, and these effects are usually described in terms of the problems they present. Though this framing is clearly a fruitful one as it has yielded much research and many successful designs (we need only look in the interior of our colleague's cars to see the penetration of GPS devices), cultural geography offers a very different, and no less compelling, view about the nature of mobility. Rather than seeing people as merely influenced by the spaces they occupy, cultural geography stresses that people actively produce, by means of movement through and interaction with the spaces that people occupy on an everyday basis, the meaning that these spaces are imbued with.

Indeed, when quoting Lefebvre's quintessential work on the production of space [1991] Hayden says, "[space] is not only supported by social relations but it is also producing and produced by social relations" [1997, 41]. What is important to recognize here is that these relationships are not somehow abstract; they are embedded and enmeshed within the actual spaces. Low highlights this in her work on Costa Rican plazas by stating, "there is a relationship between the circumstances of the production of public places such as plazas, and people's experience of them," and that, "this relationship is dialogic rather than dialectic" [1996, 863]. In other words, each person's individual experience of a space shapes and is shaped by their interaction with that space.

However, there are many different ways of interacting with, and thus understanding spaces. For instance, though it is common in the western world we inhabit to conceive of spaces as areas contained within fixed boundaries, the work of Munn on the Aboriginal view of spaces details an alternative way of understanding the world around us. She says that for the Aboriginal people of Australia the world is seen as "a space of deletions or of delimitations constraining one's presence at particular locales" [1996,

448]. This is not simply to say that the Aborigines treat spaces in terms of an area I cannot be, rather areas I can be. Beyond avoiding certain ancient places, Aborigines also make detours around certain people or events. These people, however, are not always in a fixed location, and thus the spaces which the Aborigines consider themselves to be excluded from do not have fixed boundaries. Rather, they are spaces which radiate out from certain places, events or people, and are inherently, then, wed to the mobility of these other people or the temporality of these events which are to be avoided.

Another native people, the Nukak of Amazonia, have patterns of avoidance that function in a different way. They are a nomadic people who continually move through the forest, setting up camps of residence and subsequently tearing down those camps and moving on a few days later. Originally it was thought that they moved on when resources in the area were depleted, but following a study by Politis [1996] it was found that their patterns of movement actually served to create wild orchards. Nukak eat in their camps and leave behind a wealth of seeds that, when left undisturbed, grow into a densely populated area of edible plants. Nukak never setup a new camp on top of one their ancient campsites, allowing the plants, over time, to flourish. Thus, by never living in the same place twice, they are able to manage their natural resources; they "move to produce" [ibid., 507].

We do not only need to look to aboriginal peoples to see a variety of understandings of spaces. In describing the medieval Christian city Lilley says, "the city was imagined to be a 'cosmos', and the cosmos to be a 'city'—both ordered in God's image, each a 'map' of the other—a Christian cosmopolis" [2004, 683]. This was reflected in the way these cities were structured. The wise ruling class was situated in the highest parts of the city, below them lived the soldiers who would carry out their orders and control the masses who dwelled in the lowest regions of the city. Morality was in this way enacted spatially which in turn shaped further social practices due to this physical separation of classes.

After the turn of the first century the Normans attempted to bring under their control two such English cities, Bristol and Norwich. By building centrally located castles with accompanying town spaces, they effectively marginalized the former Anglo-Saxon areas of settlement. Lilley argues that the Normans created not only a new form of spatial ordered (the castles clearly served as a lookout out point to watch over the actions in the city), but that they also employed this notion of cosmopolis to achieve a social order. Restructuring the cities in this was effective because of the way that the inhabitants of Christian cities at the time understood and experienced urban life.

Here one ruling class attempts to displace another by legitimizing themselves through a common understanding of spatial organization. This can be seen though the language of de Certeau as a "strategic" action undertaken on the part of the Normans [2002]. According to de Certeau a strategy is, "the calculation (or manipulation) of power relationships that becomes possible as soon as a subject with will and power (a business, an army, a city, a scientific institution) can be isolated. It postulates a *place* can be delimited as its *own* and serve as the base from which the relations with an *exteriority* composed of targets or threats … can be managed" [ibid., 35-36]. He compares these strategies to "tactics," which are not the actions of large powerful institutions, but rather of the weak. Where the places of strategies belong to those enacting them, the places of tactics belong to the other. Tactics are carried out by those who do not have the power to own a place in its entirety. They take what they can get when they can get it, but do not keep anything. de Certeau says, "This nowhere gives a tactic mobility, to be sure, but a mobility that must accept the chance offerings of the moment, and seize on the wing the possibilities that offer themselves at any given moment." [ibid., 37].

Strategies and tactics do not only apply to struggles over material goods. The Normans struggled against the English for power by leveraging the idea of the cosmopolis, but it

is often the case that the very notion of the legitimacy of a certain view of spatial organization itself is at stake. Looking again at the case of the aborigines of Australia we can see this conflict clearly. The way in which aboriginal people conceive of the spaces they inhabit is very different from the way that the government of Australia approaches the notion of land ownership. It is difficult for the aborigines to make claims on the land which they live in because they do not use maps and deeds to demarcate their space; it is their movements themselves enact and perform their understandings of these spaces, but their world of shifting boundaries tied to ancient sites and to the presence and absence of others holds no currency with the Australian government. Verran urges us to acknowledge that, "maps perform particular places in the land. Land is not empty space and maps are not mere representations. Land is lumpy, bumpy lived material place, and maps perform this place. Maps are a particular way of living space and encode a complex set of conventions and standards that only hold because they continue to be enacted as people make and use maps, and because a great deal of work is put into making them hold" [1998, 250]. The maps that we often rely on are then no more natural, no more objectively true, than the way in which aborigines conceive the land.

What we can begin to see, then, is that our movements through and representations of spaces are both governed by and simultaneously create those spaces. As with the aborigines and the Australian government, it is often the case that there is a struggle for the *legitimacy* of one form of spatial *legibility* over another. Here, by legibility, I mean the ways in which spaces, and the actions that shape and take place within those spaces, can be interpreted and understood as conveying particular sorts of messages. Legibility of urban spaces served as the topic for Lynch's work, in which he studied the mental image that urbanities each possessed of their cities [1960]. However, this was legibility was treated on an individual level; how does each person make sense of the city they live in by the way they move through it. In the case of the aborigines, however,

we can see an example of a *collective legibility* at work, a social group sharing not only an experience of, but also a meaning for, the space.

Scott discusses at length the history of the legibility of social life and attempts to control it, and out of this arises two quite different forms of legibility [1999]. One is what we might refer to as "panoptic legibility," is the legibility of high modernism and central planning. In Scott's work, he associates this particularly with modern state-hood. In order for a state to control or manage (or exploit or appropriate) resources, it must first find a way to understand and compare those resources. Panoptic legibility, what Certeau's might call a strategy, is a centralized form of legibility, in which a standardized scheme can be applied across multiple settings and locales in order to measure and compare them. Standardized categories – be those categories of work or human action, categories of land or natural resources – can be used as the basis for understanding and allocation. Scott provides detailed examples, including agricultural or urban spaces laid out according to straight lines and right angles without reference to local topological features, uniform single-crop (or single-strain) farming planned without reference to variable soil conditions or weather patterns. Ferguson brings this discussion even more into the present day by asserting that now not only states but the idea globalization itself is "the agent of increasing abstraction, worldwide integration, and standardization" [2005, 378]. The primary characteristics of panoptic legibility, from whatever agent it is enacted, are uniformity, abstraction, and dislocation; it is, almost by definition, a view from nowhere.

The alternative form of legibility explored by Scott is one grounded in indigenous practice, what we might term "local legibility." Rather than a view from without, this is the legibility of the view from within, the view "on the ground." Where panoptic legibility attempts to eliminate difference in order to achieve a coherent ordering of resources across different settings, local legibility focused on the heterogeneous nature of

everyday objects and actions, seeing them in terms of individual differences. Most importantly, though, local legibility is the legibility of practice – it reflects the ways in which people work in, engage with, and make use of the world around the world around them, rather than the abstracted view associated with panoptic legibility. Local legibility is the one which the aborigines enact on a daily basis through their mobility through the land. Their understandings are generated by their repeated interactions with the space around them.

What we see here, then, is a struggle between the strategic panoptic legibilities enacted by large-scale entities and the tactical local legibilities of smaller groups. However, the distinction between these two is not entirely clear cut. One is not necessarily in or out, part of the machine or part of the resistance. Often the way in which we view the spaces we live in is shaped by the representations of those spaces which are so much a part of our daily lives. For a Londoner, it is difficult to refer to traveling around their city without, explicitly or implicitly, referencing a map of the Undergrond [Vertesi, 2008]. These views from above are then, often, intertwined and inseparable from our everyday experience of moving through the spaces we live. Addressing this, Massey coined the term "power-geometries" to refer to the ways that spatial arrangements (e.g. the locations of homes and their proximity both to amenities and to sources of noise and pollution) and patterns of access and mobility (e.g. in the competition for resources between different forms of public and private transportation) reflect arrangements of power and control [1993]. These power geometries also affect the relationships between places and the means by which those relations are brought about; for instance, reflecting on the area of London where she lives, Massey comments: "It is (or ought to be) impossible even to begin thinking about Kilburn High Road without bringing into play half the world and a considerable amount of British imperialist history" [ibid., 65]. More broadly, navigating space, then, involves an orientation towards the social structures encoded within that space.

So it is important to consider the various forms that those encodings can take on. This is an issue, then, of representational practices, that is, both the practices by which certain kinds of representations are brought into existence, and the practices by which those representations are used, shared, and manipulated. Though these representations might be originally put into use by large entities, we often come to incorporate them into our everyday practices. For instance, in the spatial realm, maps are one of the most obvious intersections of practice, knowledge, and representation. The invention of maps gave rise to new ways of conceiving, cataloging and moving through space, but maps carry with them commitments to forms of practice. Hutchins refers to navigational charts as "analog computers" for seafaring, noting that "not until the Mercator projection did a straight line have a computationally useful meaning" [1995, 113]. In other words, the particular cartographic projection with which we are most familiar is designed in order to support specific kinds of navigational and computational practices. However, while a boon for Western navigation, the Mercator projection is a controversial one. In creating straight lines with navigational utility, the projection distorts the representations of the Earth's surface area, exaggerating the size of countries which lie closer to the poles (largely first world countries and former colonial powers) while under-representing the landmass of those closer to the equator (often third world countries and sites of former colonial occupation.) In this case, our appreciation of the vastness of the African continent is ruled as secondary to the opportunity to use geometric tools for navigation. As a different form of cartography, consider the "occasion maps" that one might draw when giving someone directions to a party or a favorite coffee shop. Here, what is represented is not space but a journey, and we notate significant points along the way: landmarks and turns but not small bends in the road. Consistent representational schemes are forgone or transformed in support of the particular kinds of mutually understood practice within which the map will be put to use.

Curry furthers this discussion by analyzing the use of ZIP codes [2005]. Previously, post offices needed to have a sort of local knowledge to know how to sort letters into sensible bundles for postmen to take out on their routes. The ZIP code was originally introduced to speed up the process of sorting in the post office when large corporations would generate an influx of mail to a certain area. However, these companies quickly saw the potential for targeted marketing within this scheme. Overtime large-scale databases of highly detailed consumer information have emerged; such as Clatias [web: Claritas] which touts the slogan "You are where you live." Indeed, due to this new representational practice of ZIP codes, now moving to a certain locale is not only a choice in terms of neighbors and proximity to the super-market. The personal action of taking up new residence now situates one within a nationwide scale; it codifies one's position in society.

So it goes that increasingly technological systems are being used as new forms of representational technologies that work on massive scales. Speaking of geodemographic databases like Claritas, Equifax and the like, Goss says that, "Geodemographics converts the complex social process of interpersonal exchange into technical problems to be solved by the manipulation and representation of digital information" [1995, 192]. He paints a somewhat bleak picture of how this strategic approach on the part of large corporations affects our capacity to legitimate our everyday approach to the world around us saying that, "To stand outside the sphere of consumption and the circulation of commodifies meaning I to stand nowhere at all in contemporary society" [ibid., 193].

The double-edge of this sword is highlighted by Graham in his discussion of software-sorting techniques which are becoming increasingly prevalent (e.g., geographical information systems, face-recognition in closed circuit television, etc.), when he asks, "do the inequalities that are constantly and automatically produced through software-sorting map onto the more familiar geographies and spatialities of inequality within and

between contemporary cities?" [2005, 575]. Though we actively produce the information which these systems gather, by virtue of our movements through the cities we live in, we do not have much of a say in how that information is interpreted, nor do we often even have much of an understanding of how it is interpreted. Thrift & French go so far as to say that this constitutes an "automatic production of space" [2002], and Dodge & Kitchen assert that their exist some space, like airports, where if the software fails to function as intended, the space itself actually breaks down [2004].

As ubiquitous computing is already becoming part of our everyday lives it is, then, imperative that we ask, as Graham does, if "the varying level of (in)visibility among such [service uses] – for example between relatively invisible electronic mobility systems and relatively visible city street and physical transport systems – affect such subjectivities and experiences?" [ibid., 576]. But while asking this question we must also remember, as we saw earlier, that these experiences likewise affect the representational technologies at work. The two are fundamentally bound.

Looking back to the earlier section of this chapter, then, we can see that it is worthwhile for ubiquitous computing to expand its understanding of mobility to not only be seen as something which presents problems to potential users. From cultural geography we can see that interacting with a space and the people around, allows us to gain an understanding of the physical and social dynamics at work, and in turn our actions help to shape that space (and the technologies within and of that space), simultaneously affecting the understandings that others have. The ways in which people move through (or don't move through) space make it legible, and the technologies (be they maps or mobile phones) which people use to represent these spaces often become a part of the struggle to legitimize a particular way of seeing a space. Indeed, we can also see that within cultural geography there has been a growing trend to recognize that there is not one 'mobility' but rather a plurality of 'mobilities' which give rise to different, sometimes

complementary and sometimes contradictory, experiences of the same space. As Cresswell says, “Mobility is embodied in different ways by different bodies” [1999, 179].

3: Riding the Bus

In Chapter 2 I juxtaposed of two bodies of literature in order to begin to answer my first research question: *What relationship between mobility and technology is posited by ubiquitous computing and what is left out of that relationship?* Chapter 2 underscored the way in which ubiquitous computing tends to conceive of mobility as a source of problems which technology can be used to overcome. However, from the cultural geography literature presented in Chapter 2, we saw an alternative conception of mobility. That work presents mobility – both the act of moving through spaces and, at the same time, interacting with the people who inhabit them – as a way in which people form their understandings of the physical and social dynamics that constitute urban public spaces. The culture geography literature does not serve to say that mobility is *never* problematic; in fact, in Chapter 2, I highlighted several of examples of the tensions which mobility can give rise to. However, for cultural geographers, these tensions are not the *only* feature of mobility, whereas, ubiquitous computing tends to conceive of these tensions as the defining facet of mobility, as if to be mobile was to be in the state of tackling problems.

The cultural geography literature reviewed in Chapter 2 provides a basis for Ubiquitous Computing to expand its view of mobility as not being *solely* problematic, but also as a state which can present opportunities. Rather than conceiving of mobility as a transient state that needs to be solved or fixed, ubiquitous computing could, like cultural geography, treat mobility as a necessary means of the formation of societies. Further, the cultural geography literature does not approach the notion of mobility as an singular encapsulating concept in itself, but instead highlights the plurality of intersecting, overlapping and opposing mobilities that various sub-groups of people enact; this

approach could, then, be utilized by ubiquitous computing as a means by which to begin an exploration of the opportunities presented by mobility.

The cultural geography literature points, then, to the incompleteness of ubiquitous computing's conception of mobility and demonstrates that perhaps it is necessary for ubiquitous computing to move beyond not only the notion that mobility is a problematic state which technology can overcome, but also that the practice of conceiving of a singular 'mobility' is a beneficial one. However, if, as the cultural geographers posit, there is not one form of 'mobility' but rather a multitude of 'mobilities' present even within a single space, and that these mobilities can be seen to present not only problems, but also opportunities, what does this mean for ubiquitous computing on a more practical level?

On a conceptual level, I have presented a lacuna in ubiquitous computing's conception of mobility. However, it is still necessary to explore, practically, how this gap is not merely one which is theoretical, but that by overlooking certain aspects of mobility, ubiquitous computing's understanding of technologies designed for mobility is also incomplete. Consequently, the main work of this chapter will be to explore, empirically, what it would mean for ubiquitous computing to consider the non-problematic and multi-faceted nature of mobility.

In this chapter, then, I will present a preliminary ethnographic study conducted on the Orange County Transportation Authority (OCTA) bus system. Through this study I focus on a particular, physically-describable instantiation of mobility (i.e., bus riding), and explore how this means of moving through space encompasses a wide variety of mobilities. I will highlight two key axes along which riders differed in their ways of using the bus system. First, I will explore the ways in which bus users spanned a gamut of levels of expertise in riding, and yet, this expertise was quite separable from the

frequency with which they used the bus system. And second, I will highlight the variety of self-perceptions that riders developed in the context of using the bus, and the differing ways in which they came to conceive of the other riders around them, often through self-projection.

In summary, this chapter will demonstrate that there is not a "single mobility" that describes riding the OCTA bus, but, that even in this study, I found that there were many ways of riding, and that the mobility of the riders of the bus was both an expression of and a site for the development of individual and group identity. These findings, then, represent a concrete example of some of the facets which ubiquitous computing overlooks in its construction of the relationship between mobility and technology – that there were multiple forms of mobility even with respect to a single (broadly conceived of) technology, the bus, and that that technology was not used for a purely instrumental purpose.

3.1: Initial Approach: Observations

The study was conducted, with the help of my colleague David Nguyen, over the span of ten weeks. Living in Orange & Los Angeles Counties, David and I were regular car drivers at the time, and in fact I only became aware of the existence of a public transportation system when I saw a bus out of the window of my vehicle. This led me begin the study, spurred on by a desire to know, "Who is actually riding that bus?" This question, out of context, might seem naïve or unremarkable, but Orange County is quite a unique place, and consequently, I believe it necessary to set the stage for the premise of this study by first describing the culture of Orange County in general.

When one visits Orange County, they visit the entire county—there is no city center to speak of. It is thoroughly suburban, or, as it has been dubbed by Kling et al., postsuburban [1991]. It is characterized by large malls, from the glamorous to the gritty, tract homes, beach-front mansions, suburban "ghettoes," 7 lane freeways, huge 3 lane boulevards, and lots of sunshine (or smog). The closest large city is Los Angeles to the north, followed by San Diego to the south. Orange County, having been formed in 1889, has roughly two-thirds the land area (798 square miles) of the State of Rhode Island and almost three times the population (3 million), 14% of which are Asian, 31% are Hispanic/Latino, 2% are African American, and 30% are foreign born. The largest employers are Walt Disney, The County itself, University of California, Irvine, and Boeing. Orange County's economy is larger than all but 31 nations in the world, ranking ahead of Israel, Portugal, and Singapore. It has one of the highest percentages of adults with access to the Internet, only being outranked by San Francisco and Washington D.C. In terms of transportation, the mean travel time to work is 27 minutes. There are 2.4 million registered cars, and in the 2000 census 33,202 people declared that they used the bus or trolley to get to work [web: US Census Bureau], and according to OCTA, there are more than 217,000 passenger boardings every weekday [web: OCTA]. The American Public Transportation Association (APTA) declared that the OCTA the best large property transportation system in the United States [web: APTA]. The OCTA website boasts that they have "edged out areas such as New York City, Chicago, San Francisco and Portland." Art Leahy, the chief executive officer stated that, "The nation is just realizing what Orange County residents have known in the last few years - that we have a truly exceptional transportation system that includes many ways of moving people," the phrasing of that statement being quite a fascinating in itself [web: OCTA].

We began our study of this often overlooked transportation system using an approach similar to that of the 73 urban journeys project [Jungnickel, 2008]—by riding routes which we speculated might pass through the largest variety of sections of the county

(see Fig. 3.1). The bus system boasts 77 routes, 613 vehicles, and over 6,500 stops, so in order to have an entry point into both the bus system, but also to the county itself, the first route we choose to follow was one of the longest. Route 57, traverses the county from north to south, and for our first journey we rode this bus roundtrip, with each half of the journey lasting approximately two hours. We began the route at the southern endpoint, Newport Beach, which, according to Claritas, is home to some of the wealthiest consumers in the county [web: Claritas].

The route begins at a large mall called Fashion Island (which is not, in fact, an island). Traveling northwards, one enters Costa Mesa, which is home to the South Coast Plaza (the most glamorous mall with the highest revenue in the county). A bit further north is Santa Ana which, according to Claritas, falls in the category of "Multi-Culti Mosaic: An immigrant gateway community, Multi-Culti Mosaic is the urban home for a mixed populace of younger Hispanic, Asian and African-American singles and families. With nearly a quarter of the residents foreign born, this segment is a mecca for first-generation Americans who are striving to improve their lower- middle-class status" (web: Claritas). Next, the route passes through the city of Orange which contains another popular mall, The Block, situated across from the University of California, Irvine hospital complex. Finally the route terminates in Brea, a town similar in economic status to Newport Beach which features many gated communities. The last stop of the route is, of course, the Brea Mall.

In a complimentary fashion, we then chose to ride another bus route which slices east to west through the county, running along the coast. Route 1 works its way along the Pacific Coast Highway from Long Beach, which is just over the border inside of Los Angeles County, to San Clemente, which borders San Diego County. This route, the longest in the county, with an end-to-end journey of about 2.5 hours, intersects Route 57 at its midway point in Newport Beach.

These two exploratory journeys gave rise to a variety of observations which helped us to become acquainted with the nature of riding the bus in Orange County, and to dispel our initial stereotypes. On Route 57, throughout the ride, we noted that the bus was, on the whole, quiet. Even through the busy parts of the route, when the bus was incredibly full, people traveling on their own remained relatively silent – we observed only one

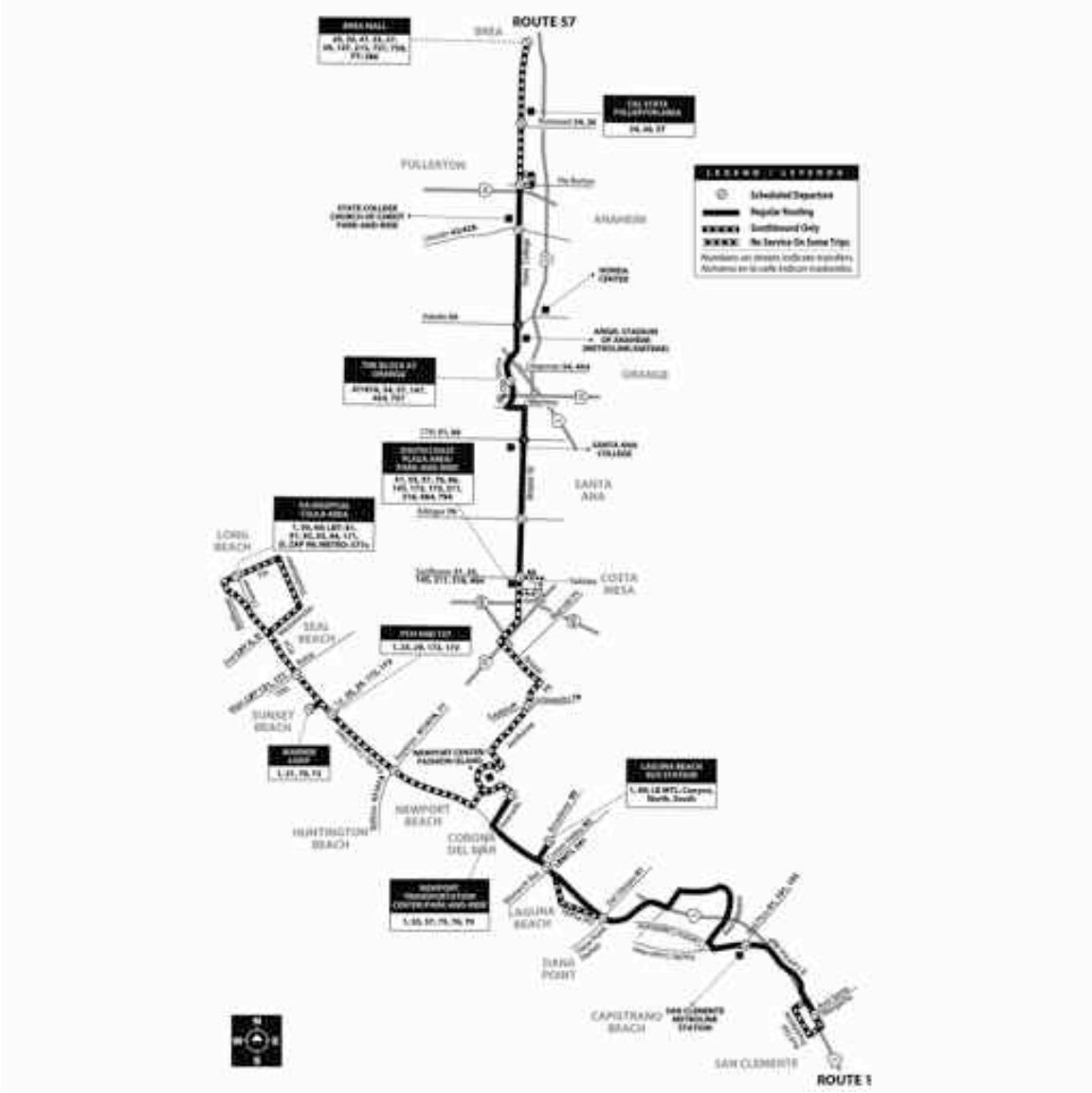

Figure 3.1: Map of OCTA routes 1 & 57

woman chatting on her mobile phone – and those in groups tended to converse in a hushed manner, akin to the relaxed atmosphere of a library. Although the bus stopped at four major malls and seemingly scores of smaller strip malls, very few passengers came on the bus with shopping bags. Furthermore, very few people were seen reading, listening to music, using their mobile phones or even sleeping. One of the only people we observed "passing the time" was a rather scruffy man carrying a hiking backpack doing a crossword puzzle. He had torn the puzzle from a magazine and was supporting the paper with a piece of cardboard. Eventually, we noted that the cardboard was a sign, folded in half, that had written on it a request for money. Finally, the inside of the bus was clean, very clean, lacking any visible graffiti, lacking even advertisements, whose absence was striking. The only signs inside the bus were cautionary ones (see Fig. 3.2), and though there was space inside the bus for ads, the only commercial advertisements we observed were plastered on the side, or wrapped completely around the exterior of the bus. The only consumers of importance were decidedly not the passengers.

This calm, media and consumption-free environment was striking because I had the expectation that we would observe many people "commuting" on this route and thus engaging in what I perceived as typical commuting behavior. Additionally, as the route is mapped, by the OCTA, in terms of the malls which it stops at, I assumed people would be boarding the bus with shopping bags, groceries, etc. However, there was a clear absence of these items.

On Route 1, on the other hand, we anticipated seeing more recreational riders, as the bus traveled from beach to beach. Interestingly, on this journey we did encounter a few people who were using the bus for a "joyride," that is, taking a journey to see the sights, without a particular destination in mind. Unexpectedly, to us, we also encountered many service workers who were employed by the scores of hotels that dot the coastline. Finally, we also observed several homeless people riding this route.

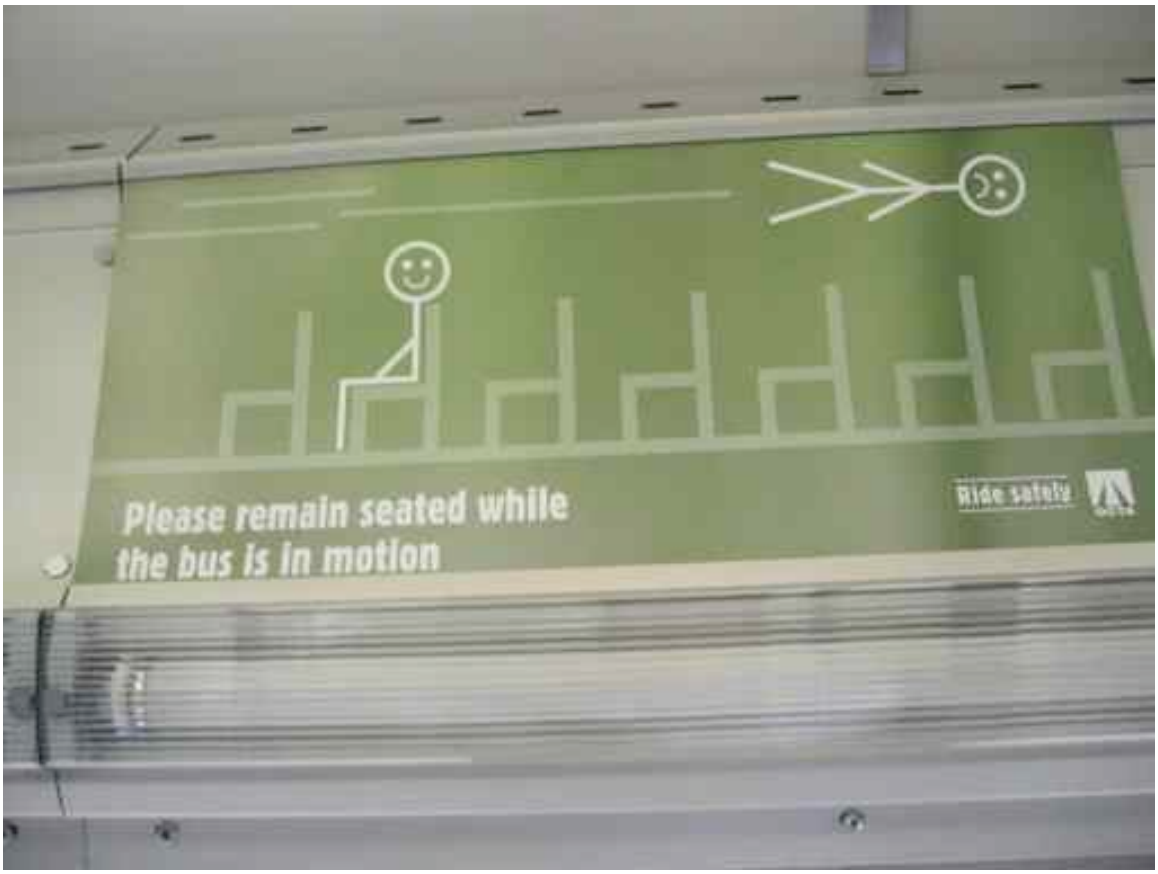

Figure 3.2: Cautionary sign

Overall, then, our initial observational journeys revealed to us that the bus was not merely the proxy car for those with lower incomes we had initially conceived it to be. On the freeways of Orange County one often sees passengers and drivers alike engaging in multi-tasking style commuting behaviors. It is not out of the ordinary to see a woman applying make up or a gentleman reading the newspaper as his car inches forward in traffic. Rather, the bus was a generally a space of calmness, not one of harried production and consumption. The OCTA was not a place to squeeze in a meal between appointments as I thought it might be, it was instead a quiet, yet genial and friendly space, where children moved up and down the aisles in surprising safety, friends encountered one another with regularity, and, in general, people rested in calmness (see Fig. 3.3). The bus, further, was not an anonymous space utilized by a massive

population. It was personal, communal, even homey. Despite the general attitude of trepidation that my friends and colleagues expressed to me when I first revealed that I was studying the OCTA, the bus in Orange County felt, to me, to be the safest public transport space I had ever ridden on, almost "a place where everyone knows your name," a small town nestled in sprawling postsuburban metropolis.

Though on the surface there may be an apparent tension between a space that is at once quiet and at the same time familiar and social, I introduce these observations here in order to give a broad picture of the atmosphere which the OCTA bus presents. However, I will return to this topic at the end of the chapter in order to explicate what, for myself as well, initially seemed to be contradictory. With all of these observations in mind – and my initial biased conception towards what I might see on the bus was

Figure 3.3: Calmness on Route 57

somewhat debunked – we set out to learn more about who these people riding the bus where, and what they felt about their journeys.

3.2: Diverse Starts: Semi-Structured Interviews

Following our observations, we began conducting semi-structured interviews with passengers and even a few drivers. In total we conducted approximately 20 interviews. Initially, we attempted to conduct opportunistic interviews by remaining on the bus ourselves and approaching potential participants as they boarded. This strategy was problematic for two reasons, one straightforward and the other which will be expanded upon in a later section. First, we encountered people undertaking two different types of journeys. We met many people taking incredibly long journeys – on the order of two hours – traveling typically between home and work, school or a medical institution. These journeys were very amenable to conducting interviews as the participants remained on the bus for more than enough time to carry out a detailed discussion. However, we also encountered riders taking "short hops" typically only a few stops. These participants were often taking quick journeys within their local neighborhoods, often between domestic spaces of friends and family. Consequently, it was very difficult to conduct in-depth interviews with such participants as they only remained on the bus for a short period of time. Second, we were initially concerned about the willingness of participants to discuss personal information while in the close quarters of the bus. Surprisingly, passengers volunteered incredibly personal details of their life which led to their riding of the bus on that particular day or more generally. For instance, one interviewee, John, openly discussed the fact that he had a stroke which led to his usage of the bus and another participant, Tara, freely shared with us that the particular journey she was on was her first step towards ending her substance-abuse as she was on a trip to a sober house. However, when we began to ask participants about their opinions of

the other passengers with whom they shared the bus, we realized we were treading into taboo territory. Immediately the participants would lower their voice to a whisper and often become unwilling to answer questions with any specificity. Given these reasons, then, we decided to conduct interviews, instead, off of the bus.

We conducted our final 13 interviews at two transportation hubs within the OCTA network, the Newport Transportation Center and the Goldenwest Transportation Center (see Fig. 3.4). There are seven large transit centers in the OCTA network which serve as the intersection point for many routes. These centers vary in aesthetic quality, organization and seating areas, but typically have benches, restrooms, large covered areas, timetables, and a small parking lot. In these transit centers the bus drivers often take their breaks or stop mid-route in order to synchronize the schedule, but riders often take this opportunity to use the restrooms at these centers, to smoke, etc. While waiting, riders tend to spread out, using all of the benches in the area, making them more distant from one another, thus allowing us to conduct relatively more private interviews.

Figure 3.4: Newport (left) & Goldenwest (right) Transportation Centers

We guided the semi-structured interviews with the aid of a series of questions we developed, though often we moved beyond these questions to encourage participants to relate to us interesting stories about their journeys in order to get a broader sense of what riding the bus in Orange County entailed. The questions focused both functional concerns such as the details of how participants learn about and use the transportation network, the variety of places they use the bus to visit, other means of transportation they rely on, but also about more experiential aspects of riding including the social aspects of the environment, the activities that they witness or engage in, and their feelings towards their journeys in general.

In order to begin our conversations we chose what we thought to be the most obvious question: where are you going? Typically people informed us that they were either going to home or to work. It was when we moved on to our second, complementary question, however, that confusion ensued. During an interview with a Hispanic man in his mid twenties, I inquired as to where he was going and he replied Santa Ana. When I followed up, asking, "Where did you come from?" He replied:

Uh I came from... the United States? —Ronaldo

Laughing, I tried to correct the situation, saying, "No I mean, where did you come from just now?" In turn he answered:

Oh where'd I come from just now? From Mervyn's, going shopping, depositing a check. —Ronaldo

Struggling to understand what we wanted to know, people often responded haltingly, asking us what exactly we meant, and giving us all sorts of answers. In our minds, entering into these people's lives mid-journey, "where are you coming from?" was a

logical follow-up to “where are you going?” We viewed their trips as having starts and ends, and we were trying to set the scene for ourselves in order to get an understanding of the way people were traveling. Interestingly, though, our participants often seemed to respond to our question with a tone indicating they felt that they were “coming from right here” and just could not understand why we were asking. Others, like Ronaldo, tried to parse our question in to something sensible, and declared that they were from the United States. In retrospect, for a young Hispanic man in Southern California, when approached by two strangers asking you where you are coming from, stating that you are a citizen is a reasonable move to make. Fro these responses though, we began to see the variety of ways in which the participants viewed m the space around them and their journeys through it.

When continuing our interviews further, trying to gain a better understanding of the places people were journeying through and between, trying to clarify what locales were being discussed, we received an overwhelming range of responses:

[My daughter’s] swimming classes. —Rosalia

My cousin’s house on Edinger and Euclid. —Betty

Huntington harbor. —Deon

Right over the 205. —Melanie

My friend’s house, somewhere in Crown Valley. —Maria

In general, our participants discussed places in terms of intersections, boulevard names, areas of towns, city names (of which there are 34 to choose from), institutions like

hospitals and schools, general types of places like 'the beach' (which is quite vague given the 47 miles of coastline in the county), but also in very personal terms as Rosalia does.

Here, what I want to emphasize then, is that just from the very first question we asked, we received a series of answers which were striking in their overwhelming diversity. This heterogeneity was something we saw throughout our study, and even though the study was relatively preliminary and exploratory, a few very strong themes which were rooted in this diversity began to emerge. First, I will discuss the variety of expertise which passengers demonstrated in riding the bus, and second, I will explore the different ways in which riders present themselves and conceive of one another

3.3: The Quality of Riding, Not the Quantity: Novices & Experts

The very first time [I rode the bus] I was so scared because I just came in from the Philippines. It was a different situation! I didn't know where to sit. And sometimes it's difficult to understand the Mexican who drives the bus. It was scary but it was exciting because… I'm by myself. And it was exciting. —Maria

We asked our participants to try and recount for us the first time they ever rode the bus in Orange County. Upon riding the bus for the first time, Maria told us that she was overwhelmed when confronted with what seat she should take. Were the seats assigned? Were certain seats safer than others? Would the driver or passengers tell her she wasn't in the right place? Was the choice hers to make, and would she choose correctly? Later in our conversation she began to tell us about the tactics she had learned over time, strategies like arriving to the stop early for certain buses which ran infrequently. Even in the course of this single interview we began to see the different levels of expertise with

which one might ride the bus. However, and perhaps unintuitively, this did not always correspond to the frequency with which the person rode.

For instance, Daniel is a student who rides five blocks each day on his way to his college from his home and back, a distance which is easily walkable, though not necessarily a very pleasant walk, as it would take him down a large boulevard with heavy traffic. A one-way fare on the bus $1.25, while a 30-day pass is $45 and the 75-day college pass is $75. When we asked the Daniel how he paid for the bus, he informed us that he always uses cash. When we followed up to ask if he ever considered buying a pass, which would save him money, we were met with the blank response:

Huh? —Daniel

Probing further, questioning Daniel about his motivations in choosing not to purchase a bus pass, we asked him if there was a reason why he had not bought one. He replied:

Uhmmmmmm... I don't know. —Daniel

For Daniel, a pass would be far and away a money saving choice, but he appeared to have little rationale for opting not to purchase one. It is clear, then, that although you might ride the bus often, this would not necessarily make you "good at it." This leads into the understanding that it is misguided to conflate frequency of riding with expertise, as well the opposite. One might be very new to the bus system, and yet still manage to "ride like an expert."

For instance, Tara, whom we met while she was on her way to a sober house in Dana Point, had a remarkably strong command of the bus system, even though she had only recently arrived in California from Washington, D.C. She told us about how she had

flown to California in the week passed in order to seek out a place for rehabilitation. Initially, she had taken residence in a sober house in Long Beach, but she found that there were still too many temptations in that urban environment, and so she had decided to head to a relatively more peaceful locale. When we encountered Tara she was on the third leg of her trip from Long Beach to Dana Point Having started her journey at 11:20 a.m. that morning, it was 1:20 p.m. when we began our interview.

When we asked how she, having only recently arrived to the area, had found her way through the bus system she told us that she initially received some information from rehabilitation center in Long Beach and went from there. They had advised she stand at a bus stop near to the center, and ask a driver for directions. From the driver, she learned she needed to find the Route 1 bus bound for Dana Point. Though she did not know which side of the street to stand on, she made a rough estimate of which direction was heading south—knowing that Dana Point was south of Long Beach. Further, she also called a friend search the Internet for the bus schedule and jotted the times down on a piece of paper she carried with her (see Fig. 3.5).

Looking at her notes one can see that she made sure to record pertinent information so that she could navigate the system, and even made comparisons to alternative, and far more costly, methods of transportation such as the Super Shuttle (a shared-ride van service). Indeed, Tara revealed that she had made use of public transportation, "PT," as she called it, while living in D.C., and it became clear that though she was new to riding the OCTA system, she was doing so with a certain ease and finesse. Saying she was in experienced to riding the bus in Orange County, she pointed to the cord used to signal the bus driver to stop, asking:

When do I pull this thing? —Tara

Yet, she was aware enough to ask the driver to let her know when the bus had arrived at her destination. Clearly, then, though this was Tara's first time on an OCTA bus, she was able to work the system proportionately more effectively than a daily rider like Daniel. One might say, then, that Tara was somewhat of an "expert rider."

Of course, though, this prompts the obvious question: what does it really mean to be an expert? Who is judging? What are the criteria? In order to find the answer, I need to first address the second theme of this chapter, that of self-perception.

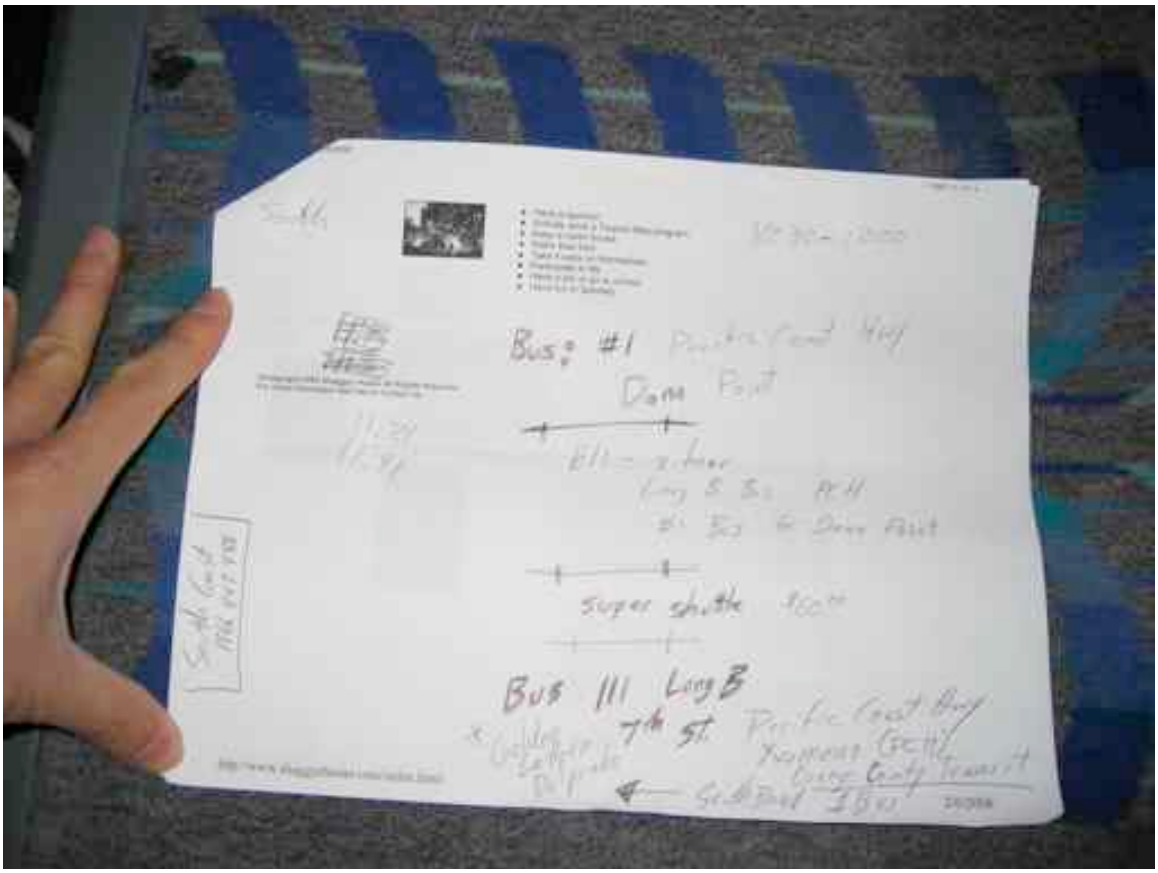

Figure 3.5: Passenger's directions

3.4: Self-Perception & Presentation

Not only was there a notable separation between people's way of riding and frequency of riding; there was also a strong tension between how people *talked* about their riding of the bus. Many of the people we spoke to explained that they were only riding the bus temporarily. Often explaining they would soon have their license or a car:

My sister brings me to work. My sister has a car. … Without the bus? No. I cannot move. I'm waiting for my driver's license. So, by the time I get my driver's license, seldom will I take the bus. But I love taking the bus. —Maria

I still need to get my license. —Jorge

I'm trying to get a car. —Eddie

[I ride the bus] very rarely, I don't have my car right now that's why. … I don't have a car for a month. So I'm riding a lot. —Rosalia

This sort of contextualized justification was a theme we saw repeatedly, very reminiscent of the identity work which Snow and Anderson describe [1987]; people often claimed that no, they were not bus riders. In fact several people we encountered at transportation hubs, or even on the bus itself, declined our requests for an interview on the basis of this fact. This assertion, which was more or less *de rigueur* in car-dominated Orange County, varied in voracity and delivery. Overwhelmingly, though, our participants felt the need to contextualize, justify or explain their bus-riding, as if it was a condition which required clarification. In one candid moment of self-awareness, one participant seemed to acknowledge, mid-sentence, that his car-less state was a fact of the now, rather than a fleeting state we had happened to catch him in:

Yeah, yeah I don't drive car right now, so… I don't have a car, just basically, heh.
—Roberto

Those with the least choice, or exposure to choice, like Roberto, often were the most forthcoming about the fact that they depended on the bus, and moreover they were accepting of that fact. Their talk of cars and licenses was more oriented towards hope, as if it were a goal to be attained, a dream to be fulfilled. Whereas those accustomed to, but not currently able to avail themselves of, a car, were typically forceful in asserting that they would no longer need the bus in the very near future.

As I mentioned previously, we had a chance to speak to John, a man in his seventies, who had recently suffered a stroke and so he was not comfortable driving in Orange or Los Angeles County because there were:

Too many things moving, too many obstacles. —John

In contrast to, he told us, San Bernadino, which was apparently more obstacle-free. While John did not mind riding the bus, he also did not enjoy it, citing such annoyances as long travel time and fat ladies. At one point when he listing these grievances, the bus driver jokingly announced over the PA system that John was:

Angry that the machine doesn't take pennies. —Driver

With this announcement everyone on the bus laughed in yet another example of the atmosphere of camaraderie I mentioned previously. Clearly, then, John has a decent rapport with the bus driver, and even in the context of this moment with other passengers. In general he expressed neutrality to the overall experience of riding the

bus, but at the same time he did not embrace or feel satisfied with this aspect of his life, saying:

I didn't think I'd be a bus person. —John

So, even though occasionally the idea of regular riding was brought up by the participants, no one ever identified themselves, or others, as a "commuter." While in more urban settings, commuters are often public transport riders, here in Orange County it seems that this word is reserved for the people who travel by car, enduring the torturously long rush hour. The idea of commuter, which carries with it a certain sort of status, is not applicable in the world of the bus.

It seems in part because there is no merit in being a "frequent rider," that people tended not to act like, what I had thought of as, typical commuters. Because there is no immediate corpus of commuters to associate oneself with, a distancing from the general notion of "commuter" occurs. We, along with some of the informants we interviewed, noted that there were few people reading, listening to music or engaging in other such activities which both "pass the time" and "fit more in." By not acting like a commuter, by not reaching to be something that one cannot, an effective downplay is achieved. Interestingly though, this is a collective phenomenon. Thus, in order to be an expert rider, one must, in a sense, but a studied non-expert.

3.5: Self-Projection

This reaction to the notion of commuting is not the sole cause of the behaviors which we observed. Many of the daily riders we saw were working class people who held service jobs which could be physically exhausting. The time of travel from work to

home, could often be looked at as down-time, a time of simple rest. Between the demands of work and family life, a bit of time to one's self was often described as peaceful or serene. Maria, the woman we met who had only recently moved to South California from the Philippines told us that on the bus:

I reflect on the beauty of God's creation. Because, really, America is so beautiful. … Yeah, the beach. I say, "God, you have made this place really beautiful." It's really interesting. And I find comfort because especially for me, my family is in the Philippines. You find comfort in seeing these places. It's nice. It's a tourist spot. —Maria

The un-commuter-like behavior is as much a reaction to external social norms as it is to everyday experience. But interestingly, although we did see a great diversity in people's personal experiences, when we asked participants to describe for us a typical bus rider, those who were frequent riders most often described to us a slightly generalized version of themselves. Without the ability to name the mass of others as "commuters" and due to the social trend towards justification of riding, participants adopted the strategy of equalizing the others around to be just like them. Here, instead of painting a picture of diversity, people created one of sameness. Maria went on to tell us:

A typical bus rider… she's carrying a bag. She has book. She has a drink. … Yeah, water. They always bringing water with them. They have radios. They have headphones. —Maria

When we followed up to ask her where her radio and headphones were, she immediately made the move to almost correct this error, bringing the picture back in line with her perception of herself. She continued:

I don't have... and what else. They are all thinking. They are all wondering. … I think it's the best time for them think about things, about life. —Maria

And this is just like what she does. Those people who were frequent riders managed, then, to create for themselves a level of normalcy and legitimacy by seeing others as reflections of themselves. Yet there is a level of ambiguity, it's not clear what the others are thinking of, but then the same would hold for me—I, like the people around me, am full of potential; I could be anything.

Indeed, a Brazilian woman who we met, Rosalia, initially informed us that she was not a bus rider, but as we began talking she told us about the variety of buses she had been taking to travel to her workplace, daughter's school, and her daughter's after-school activities. She was using the bus after having been convicted of Driving Under the Influence, and when we asked her to describe a typical rider that one might encounter on the bus, she told us:

It's quite a… it's interesting. You know. There are a lot of different kinds of people. I notice that there are a lot of Hispanics. A lot. It's just 'cause I'm a people watcher. I like to watch people. It's probably because people are hard workers and don't have money to buy a car. Or maybe not. You look at a person and think they're rich and they're extremely poor, or vice versa. You probably look at me and think I'm a millionaire, but I'm not. You know what I mean? —Rosalia

Rosalia projects her potential on to those around her. She believes, or hopes, that from the outside, people would not judge, or be able to judge, her personal life. She is not riding the bus because her license was revoked, she is using public transport as an undercover, frugal millionaire. Yet, this special treatment is not reserved for herself. The

Hispanic people she notices, they too could have intriguing lives, floating just below the surface.

We can see, then, that this self-projection was a way for each person to preserve and assert their unique identity on the one hand, but to create a safe social space on the other. We are all in this together, because everyone is just like me. So even with all of this diversity, there was a sense of a shared experience which lead to a great deal of socializing. We met many people who often made new friends or encountered old ones in the course of their journeys.

3.6: A Thousand Social Spaces

As I mentioned previously, the bus in Orange County was both at once a calm and a social space. While this, perhaps, seems contradictory, in this section I will explore the ways in which this duality unfolds. In order to do this, though, I will begin by highlighting the variety of ways in which sociality manifested itself for various participants.

Tammy had recently moved to Southern California from San Francisco. She told us that the first time she rode the bus in Orange County it was actually quite scary, but mainly because the price was so much higher than in San Francisco. Tammy freely volunteered to us that she rode the bus everyday. In fact, her typical journey to work spanned across three different bus routes and lasted for two hours and ten minutes. Living in Laguna Beach, but working in Costa Mesa, Tammy was accustomed to the long journey which would bring her to her job. She explained to us the difference between the variety of the buses which she had to use. In a hushed tone, Tammy told us of the diversity between, and within, Routes 1 and 55:

I see so many kinds of people [that] ride the 55, you know, than I do the 1. I… to be very honest with you. I enjoy riding the 55. … Because the 55 doesn't smell like bad B.O. And it doesn't smell like urine. … The bums always ride the 1. They smell. They don't shower. They always panhandle. —Tammy

When the interview turned to the topic of meeting people and making friends on the bus, Tammy drew out the difference between the buses she uses even further:

I have [made friends on the bus. Only on the 55 though. The 1, I wouldn't dare. To be… I'm afraid of those 1 buses. The 1 bus actually scares me. I've made a friend with an attorney [on the 55]. She's a regular bus rider. She would rather take the bus than drive her car. And she's actually a pretty cool lady. One of the rainy days we just had, you know, she was just, you know, on the bus. Her car wouldn't start. And we just started talking then. 'Cause we both were in kind of shitty mood that day. —Tammy

Here again, we see a bit of self-projection. Tammy's friend has a car, but Tammy happened to meet her on a day when her car was not working and so her friend was forced to use the bus. But Tammy relates to her, idolizing her in a way, by saying that her friend would actually prefer to use the bus. Indeed, Tammy tended to conceive of the bus as a space where their existed free-loading bums (on Routes 1 and 43) on the one hand, and hardworking business men and women (on Route 55) on the other. When characterizing other bus riders Tammy told us that they are:

A lot of business people that wear suits. A lot of people who are nurses, who are doctors. You know, they ride the bus. 'Cause gas these days are expensive. —Tammy

In the course of our conversation with Tammy, it became clear that she aspired to be a professional business woman, and she projected these goals onto her conceptions of the other riders around her. She informed us, for instance, that her family had purchased for her a 30-day bus pass because previously she was spending three dollars a day to go to and from work, and this placed an economic strain on her. Tammy, seemed then, to conceive of herself not as having money-troubles, but rather as being the frugal professional which she believes her fellow Route 55 passengers are as well. It is through this duality of identity formation by means of self-projection, then, that the social world of the bus is opened up to Tammy.

Social interaction on the bus, for Jorge, however, took on a slightly different character. We met Jorge on Route 1 on his way from San Diego to look for a place to live in Santa Ana. Quite soft-spoken and gentle, it became clear through the course of our interview that Jorge was, or had been for a time, homeless. He recounted for us two instances of encountering or making friends on his journeys. Once, he shared a bus ride with another gentleman, and in the course of the journey it became clear they were both on their way to the same shelter. Their shared experience, then, opened up an opportunity for a more lasting friendship outside of the OCTA system. Relating a very different occasion, Jorge told us that he once encountered a friend on the bus, who he knew from his trade school in San Diego that he attended about five years ago. The man approached him asking Jorge if he remember him. It was not until the man reminded Jorge of his trade school nickname “pooch” that Jorge placed where they had known each other from. Jorge went on to say that this friend had become a store manager, placing heavy emphasis on this point. In this case, it seemed for Jorge that this friend from times passed embodied the sort of potential or hope I mentioned previously. The bus then, for Jorge, is a space of both personal and social opportunity.

Roberto, on the other hand, rides the bus in Orange County regularly to get to work. He described for us the way in which, over the course of weeks or months, he would often see the same people over and over again, and slowly develop friendly acquaintanceships, or more lasting friendships, with them:

I have a lot of friends on the bus. Yeah most of the time, you know, you take the bus on the same time and all the people take the same bus on the, all of the same people on the same time. ... I meet a lot of good friends in there, that I know and sometimes see, see each other on the weekends. ... They just, you know, sit on the side of the other guy or over and say "where you going," "I go to work," you know, start up communication. And sometimes you see ellas *everyday, you know, and start talking again and be friends. After a couple weeks, three weeks, more, a couple months, be friend. ... I see a lot, but I don't know their names, you know like my neighbors, like "hey."* —Roberto

Here, Roberto captures quite clearly the feeling of the community[1] of the bus. The people he encounters are not blank-faced strangers, but rather, he says that they are like neighbors to him. Some of these neighbors he has a polite rapport with, and with others he develops a deeper relationship. But what is of importance here, is that the bus represents a space that these types of relationships can, and do, develop in. Roberto, and his social interactions, are not an exception, they are the norm.

[1] Throughout this dissertation I use the terms *community*, *collective*, and *sociality* to refer to three different facets of urban publics. The word *community* refers to cohesive groups of people with a shared identity. *Collective*, on the other hand, is used to describe a wider-reaching phenomenon than the *community*. A *collective* is characterized by the emergent patterns resulting from large-scale participation of many individuals and is often broader in scope than a single *community*. Finally, *sociality* refers to the small-scale interpersonal interactions between individuals, and it is these interactions which form the basis for the creation of both *communities* and larger-scale *collective* patterns.

I argue, that this atmosphere, creates a baseline from which other types of interactions flourish. Tammy, though she entered the OCTA system as somewhat of an outsider, was able to discern the character of the various routes, and see the possibility that, some of them, represented a place to form new friendships. The Robertos of the bus system, and their daily interactions, each contribute in their own ways to create, from the bottom-up, a space of communal safety and calmness which can be perceived, and utlizied, by someone like Tammy.

This same atmosphere is also used by other riders in yet different ways. Eddie, a young marine, stationed at Camp Pendleton, who we met on his way from San Clemente to Laguna Beach to deliver a Valentine's gift to his sister, told us how he enjoyed, very much, talking to strangers on the bus. He detailed numerous and varied interactions that he had with people on the bus, from talking about sports to meeting a young man, who he still keeps in contact with now, who brought him to an interesting party. Eddie also related to us how a stranger once attempted to provoke a confrontation with him. Because Eddie sports a military haircut, he told us that the stranger assumed that he was a soldier and began criticizing the war in Iraq. The conversation became heated and the stranger asked Eddie if he wanted to fight. At this point Eddie was emphatic that he would never actually fight on the bus—he would take any physical confrontation off of the bus and onto the street, for respect to the passengers and driver. Here, then, Eddie demonstrates how he is observant of the communal nature of the bus in both the way he feels comfortable in speaking to strangers there, but also in that he would not disrespect that community by abiding violence in that space, even for a cause he believes in.

This space of safety, though, that Eddie respects, is also appropriated by other people for purposes beyond neighborly camaraderie. Alejandro, a young Hispanic man, who we met on his way back home from a day of contemplation at the beach, had been riding

the bus often, because he crashed his car, but when he was a young teenager he used the bus frequently, and so the system was familiar to him. He told us of two interesting, sexually-tinged encounters he had on the OCTA system:

I was on the bus, I was on Beach Boulevard, headed toward Edinger, and uh, some lady had a kid. I guess I found her, she found me attractive. So she was like, "Kid, get him, get him." Whatever his name was, "Get him, go get him, go make him your daddy." She was like making it known to me, you know? She wanted me to know that. She didn't have words to tell me, so she started telling the kid, "Go get him, go make him your daddy. She was a white lady, you know? I sat back and I waved "hi." I laughed 'cause the kid was cute, you know? —Alejandro

One time I was waiting for the bus, at a bus stop. Some guy pulled me over. Offered me a ride. Told me, "Don't have to take the bus, I'll give you a ride." And he offered me a stripper position for his group of strippers he had. I was just like, "Whoa." He was all like, oh, first before you get the position, you have to, uh, model in a thong. I was just like, "Whoa." And the picture was going to be posted on the Internet. So, I was like, "No, thank you." [I was on] Main and Edinger. It's in Santa Ana. It's a pretty busy stop. He just kind of like, rolled by all pimp and stuff in his fucking BMW. For real. He rode by like all pimp, and like, he just pulled down his window and, "hey come here." [And I went.] He didn't pose a threat. He gave me a ride to where I wanted to go <laughs>. And then he told me his intentions and I was like, "Whoa." I mean, I didn't tell him off or anything. Whatever, I'm getting a ride anyway. It's quicker. Fuck it. But that was pretty interesting, you know? Like, Hot Latinos and shit, or something like that. Nahhh. I was like, "No thank you." But it was kind of weird, 'cause the guy was kind of gay. So, not that people who are gay bother me, but, just he's looking at me weird and shit, and I'm right next to him, you know? And he's like, "Can I see your abs?" Like you're not used to that, one's not used to that. You're not used to that at all.

—Alejandro

Both of these people that approached Alejandro, in a way, manipulated the safe atmosphere of the bus system in order to have an inroad. Because the bus is a place where talking to strangers is normal, even welcomed, Alejandro was receptive to their initial contact. It is notable that he did not outright ignore them, but rather he chose to continue the interactions. Perhaps even more notable is the way he characterizes the man in the BMW as not posing a threat. Alejandro went along with the interaction rather than shielding himself from it.

Finally, we even had a chance to interview one gentleman who was on the other side of this interactional coin. This amazing rider had taken the social life of the bus to the extreme. Deon had frequent access to other means of transportation. Although lived in Las Vegas, his ex-wife and children are residents of Orange County and so he came for frequent visits. Typically he would fly in and shares the car of his ex-wife while he was in town to see his children. But, he informed us that he takes the bus in order to escape from some of the burdens of family life:

I do the kid thing, and today, you know, it's like, it's gonna rain tonight, I'm like let me go take care of some business today so, my kids momma's like "you wanna, like use the car?" and I was like "no, I don't feel like drivin' you to work today, and go pick you up, you take the car I'm jumpin' on a bussss." So I've been havin' a blast all day. —Deon

Deon used the bus to seek out social encounters. He described to us how he used the bus to pick up women. He gave us very detailed information about which buses have the best women (night buses, and any bus that runs down a boulevard), the best neighborhoods (beach communities), and some key lines and tactics one might use (best to sit by the rear exit so you can see everyone getting on, and everyone getting

off). For Deon the bus was a moving playground, a place where mobility and this shared experience were the keys to meeting women. He saw all the women as having the same motivation as he did. Why else, he asked us, would these women be on the bus?
The bus in Deon's eyes was an intensely social space, and as he put it perfectly:

The bus was like this stage called Broadway, and it was time to perform. —Deon

3.7: Conclusions

At the beginning of this chapter I presented a theoretically-grounded answer to my first research question: *What relationship between mobility and technology is posited by ubiquitous computing and what is left out of that relationship?* I explicated the ways in which cultural geography literature can shed light on what is missing from the relationship between technology and mobility as it is conceived of by ubiquitous computing. Whereas ubiquitous computing often approaches mobility as a problematic, transient state which technology can help to solve or erase, cultural geography treats mobility as both something which is fundamental to the formation of societies and also something which, in itself, is pluralistic (i.e., there is not one 'mobility' but rather a multitude of 'mobilities'). Through the study presented in this chapter I have strengthened this theoretical answer by exploring, empirically, how ubiquitous computing could begin to consider the non-problematic and multi-faceted nature of mobility. This has served to show that while ubiquitous computing might currently overlook a particular aspect of mobility, there is actually an opportunity for this gap to be filled in a practical sense. Consequently, this has opened up the possibility for exploring how we might go about addressing this gap in a more comprehensive and in-depth fashion—the theme which will comprise the remainder of this dissertation.

More specifically, the study on the OCTA bus system shows, practically, how even within the context of a single, broadly construed technology (the bus), there are a multiplicity of mobilities at work, and at these mobilities are not merely constituted by solving the problems public transport can present. In the case of this study, this diversity and plurality can be seen on three fronts. First, mobility, for our participants, is not purely an exercise in problem solving. The time spent on the bus does not represent a gap in productivity, a wasted period of time. For someone like Maria, her journeys are a space of reflection, a time to think about life, a time of peaceful rest and calmness. Second, each of our participants used their bus-supported mobility to form their personal identities in a variety of ways, diversity manifesting itself not only between people, but also in the course of a single person's experiences. Maria, initially frightened of the bus, came to enjoy her journeys. Roberto, who, in the course of our interview, embraced his car-less-ness, used the bus as a social space to enter into a quiet, neighborly bond with the other riders around him. On the other hand, Rosalia conceived of herself, within the space of the bus, as a person full of potential, someone who could be anyone. Finally, our participants conceived of one another, and indeed the social space of the bus, as having a variety of characteristics. Though this was often done through self-projection, the fact that many people were simultaneously viewing each other as being similar to themselves, gives rise to a very communal and social space. Tammy bonded with a friend who she perceived to be on the same wavelength as her, the same sort of hard-working girl just trying to make it to the office on time. Deon, on the other hand, saw all the women on the bus as having the same objective as him, to connect with members of the opposite sex.

Mobility, or rather the collective mobilities of the participants, can be viewed then as both an expression of and a site for the development of certain notions of identity, both individually and communally. The places I move, the ways and rhythms with which I move through them, and my sense of the relationship between my movements and

others', are ways in which identity can be managed. The bus in Orange County could then be seen a site for the negotiation and production of forms of communal and individual identity. It becomes clear, then, in contrast to the prevailing ubiquitous computing view of mobility, the primary purpose of movement cannot be viewed as solely resource driven. In this case, we can see there are a diversity of experiences being supported, and that these experiences contribute to identity creation. Though resources, like bus time-tables and tickets, are clearly used to achieve this end, the management of these resources are not the singular, or defining, feature of riding the bus in Orange County.

Consequently, then, this study serves to motivate how ubiquitous computing might, and can, begin to address the non-problematic and multi-faceted nature of mobility. By focusing on a particular instantiation of a classically characterized mobility, in terms of the physical means of movement (i.e., the bus), I have shown how this mobility is better characterized as a set of various mobilities. By examining both the varying levels of expertise that riders display while riding the bus, and by exploring the variety of self-perceptions, and understandings of one another, that riders developed through using the bus, we can see that there is not a "single mobility" which accurately captures the experience of riding the bus in Orange County. These findings, then, and the utilization of ethnographic techniques, represent a concrete example of the ways in which ubiquitous computing might begin to conceive of, and address, mobility in a more comprehensive way, and they pave the way for the deeper exploration, which this dissertation will present, of how ubiquitous computing might more formally expand its conception of the relationship between mobility and technology.

4: Introduction to the Underground

In Chapters 2 and 3 I provided both a theoretically- and an empirically-grounded answer for my first research question: *What relationship between mobility and technology is posited by ubiquitous computing and what is left out of that relationship?* Chapter 2 demonstrated – through a literature review – that ubiquitous computing conceives of mobility as a universal concept characterized by its nature of posing problems which can then be tackled by technology, whereas cultural geography tended to treat mobility as something that is both pluralistic and fundamental to society, rather than being purely problematic. Chapter 3 provided an empirical example – an ethnographic study of the OCTA bus system – of what it would mean for ubiquitous computing to consider the non-problematic and multi-faceted nature of mobility. This study served to illustrate that while ubiquitous computing might currently overlook a particular aspect of mobility, there is the possibility for this gap to be filled in a practical sense. Consequently, I indicated that the remainder of this dissertation would be given over to exploring how we might go about addressing this gap in a more comprehensive way.

With this understanding that there is a potential to address the way in which ubiquitous computing currently posits the relationship between mobility and technology, I am able to pose my second research question: *How can we expand (through conceptual resources) the relationship between mobility and technology in useful ways?*

The results of the study on the OCTA bus system represented an overwhelming diversity in the ways in which people both rode the bus, and the ways in which they conceived of themselves and the others they encountered in their travels. Though the interviews with participants addressed a wide variety of aspects of bus riding, I was struck by how all of our discussions, even when discussing functional matters like locating bus stops,

highlighted the experiential nature of journeys. The findings from the OCTA study pointed towards a potentially rich area for further exploration: examining the ways in which an understanding of the experiential quality of journeys could be capitalized upon for the design of new technologies within ubiquitous computing.

This chapter, then, will describe the development of, and methodology for, a study which I conducted in the London Underground, entitled Aesthetic Journeys. I will outline the conception of the study and the ways in which this ethnographic inquiry was mounted in order to begin to answer my second research question.

4.1: Approaching the Aesthetic Nature of a Journey

From OCTA bus study we began to see the diversity in the ways in which people created, and reacted to, different experiences of mobility. These concerns are not simply with the traditional problematics of urban transportation—missing the train, unexpected delays, and complicated connections. Instead, they focus on the experiential quality of local travel, what I call "aesthetic journeys." The preliminary study in Orange County, then, served to provide me with the foundation to go ask what makes a good journey and how is it done?

In order to answer this question, I decided examine an incarnation of urban mobility that contrasts with the bus in Orange County – not only in terms of scale but also in culture – the London Underground. The OCTA bus system was fascinating in part because it served a limited group of people. The Underground, on the other hand, presents an opportunity to study the opposite extreme. Almost 4.25 million people ride every day, and the popularly held view is that "everyone rides the Tube." Indeed, studies such as that of Vertesi [2008] showed that the Tube was such an integral part of the way in

which Londoners conceived of their city, whether they were frequent riders or not. Consequently, I would like to give a brief overview of the city of London, as world-famous as it might be, in order to shift into the very different context that the Underground represents.

At 609 square miles, Greater London is three-quarters of the size of Orange County, but it has population two and a half times as large, at almost 7.5 million. 70% of this population is white, 13% are Asian and 11% are black [web: Office for National Statistics]. The Underground, which, contrastingly, finds ridership in more than half of this population, serves 275 different stations, and winds through the urban area with 253 miles of track, making it the longest subway system in the world. With part of the existing system first opening in 1863, the Tube is also the oldest underground system. The London Underground even boasts Western Europe's longest escalator, a 60 meter long experience for the passengers in Angel Station. These facts, interesting in themselves, also serve as a source of great pride for Londoners; one stranger remarked to me, "the New York City metro is just a subway, but ours is a real underground." There is something, indeed, about the depth and reach of the Tube that lends enough magnitude for one to understand why is has become emblematic of the international city itself.

The Underground presented an exciting opportunity for the study of diversity given its massive reach. However, it was this sheer scale that made it challenging to tackle the Tube as a site of ethnographic study. Indeed, Crabtree et al. [2006] point out the difficulty of conducting ethnographies of people engaging with mobile technologies. They focus on the difficulties of reconciling interactions which span several devices, applications and services (e.g., mobile phones and PDAs with Internet and GPS capabilities). In the case of the ethnographic study presented in this chapter, however, I set out to focus journeys themselves rather than the constituent pieces that they were

shaped by. My ultimate goal, then, was not to conduct a study of existing ubiquitous applications, but rather to understand the aesthetic and experiential characters of (a particular slice of) urban mobility. In order to do this, instead of considering solely mobile technologies, I adopted as my unit of focus the journey.

Such an approach, then, necessitates careful consideration regarding the techniques of inquiry to be employed. My focus on the journey rather than, for example, the space of the Underground itself, can be seen as an example of multi-sited ethnography [Marcus, 1995]. Though Marcus' work lends itself well to the study sites distributed across the globe, my study is on a somewhat different scale. Rather than focusing my study on the site of the Tube conceived as a singular location, I examined the sites of the journeys themselves. Journeys are distributed across space and time at various granularities. Though they are more challenging to define than, for instance, a particular Underground station, I took this approach because I was interested in the experiential qualities of urban mobility, and a journey is something one can speak of having experienced. Rather than only looking at the span of time participants spent within the Underground, I attempted to understand journeys more holistically—from when one prepares their bag before leaving home until they arrive and settle in at their destination. Further, the unit of the journey was something participants in the OCTA study were able to speak about comparatively. Certain trips had different characteristics, sometimes because of, but often in spite of, the particular route a person was traveling. In order to explore the diversity of experiences one might have of the London Underground, then, it made sense to put these experiences in a context which was amendable to comparisons.

However, precisely because so many elements contribute to a journey – the transport infrastructure, the time of day, the disposition of the person, the things they are carrying, the people they encounter, and so on – I decided it was necessary to employ a range of techniques to sample the experience in different ways. The culture of OCTA

bus system was, as I elucidated in Chapter 3, one of a sort of calm sociality. As such, it was not, for my participants, too out of the ordinary to engage in a spontaneous conversation with me. The London Underground, on the other hand, is a place where, according to one of my participants:

You can't speak to anybody; you don't speak to anybody —Manny

Consequently, engaging in opportunistic interviews on the Tube seemed that it would be challenging at best, and I decided it would be wiser to pre-arrange a series of meetings with a variety of participants and to compliment, and prepare for, these interviews by first employing a range of observation techniques within various areas of the Underground. In the next section I will expand upon this range of techniques.

4.2: Techniques for Tackling the Underground

The Aesthetic Journeys study took place over the course of three months, with six weeks devoted to the gathering of data in London. The study was conducted during the course of an internship with Intel, and consequently I spent the remaining weeks in Portland, OR outlining my approach and analyzing the data with my mentor, Scott Mainwaring. The six weeks of data collection were broken into two intensive three-week sections and separated by a return to Portland for one week of early analysis and reflection, which served to shape and redirect the remaining period of data collection.

The first half of the study was mainly devoted to a variety of techniques of participant observation, six in all, whose descriptions follow. Though I had previously spent a good deal of time in London, I consciously attempted to defamiliarize myself with the Tube to observe my surroundings with fresh eyes. In order to do this I engaged in a variety of

styles of photo-documentation, collecting over one thousand photographs. Each of my ten photography sessions lasted approximately six hours and utilized different ways of moving through the Underground network. One such type of journey was focused on a particular Tube line and involved alighting at, and exploring the interior of, each station. This was done to try and get a sense for the character of an individual line—what, for instance, does it feel like to ride the Northern Line? During these journeys I focused my photographic efforts mainly on documenting both the architecture and the infrastructure of the Underground.

The second type of these journeys focused on a given train as it moved along the tracks. During these journeys I would board a particular train and with every stop it made, I would quickly exit the train and move into the next carriage. This was done in order to get a sort of broad snapshot of a specific train. Here, rather than focusing on the physicality of the space of the carriages, I turned my attention towards the variety of people sharing the train together and the activities they performed. This type of journey lent itself towards examining, comparing and contrasting the interactions of a variety of people sharing the same space yet at the same time separated by the boundaries of the carriages. Inspired in part by Ryman's novel 253 [1998], I took these journeys not intending to create a perfectly rigorous summary of every single person on the train – which would be essentially impossible given the fact that many people board or disembark from the trains at every stop – but rather to get a somewhat coherent and almost artistic overview of the inhabitants of a train as it traveled along on the rails. Occasionally, on these journeys, I narrowed my focus even deeper, spending several hours documenting the nuances of a particular action: watching the way people held their tickets, observing the interactions between strangers, noting the variety of electronic devices present and how they were utilized, etc.

The third type of journey I took was a much longer one. I traveled from the flat in Brixton, a neighborhood of London, where I was staying, to the apartment of a colleague in Paris. This journey, which lasted approximately 5 hours in each direction, spanned over two lines of the London Underground, the Eurostar train which travels through the Chunnel between England and France, and finally two lines of the Paris Metro system. This journey was mounted in an attempt to experience both the continuity and the contrasts between the variety of train systems. By juxtaposing the various forms underground transportation, and by focusing on the moments of transition, I used this form of photo-documentation as an opportunity to compare both the structure of the spaces themselves and the ways in which the variety of people made use of them.

Fourthly, because I was spending a significant amount of time in London, even when I was not engaging in one of the three specific types of photo-documentation journeys mentioned above, I always kept my camera on hand and documented my own personal routine. This allowed me to both capture and reflect on my own daily patterns, and to record my personal perspective on the Tube. In these times, I photographed things which caught my eye—from odd pieces of trash, to bizarrely dressed riders, to examples of quirky signage, and so on. Photo-documenting this type of journey was an attempt to discover the hidden aesthetics of the ordinary travels of one rider. While this perspective alone might be limiting, taken in conjunction with the other styles of journeys, it allowed me to bring my own brand of personal curiosity to my photos, and develop an intimate understanding of the aesthetics of the Tube that became indispensable during the interviews I would later conduct.

Fifthly, during all of my observation sessions, and also while I was traveling during the course of my own daily routine, I took notes about my surroundings. I used these writings in conjunction with the photo-documentation to create a series of lengthy pictorially- and textually-based field notes. These documents served to represent the

larger narrative which began to emerge from my observations, and to contrast and compare data across the entire length of the study.

Finally, I employed a technique which harkens back to a method Marcus highlights, which he dubs "Follow the Thing" (1995). In his conception, Marcus describes this technique as tracing the movement of an object through a variety of, often globally disparate, contexts. Typically this object is conceived of as a commodity moving through a capitalist marketplace, but in the case of the Aesthetic Journeys study, I employed a variation of this method on a far different scale. During my early photo-documentation sessions I noticed that there were a variety of items often directly and indirectly exchanged by passengers in the Underground. The two most prominent examples being newspapers and paper tickets. I will discuss these practices in more detail within Chapter 6, but, briefly, what I found noteworthy was the practice of handing over a physical object from one stranger to another. It struck me that these objects were both entry points of interaction and intersection points between the journeys of various people. This inspired me to consider a journey then, as not only something which a person might undergo, but also something that, in an often parallel, but sometimes perpendicular, way, an object might take. I carried out this "object shadowing," as I came to call it, by leaving a newspaper on the seat within the carriage, and following it as it was picked up by various passengers and carried around the Tube. I recorded all of the interactions which took place around, with and through these newspapers, in order to capture the story of a specific object which was contributed to the experience of several people's travels. By explicitly following the journey of an object, then, I was able to gain an alternative perspective on the aesthetic experiences to be had in the Tube. By moving away from the notion that journeys must always be approached as the experience of a single person, I was able to highlight not only the mere overlap between the journeys of passengers, but also the way in which these

intersections were, in a sense, fundamental and constitutive of the very nature of journeys.

4.3: Talking to Tube Riders

During the first three weeks of data collection, I also conducted two preliminary interviews. These interviews served as an initial foray into encouraging participants to elucidate their aesthetic experiences of the Tube. During the break between data collection sessions, I used the results of these initial interviews in conjunction with the observation data, to shape the format and approach of the remaining three weeks in London, which I will describe below.

In the course of the study I met with a total of 19 participants. Interviews typically lasted between one and two hours, and were audio recorded, with the participant's permission, and later transcribed when the sound conditions of the meeting place permitted. Otherwise extensive interview notes were taken, and later elaborated on after the meeting concluded. With regards to participant selection, as I stated previously, I approached this study through a lens of diversity. In keeping with this, rather than attempting to choose a statistically general sample of participants I tried to find a theoretically interesting one. By this I mean that I chose to look for participants who had a unique perspective on the Tube or some sort of "expertise" – continuing to purse this theme which emerged from the OCTA study – in order to highlight and explore the idea of diversity.

Because of this interest in finding participants representing a range of different aesthetic experiences of the Underground, I spent the months leading up to the study regularly monitoring not only mainstream media news sources (e.g., BBC) but also a

variety of blogs that highlighted interesting Tube-related people and events, including London-based sites (e.g., [web: 43; web: Cast Off; web: London Underground Tube Diary; web: Londonist; web: Smoke; web: Tube Gossip]), as well as international ones which often report about London (e.g., [web: Boing Boing; web: Networked_Performance; web: We Make Money Not Art]). Having become acquainted with a variety of interesting people through these sources, I contacted approximately ten groups and individuals inquiring if they might be interested in participating in my study. The responses to my invitations were overwhelmingly positive and I was able to meet with six individuals whom I had contacted in this way. I spoke to a photographer, then based in Canada but fortunately on shoot in Paris at the time, who had visited London to create a photo essay of the Underground. I also interviewed the editor of an alternative magazine geared towards peculiar goings on in London often specific to public transport. Further, I met with an interactive artist working with Oyster Cards and a graphic designer who had produced an alternate version of the Tube map. Finally, I spoke with two staff members of the London Transport Museum, one of which specialized in photography.

To compliment this more artistically-oriented group of participants, I also employed snowball sampling. Sending a formal email invitation to the study to friends who currently, or had previously, lived in London, I asked them to forward the message to anyone who they thought might be willing to participate. In order to look for aesthetic diversity outside of the arts community, I explicitly expressed the request that my initial contacts forward the invitation to those people who felt they had unique perspectives on the Tube, who felt passionately, in one way or another, about the Underground, who were in a different life stage than myself (e.g., with children, elderly, etc.), or who were either new to London or currently living in another city. From these invitations I was able to interview an additional 13 participants. I spoke to a recently married woman who was living between two homes on opposite sides of the city. I interviewed a self-professed Underground enthusiastic and a woman with "Tube-phobia" so severe that though she

loved it, she had been unable to ride the Underground for years. I met with a mother whose now adult children had been riding the Tube with her from a very early age. I also talked with a woman whose daily commute utilized an automobile, an overland train, and the Underground system, taking two and a half hours, one way, to complete. Finally, I conducted an extended group interview with a small social network of tech savvy friends who, though all living in London at the time, had originated from Ireland, Holland, England, America, Italy, and Korea. This group interview was arranged in order to facilitate a different form of story telling. Whereas when I interviewed individual participants I was able to gather a range of very detailed and diverse experiences, the group interview gave rise to a type of threaded and self-propelled conversational memory swapping. During this extended session, the interviewees recounted shared experiences, prompted one another to tell me certain stories which they found significant, and argued around several of, what they considered, the finer points of Tube travel. By allowing the discussion of Underground experiences to emerge by exerting far less direction over the interview itself, the conversation took on its own momentum and form, this itself being indicative of what sorts of experiences were collective in nature. However, within all of these interviews, I attempted to maintain a level of consistency.

The interviews with participants were semi-structured and consisted of two main parts. The main portion of the interview centered around eliciting personal experiences of riding the Tube from the participant, focusing specifically on the feelings brought up by different sorts of journeys. For each meeting I drew from the same list of interview questions, but tailored the discussions mainly around five themes: rich descriptions of particular journeys, comparisons between journeys, expectations about hypothetical journeys which I proposed, details about the worst and best journey a participant had taken, and, finally, emotions and attitudes towards the Underground. Throughout the interview I often deviated from the questions to encourage participants to go deeper with stories and recollections about the Tube which they had touched on, with the

ultimate goal of eliciting highly specified recounts of a selected set of significant occurrences which participants felt exemplified their journeys, rather than seeking broader and more general accounts. This method of interviewing was chosen instead of, for instance, a more structured questionnaire, because the study intended to address the richness of mobile experiences, and in order to tackle that topic, it was appropriate to gather highly specified data. Though I was attempting to explore the diversity of experiences with this study, ultimately I had set out to use this data to explore the ways in a more experientially-oriented study of mobility could be used in the design of new technologies. Looking back to my second research question, *How can we expand (through conceptual resources) the relationship between mobility and technology in useful ways?*, we can see that the intention is keep my exploration, and subsequent expansion, of the concept of mobility *useful* for ubiquitous computing. Consequently, I placed great importance on conducting the interviews in such a way that the resulting body of data would be consistent enough for analysis, and thus guided my interviews not on precisely the same questions, but rather on eliciting discussions around the same five themes which I highlighted previously. Likewise, the second portion of the interview was also designed in such a way as to bring yet another common thread of reflection through all of my discussions with participants.

The second part of my interviews made use of the photographs which I had taken during my observations in the first half of the study. I presented my participants with two sets of photographs containing approximately 30 photographs in each, to prompt two different lines of inquiry, which acted as common objects around which all the participants could talk. The first set I dubbed the “experience” photographs, and these were mainly shots of spaces, objects, small details, and large groups of people. From these I asked participants to look through and select the one which most reflected their experience and to explain why. The second set I referred to as “stories” photographs and these contained close-up shots of individuals or small groups engaged in a variety

of activities within the space of the Underground. For these, I asked each of my participants to select one photograph and to tell me a story about the person, or people, pictured. Early on in the conception of the study I had considered accompanying participants on a journey and asking them to reflect *in situ* on the specifics of the experience at hand. However, as I highlighted in Chapter 3, the participants in the OCTA study became uncomfortable when asked to discuss the other passengers presently around them. Because of this, I chose instead to present the participants photograph sets taken during the first half of the study for two reasons. First, because this would alleviate the difficulty of asking my participants to openly discuss the present situation in front of the other passengers; and second, to substitute this with a, relatively, shared experience between not only myself and the participants, but among the participants themselves. In this way, a thread of continuity was woven throughout all of the interviews. To be sure, these photographs were somewhat removed from their original contexts, and represented a conception of my own observations, presenting the moments which I myself was drawn to. Nonetheless, the photographs prompted a variety of strong and detailed responses to my participants, and it was significant that several of the photographs drew far more responses than others. The use of photographs, then, served as means to tie my observations from the first half of the study, into the data gathered from the interviews, and to compare and contrast the diverse experiences of my participants through a single medium.

4.4: Conclusions

The Aesthetic Journeys study, then, was designed in such a way as to gain a deeper understanding of how people create and craft their urban mobile experiences with the London Underground. Tackling this topic was done in greater service to approach my second research question: *How can we expand (through conceptual resources) the relationship between mobility and technology in useful ways?* The methodology of the

study described within this chapter, then, is the first step towards answering this question. One way in which we can expand ubiquitous computing's conception of the relationship between mobility and technology in an actionable is it to approach the study of mobility with new techniques and to examine not only the functional aspects of urban navigation but to look at the variety of experiences people have in these public spaces. I employed an array of approaches including photo-documentation, object-shadowing, and experientially-oriented interview techniques, in order to explore the aesthetic aspects of individual and collective urban journeys. However, before I present both the findings from this study and the series of design inspirations which emerged from analysis, I need to employ another means of approach to my second research question.

At the same time that I began to structure the Aesthetic Journeys study, I was simultaneously conducting a literature search centered around the aesthetic aspects of mobility. These works served both to contextualize my own findings, but also to act as another conceptual resource through which ubiquitous computing could expand it's view of the relationship between mobility and technology in a concrete direction. Accordingly, before I delve into the analysis of this study, I will first present a review of literature highlighting a variety of aesthetic and experiential aspects of mobility. This review will serve to frame the findings of the Aesthetic Journeys study which will be presented in Chapter 6.

5: Experiential Mobility

In Chapter 2 we saw that it would be worthwhile for ubiquitous computing to expand its understanding of mobility to not only be seen as something which presents problems to potential users. From the cultural geography research we saw that interacting with a space and the people around, allows us to gain an understanding of the physical and social dynamics at work, and in turn our actions help to shape that space (and the technologies within and of that space), simultaneously affecting the understandings that others have. Echoing the cultural geography literature from Chapter 2, the work presented in Chapter 3 provided additional empirical evidence for recognizing that there is not one form of 'mobility' but rather a multitude of 'mobilities' present even within a single space.

While Chapter 2 highlighted the relevance of expanding ubiquitous computing's conception of mobility, the background for the Aesthetic Journeys study in Chapter 4 presented a promising direction in which that expansion might go; that is, towards an understanding of the diversity of not only the functional aspects of mobilities, but also the aesthetic ones, might be useful for ubiquitous computing. In order to ground that inquiry, this chapter will present another overview of related work, focusing on how both cultural geography and ubiquitous computing itself have approached the idea of an aesthetic experience of space.

Each of the subsections within this chapter will serve to bring together a diverse range of work from different bodies of literature; I will review works from both cultural geography literature as well as ubiquitous computing literature. What I intend to contribute is an understanding of the various themes which emerge from the categories of analysis I will outline below, and a knowledge of how the different ways in which

these themes are borne out in both bodies of literature can be synthesized to create a knew approach to urban mobility. This chapter will then be broken down into a series of sections which explore five different ways in which the conception of urban mobility in these two bodies of literature might be described. Broadly these sections will present a series of works that, when viewed as a whole, illustrate that there are a multitude of ways one can experience the city through mobility.

While at first, one might be inclined to conceive of this diversity as the difference between riding the bus or walking, the difference between cycling or driving, but with themes introduced in this section I will present a new way of approaching the diversity of mobility. The categories described below will shift the discussion of mobility from a functional one (in terms of mode of transport) to a more experiential one, in which we can begin to talk about urban mobility in terms of the similarities, and indeed differences, that cut across functional boundaries. Consequently the themes that I will discuss focus on the experiential qualities of movement. In the coming sections I will describe how urban mobility can be conceived of as 1. A form of voyeurism and creation 2. An enacted and embodied bridging of the public and the private 3. An experience of hostile alterity 4. A way of creating communities and cohesion and 5. As a lived tension between groups.

During the course of addressing these overarching themes two other categories of differentiation will come in to play concerning methodological approaches, as well as a series of cross-cutting themes which will recur throughout all of the sections. Within each of the sections I will cover a range of different methodological approaches that the literature takes towards urban mobility. Although these will be described more in detail within the body of the chapter, loosely within the cultural geography I will define three approaches. Some works approach the subject of urban mobility through a historical or analytical lens, focusing on broader trends in society as a whole. Other works fall on the

opposite end of the spectrum, looking through the eyes of a single individual to understand the experiences offered by the city. Finally, a third group of works approaches urban mobility as it is facilitated by a particular medium, type of interaction, or technology. Within the ubiquitous computing literature, on the other hand, we see two main approaches. Many of the works focus on how a particular design is conceived of, implemented, and deployed within an urban setting. However, there is also a large body of works within ubiquitous computing which focus on sociological studies of urban mobility. These works differ from cultural geography in that they are often explicitly focused on the use of emerging technologies, and they often directly study medium-sized groups of city dwellers. Though this categorization is not completely comprehensive, it does serve to outline the dominant methodological approaches taken by the two bodies of literature, and provide a point of reference for works which sit outside of these approaches.

The cross-cutting themes which I will present provide another alternative way of understanding the literature space. These subthemes explicate the links which run throughout the broader picture I am presenting, and serve to demonstrate that while the overarching themes I present are an actionable categorization to help us expand the notion of urban mobility, they are not entirely distinct from one another. The cross-cutting themes will then serve to show the points of intersection, overlap, and blurring, that act to strengthen the synthesis between this diverse range of literature. I will address the cross-cutting themes as the arise within the chapter, and they concern the following topics: *corporeal engagement*, *urban play*, *traveling without moving*, *metropolitan memories*, and *time travel*.

5.1: Urban Mobility as Voyeurism / Creation of Poetic Journeys & Experiences

The study of urban mobility has deep roots and we can see that the discussion began as major historical city centers were beginning to form. It is through this historical perspective that we see the first theme, the idea of journeys as both voyeuristic and creative, begin to emerge. By this I mean a conception that an individual journey is at once a way to peek into the surrounding city, but also to create a personal narrative for that city. By taking a particular path, at a particular time, and paying attention to certain details, one can begin to craft a unique experience that is, in effect, entirely personal and irreproducible. Though the individual is clearly part of the setting through which they are traveling, the focus here is on the person as author, as director, as an artist, though co-present with his subject, still distinctly removed.

In order to grapple with this idea I will describe a selection of cultural geography literature and then contrast and compare this with ubiquitous computing literature. Beginning with cultural geography I will describe first work which approaches urban mobility from a historical perspective. Next, I will then turn to works which examine urban mobility by focusing on the experiences of a particular individual. Finally, I will cover a third approach which looks at the ways in which urban mobility can be conceived of as being support and experienced through a particular medium.

Perhaps some of the earliest work considering the aesthetic aspects of interacting with spaces can be seen in the discussion of *flânerie* by Baudelaire. The *flâneur* was a lone wander in the urban landscape, an idler, a lounger, a pedestrian detached from his surroundings, strolling through the city, taking in the sights. *Flânerie* became popular in Paris during the turn of the last century during the time of the arcades, the covered shopping centers, places to see and be seen. Though Baudelaire first popularized the term, it later featured heavily in the work of Benjamin, who believed that the freedom which the *flâneurs* possessed allowed them to follow their inspiration wherever it might

lead them [2002]. Choosing this path or that was almost poetic in nature. But the lyric beauty of walking one's turtle down the boulevard was not something shared by all and was not without a darker side.

As Buck-Morss states, "Unlike the earlier bourgeoisie … the modern city-dweller does not have the luxury of the *vita contemplativa* on solitary walks. Nor is this public sphere a place of dialogue" [1986, 128]. In the city the *flâneur* was neither alone nor in truly amicable company. Of course, this was part of the attraction. One could move through the public space in hyper-voyeuristic state. The arcades were drawing huge crowds into concentrated area of town, and it was becoming possible to legitimately move through a sea of faces heretofore unseen in such numbers. Even more importantly, though, it was expected that one would stare because these were places of consumption—where one must look to buy. The spectacle of lavish sights was grand and captivating, and as the *flâneur* moved through this panoply of imagery his mental state was often compared to that of a dream. Unlike the people in the arcades selling their wares, he was able to glide through this disjoint set of images and piece together, make sense of, the whole. "For the flâneur-as-detective, traversing urban space became a movement back in time. "For the flâneur, the following transformation occurs with the street: it takes him though a time which has disappeared" … (V, 1052) … A temporal map is imposed on the spatial one" [ibid., 132].

The *flâneur* was then able to discover connections in both space and time; he was able to see the urban landscape in a way unlike many others. Indeed, there was a fear among some rulers that this privileged viewpoint could lead to sedition. In Chapter 2 I emphasized this tension between the strategic and the tactical, the panoptic and the local, but rather than re-igniting a discussion on that struggle, that plurality, in this Chapter I will focus on the experiential aspects of what the embodied nature of such mobilities, seditious or otherwise, might be.

The *flâneur*, as we have described him, is most decidedly just that, a him. The privilege of being able to move about unencumbered and unaccompanied was uniquely male. Buck-Morss argues that, ""In an arcade, women are as in their boudoir" (V, 612). Prostitution was indeed the female version of flânerie. Yet sexual difference makes visible the privileged position of males within public space. I mean this: the flâneur was simply the name of a man who loitered but all women who loitered risked being seen as whores, as the term "street-walker," or "tramp" applied to women makes clear" [ibid., 119]. A woman alone in the arcade was immediately judged as a whore—she had no purpose, no place there. Of course women have since managed to become mobile, and as we walk down the streets strangers tend not to presume we are prostitutes. What I want to point out here, is that the journey from then to now has given rise to a varied collection of experiences for the mobile, and in this case female, person.

Historically, then, women in many places have not been able to move around the city in the same way that men have. But that does not mean life for men is somehow definitively better. Indeed, Farish talks about the darker side of mobility in modern spaces, particularly with reference to the noir motif [2005]. He writes in depth about the experiences of the detectives featured in noir films, and he envisions these films as both essential and contrasting to modernist views of American geographies. He writes, "Geographies of dispersal achieved their apotheosis in Los Angeles, where noir protagonists … faced the discontinuities of horizontal, circular, and fragmented space, in addition to the usual temptations. Marlowe's privileged, detached status enables him to move across and connect these zones forming an urban totality. Although revealing, this was a map that rarely empowered its creator…" [ibid., 112]. Like the *flâneurs* Marlowe moved freely through the city, but rather than experience a panoply of sensuous delights, he was treated to a far bleaker reality. Perhaps, then, this knowledge

of the underbelly of a city was more frightening than useful, more shocking than liberating.

These works all look historically at the ways in which voyeuristic journeys were executed but they do raise several different points. Baudelaire and Benjamin emphasize the whimsical side of this creation. For them, it is about the freedom, the almost poetic license, that the flâneur was able to exercise, not only by revealing connections between disparate spaces but also across different times. Buck-Morss and Farish, however, stress that this act of creation is neither universal nor inherently pleasant. Buck-Morss reveals that there is a double standard at play. *Corporeal engagement* with the city requires the *right* sort of body. Flânerie in historic Paris, then, is only an option for reasonably well off men, while women are entirely excluded. Farish, on the other hand, emphasizes that even for the men who were able to make these journeys that revealed connections across the city, in the world of noir, what they revealed was often short of pleasing.

Clearly, though, people move through cities in other ways than walking. Indeed, within cultural geography there are several studies focused on the ways in which transport infrastructures contribute to the aesthetics of the urban experience. Perhaps one of the most quintessential works on public transport belongs to Augé [2002]. He paints a sharp portrait of subway travel by saying, “Most of the singular itineraries in the subway are daily and obligatory. We don’t choose to retain them or not in our memory: they get impregnated within us, like the memory of military service” [ibid., 8]. Unlike *flânerie*, then, subway travel is often necessary and repetitive. However, out of this necessity interesting experiences can arise. When speaking of traveling to a football game, Augé describes the moment of catching the eye of a fellow fan, saying that he saw in his eyes the, “pure sense of sharing, the happiness of the moment, and the imminence of a pleasure anchored in habit” [ibid., 18]. Set against the backdrop of routine, the joy of unexpected excitement can be found. Augé’s work, however, is written from the first

person, and it focuses on the experience of the solitary, isolated traveler. A strong notion of "alone-togetherness" permeates his description of subway travel, and in fact he tells us that, "the prosaic definition of the metro [is]: collectivity without festival and solitude without isolation" [ibid., 30]. For Augé, we are all in the same place, but at the same time we are deeply alone with our own memories, our singular journeys, our experiences that no one else can experience. His writings recall the poem of Ezra Pound, titled *In A Station of the Metro*, "The apparition of these faces in the crowd; / Petals on a wet, black bough" [2003]. Indeed Pound was also writing of his experience in the Paris metro, and he struggled to pen lines enough to express the experience he had that night. Perhaps Augé would well understand this poem and take as his reply what he had said in his book, "everybody discovers in the subway…what they bring to it (repugnance or fascination and, more generally, a subtle combination of the two) and, at the same time, a kind of objective confirmation of the reality of the surrounding world and of the values that are so spectacularly displayed in it: the images never stops proving the image" [ibid., 64]. Like the mirror that the city holds up to the adventurous *flâneur*, the subway, according to Augé also acts as a reflection, perhaps more deeply so. It seems for Augé this is due in large part to the solitary yet necessary nature of the trips we take underground. At the same time, the subway offers a type of constraint on the way in which we see the world around us. Augé says that public transport provides us with a more geometrical, rather than geographical, lens through which to view our cities. Going underground and one place, and popping up in another, creates a landscape of "hops" which our personal memories become intertwined with. Finally he says that, "every society has its subway, and imposes on each and every individual itineraries in which the person uniquely experiences how he or she relates to others" [ibid., 70]. Not every metro experience is the same, then, for Augé, but what they do have in common is the way in which they all have the power to shape our individual experiences.

Duruz and Cohen also present the experiences of a single individual, albeit from a very different perspective. Duruz looks at the ways in two women, living in London and Sydney, experience distant cultures by traveling through ethnic neighborhoods near to their homes [2005]. Here, he tells the story of how the sights and smells of foreign foods in the markets serve to transport these women across culinary and cultural borders. Cohen, on the other hand, explores the way in which music has done something similar for a Jewish man from Liverpool [1995]. Rather than connecting with a culture foreign to him, however, Cohen explores how the music of his childhood contributes to sensuous production, and reproduction, of space, and to the creation of his individual identity, and to the shared communal identity of his people. Listening to music from his past, the man is able to revisit and remember the places of his childhood. Similarly to what Duruz speaks of, the music also enables Jack to travel in an imaginary sense to different times and places" [ibid., 439]. While thinking back on his past in Liverpool he speaks of songs about other places, like Italy, and feeling he was there saying, "I used to lie awake at night going through all the districts of the tunes" [ibid., 440]. There is then a two-fold type of memory at play here; Yiddish folk songs allows Jack to remember his past in Liverpool, and in this remembering he thinks again of the foreign music he listened to when he was young, and is again transported to a distant land.

These three works take as their foci the experiences of a single individual. With these, we can see a contrast to the more historically oriented, as these focus more deeply on the sensuous creation of one person's journeys. Rather than discussing a more general way of experiencing places as the historical works do, they focus on how one particular person does so. We see that urban mobility can be conceived of as voyeuristic and creative, but here the focus is somewhat shifted. Augé speaks of feeling completely alone in the crowds as the flâneurs did, but he adds to this isolation another dimension, memory. His *metropolitan memories* are intertwined with and evoked by his journeys,

thus tying him, at least mentally, more strongly to the places he passes through. Augé's past intimately connects him to his present. Likewise these memories hearken back to the past experiences he had in the places he is moving through now, and this yields a type of *time traveling* effect as he moves through the Metro. Duruz goes further to show a different way that these voyeuristic experiences can be compounded. The city around us, especially when it is filled with new and foreign sights, can lead us on imaginative journeys to foreign lands, to, in effect, allow us to *travel without moving*. Finally, Cohen synthesizes all three of these cross-cutting themes when she describes the way in which a man uses music to recall his memories of distant places and times. All at once he travels back to the cities of his past, and to his imaginings of the places where the music originated, when he hears and old record.

The works of Duruz and Cohen point towards another interesting area of discussion: how a particular medium can aid in shaping, or even fundamentally transform, the way we move through a city. Robertson, for instance, asserts that the car alters our experience of the spaces around us [2007]. Drivers do not merely sit back and gaze from inside his car, on the contrary, the "immediacy and responsibility for the performance of driving has the paradoxical effect of increasing the sense both of living the moment and of half-dreaming" [ibid., 86]. This experience is posed in sharp contrast, then, to the act of walking, for instance. Here the physicality of the car, and the type of engagement that a driver must have with it, is at the forefront of this type of mobility.

Bull looks at the ways in which a very different medium, the personal stereo, can shape our journeys [2000]. Here, the personal stereo is not the instrument of mobility, but it nonetheless shapes one's journeys. Bull categorizes the various ways in which people transform their movements by listening to music. Through the personal stereo, he says, one can block out uncontrollable thoughts, keep unwanted strangers at bay, control the

environment around themselves to keep out unwanted sounds, establish a private and personal space in public, and transform what they see into an aesthetic experience. The soundtrack that the listener creates makes moving through the city more meaningful but for Bull it is ultimately a highly individualized meaning. The users experienced the city 'filmicly' but ultimately this film was created by, and only for, a single person.

Stevens, on the other hand, examines a variety of media that could arguably fall somewhere between the car and the personal stereo [2006]. He looks at a variety of 'props' within the urban context, saying that, " Props are objects which have been added to public settings with the intention of making them more comfortable, by contributing to their function and aesthetics. Yet they were also observed to make possible and to stimulate a variety of noninstrumental, exploratory, and risky forms of movement. Skateboarders contest the everyday functionality of urban design features such as steps, handrails, planter boxes, bollards, bicycle racks and benches" [ibid., 811]. Here then coincidence of the skateboarder and the urban landscape come together to give rise to a new interpretation of what a handrail is meant for.

What we see here, then, is another approach to studying urban mobility, examining the way a particular medium can transform a journey through the city. Robertson focuses on the car. However, he does not consider it as merely a category to describe a mode of transport, rather he looks at the way in which the car can alter our experiences of a space. Here our physical connection with the car creates an extended form of *corporeal engagement* which changes our interaction with the city. Bull, on the other hand, looks at how a much smaller technology, the personal stereo, can affect our journeys. Here, we see the concept of the creative journey at its peak. For Bull, the personal stereo allows us to become the directors of our own personal urban films, giving us almost total control of not only our perception of the environment around us, but also of ourselves. The sound of music in our ears gives us the ability to drown out our

metropolitan memories which might distract us from the now. Finally, Stevens offers another approach to *corporeal engagement*. But here, rather than involving a physical medium, he focuses on how the attitude of *urban play* can shape our journeys. This does, of course, involve physical objects, as when I have a skateboard under my feet, the city around me is transformed into an obstacle course. But also, it involves a mental shift, cycling playfully can then become distinct from cycling in a rush to make an appointment. It is then not only the technology, loosely construed, that we are utilizing, but also our general disposition to it and the city around us, that changes our journeys.

What we see have seen from all of the cultural geography works thus far is the way in which moving through the city can be thought of as a way for people to make creative journeys or to explore the urban environment around them. The focus here is strongly on the individualistic nature of these journeys; they are something that *I* make, and make for myself. By gathering these works together, I have then shown that it is fruitful to move the discussion away from a particular functional way of moving around, and towards an attitude about that movement. In seeing this literature as a whole we can realize that experiential qualities like voyeurism and creation are not the property of a particular mode of transport or technology, but rather that they are inherent to urban mobility itself.

Now I will turn to the way in which ubiquitous computing literature explores this theme of urban mobility as voyeurism and creation. I will begin by examining work which is part of the ubiquitous computing domain that on the surface is quite similar to the cultural geography literature presented above. These works are generally ethnographic in nature, however, they differ from the cultural geography in two important ways. First, they focus strongly on how a particular technology, or set of technologies, influences, and is influenced by, urban mobility. And second, perhaps more importantly, these work engage with medium-sized groups of participants, often comprised of a select set of

individuals from a more heterogeneous population. This distinction will be discussed further within the coming sections. Afterwards we will discuss a series of works drawn from the ubiquitous computing domain that focus on creating, implementing or deploying designs that tap into urban mobility.

In a London-based study, Vertesi focuses instead on an icon of London Transport, the Tube map [2008]. She highlights the way in which the map is an integral part of Londoners' conception of their city, as they rely on it to, "tame and enframe the chaotic city above ground" [ibid., 9]. Vertesi posits the importance of considering a representation like the Tube map as one among many technologies that mediates our experience with the city. The Tube map acts as a way for people to understand the city, often considering the map (which is a distortion of the actual geographical layout of the city) to be 'normal.' Vertesi also highlights the ways in which relying too heavily on the Tube map can be a mark of 'inexperience.' Often, stations which are several stops apart on the map, are only a few minutes walk above ground. Expert riders were, then, those who had achieved a "cumulative above-ground competency and displayed an ability to use the Tube Map selectively as a tool" [ibid., 23]. By emphasizing that this map is often the embodied representation of the city for many, but not, for instance for bike messengers, Vertesi also helps to highlight another access for further exploration. Shared experiences also occur around particular technologies and among groups with similar levels of expertise.

Mainwaring et al. [2005] and Ito et al. [2009] focus on another set of objects, which they called 'mobile kits,' and how they were used by people to interact with the city and other urbanites around them. By understanding what a set of young professionals living in London, Los Angeles and Tokyo brought with them during their daily journeys and how this affected their experiences, they developed a lightweight taxonomy of the different activities people anticipated engaging in. Beyond just the functional rationales behind

carrying certain items, they uncovered the importance of the style, to the participants, with which the mobile kits were constructed and the nuanced physical experiences they engendered. “The importance of the body in the management, perception, and valuing of urban kits is difficult to over-estimate. The category of “body-related” items was alluded to above, but this could be extended to include the fit of wallets and other items in pockets (avoiding uncomfortable and unsightly bulk sometimes gave rise to secondary or tertiary wallets annexed to the carried bag), the way bags are worn while walking or placed while sitting, the importance of bodily contact providing reassurance that critical items are safe in one’s possession, and the positioning of cell phones and transit passes to be ready-at-hand, to name but a few. There was a general delight in being unburdened and unencumbered, whether that meant stashing items away in one’s car (or VIP apartment one is tending, in Alex’s case), or positioning an RFID (radio frequency identification) transit card in one’s pocket so that it can be read by a subway wicket without breaking one’s stride, or leaving everything behind but your keys and some cash to run out to the corner store” [ibid., 279]. What people carry with them, and how they carry it, can greatly change the way the feel about their interactions with the city around them. Moreover, this is a fact they are aware of and they actively adapt their mobile kits to produce different experiences for themselves. Following on from this, Ito et al. extended the mobile kits work by specifically identifying three distinct space-making practices centered around the technologies people carry with them.

These three works all focus on how objects or technologies can help to create certain kinds of urban journeys. Vertesi explores a particular kind of voyeurism, one that is strongly influenced by the Tube map. Generally the experience of London that a rider has is one of popping around between locales. It is only when a rider has the courage to go ‘off the map’ that they gain the expertise, the ability, to draw connections between parts of the city that though distant on the map, form a continuous whole above ground. Here, then, one must *engage corporeally* with the city, by moving through it

physically on foot, to be able to draw connections in the way that the *flâneurs* do. Otherwise, the standard journey using the Tube becomes almost a for of teleportation, of *traveling without really moving*. Mainwaring et al., on the other hand, take a more bodily approach, understanding how objects help to alter and support *corporeal engagement* with the city. Here the creative aspect, rather than the voyeuristic one, is foregrounded as Mainwaring et al. examine the transformative and performative aspects of using objects as one moves through a space. Ito et al. extend this research by further defining specific, creative space-making practices supported by the technologies people take on their journeys.

The remaining five works in this section describe the conception, implementation and/or deployment of designs which either address or facilitate creative mobile practices. Chipchase et al. continue on from the work of Mainwaring et al. and Ito et al. to not only study how the objects that we bring with us on affect the journeys we take, but to actually create new types of 'mobile essentials' [2005]. Here another layer of creation unfolds; the designers generate new objects that help to support creative, mobile, urban experiences. The work of Barkhuus et al. approaches creativity from yet another angle [2005]. With the Treasure game users need to create connections between the technological (WiFi), spatial (the outdoor terrain) and social (teams of players) networks that comprise the field of play. Where the connections which the *flâneurs* made were voyeuristic and leisurely, Treasure players needed to make these connections, and needed to make them quickly, in order to be successful in the game. This new type of *urban play* pushes creativity beyond the voyeuristic level and forces it to take center stage, to constitute the experience itself. With Feeding Yoshi, Bell et al. also explore the creativity needed to make connections through *urban play*, but in their case the connections take on the form of a lived synchronicity between daily life and game play [2006]. Cutting across modes of transport and times of day, Feeding Yoshi requires that players find ways of actively and repeatedly connecting their travels around

the city with the actions of cultivating virtual farms and feeding little creatures located in a variety of places. Rather than rushing to learn to game the system, players must find ways of meshing game play with their daily routines in order to create a longer lasting experience whose transformative power emerges only with *time*. The GPS Drawing project grapples somewhat with *urban play* through its flexible nature [web: GPS Drawing]. Participants in the project are able to use their GPS devices to draw whatever they choose, creating works that, "are exhibited as printed editions and sculptures as part of ongoing research into writing over the earth and drawing with ourselves as we move" [ibid., info.htm]. Their movements around the city create traces and patterns. Some people communicate with others by generating giant messages, others craft intricate drawings, and even others use the technology to play time consuming games of tic-tac-toe. Whatever they choose to do, though, they do on a grand scale which can facilitate a new type of interpretation and understanding of the city. Here the creative aspect of connecting and moving through distant parts of a city invites *play*, but does not explicitly require it. The users are encouraged to see the city writ large as a site of massive creations. Gaye et al. also created a design which taps into the creative power of urban mobility, but their work takes place back on the smaller scale actions produced by more localized *corporeal engagement* [2003]. Users of Sonic City are invited to *play* the city in the musical sense, as both a site of, and an instrument for, creation and composition. The music changes and unfolds as the users are *traveling through time*, literally producing different sounds as the temporal rhythms of the city are manifest throughout the day.

What we have seen from all of these ubiquitous computing works thus far is an active approach towards supporting the ways in which moving around the city can be a creative process. The methodological focus here is more on groups of people; either those subgroups of the broader population which are gathered for an ethnographic study, or those which come together by virtue of their shared or common use of a

particular technology. These projects extend the notion of voyeurism and creativity which the cultural geography literature motivates, and allows us to begin to see how this topic might be manifest within the design of new technologies for urban mobility.

5.2: Mobility as an Enacted and Embodied Bridging of the Public and the Private

In this second section we will also examine a theme rooted in the historical perspective, the idea that movement through the city enacts and embodies a bridging of the public and private spheres of daily life. This bridging is not merely a transition, not the times and spaces in-between home and work, rather it is the practice of merging, of meshing, one and the other. In this section I will describe three different approaches of cultural geography. Looking first, again, at works with a historical perspective, moving on to a paper with an ethnographic approach, and concluding with research that takes an analytical approach to city-wide social practices. Afterwards, I will describe the, somewhat few, ways in which ubiquitous computing has addressed this theme.

Looking back to the discussion of historic female mobility raised in section one by Buck-Morss, Cresswell describes one of the first sorts of women able to move about without the stigma of the "street-walker," the imperial lady traveler [1999]. Cresswell states that their mobility "allowed them to produce new kinds of knowledge through their travel writing, which often contradicted or revised commonly held assumptions produced by masculine exploration. The freedom that such mobility gave them was ambivalent, in so far as these women were usually from imperial centers and carried the privileges of home with them. In some senses, these privileges were experiences as constraints rather than freedoms, as women were forced to take 'home' with them as they moved" [ibid., 179]. In order to get out of the house, the women had to take the house with them. That is, by moving the "inside" world to the outdoors, they were allowed to move

about, albeit encumbered and outwardly marked in such a way as to distinguish them from the more unfettered male traveler. Still though, they were moving. It has been suggested that rather than being burdened by maintaining an image of decency, many women were actively keeping up this façade of propriety in order that they might do as they pleased. They were not forced to conform to social convention, but actively acting as if they were in order that they might be able to radically break from it on the sly.

Bruno highlights another guise under which women were first allowed to venture out of the house without the company of a husband [1992]. While the arcades of Naples, like those of Paris, were generally were not available to women in the same way they were to men, there was a place within the arcade which a woman might go the cinema. The arcade in Naples, the Galleria Umberto I, was a place of open-air film screenings around the turn of the last century. It "opened up the urban space and exploded the division interior/exterior in favor of a fluid light space. The arcade was not an isolated phenomenon. Iron was the "structural" mark of railroad stations, bridges, and exhibition halls. All were signs of transit, signifiers of a new notion of space and mobility, signs of an industrial era which generated the "motion picture"" [ibid., 121]. What Bruno describes is blurring of the distinction between the inside and the outside, and a foregrounding of the lust for mobility. Although women were not socially permitted to roam the arcade or ride the trains in the ways in which the men were, they could go to the cinema and have a piece of the experience. In this way, the female gaze was now open to be something for pleasure. "The implantation of cinema in the cityscape, the constitution of spectatorship, gave the female subject access to the dream-reverie of flânerie and to the erotic exchange that, within the space of public sites, takes place" [ibid., p 129]. Bruno describes, then, the first fleeting instances when the experience of *flânerie* was a possibility for women. In the cinema the women could feast their eyes on a panoply of moving sites, as the *flâneur* does, without, for the first time, being judged. However, in the darkness of the theatre no one could see the women in turn. Although

the women's gazes might be liberated, there is still the question of their being seen. Regarding this, Bruno brings up an interesting quandary. In Italian *passeggiatrice*, and in the Neapolitain dialect, *peripaetetica*, does not mean female *flâneur*. It is "the mark of prostitution. Woman cannot wander. The figure of the flâneur is traditionally male. A female equivalent was made impossible by a division of sexual realms that restricted female mobility and confined woman into the space of the private. As a result the "peripatetic" gaze of the flâneur is a position that woman has had to struggle to acquire, and to liberate from its connotations of social ostracism and danger. It is not by chance that one of the first acts of Italian feminism was for women to "streetwalk" together through the city at night" [ibid., 126]. Historically then, in order to move the freedom which they found in the cinema out in to the streets the Italian women engaged in the *passeggiata*, together as an act of defiance. Two points are of interest here, first the validity of success of women liberating themselves by engaging in the *passeggiata* and, second, the division of public and private space through the act of walking.

Cresswell and Bruno both look historically, then, at women's mobility and the ways in which it has changed through time. Cresswell highlights how *corporeal engagement* has a strong effect on our experience of a space, like Buck-Morss, in that the gender of one's body historically determined, to a large extent, the type of mobility one could engage in. It is only by bringing their homes on the road, almost literally, that the lady travelers were able to move about, legitimized because they were still, in effect, in private. Cresswell argues that they went to such great lengths to be out and about because women too desired the sorts of voyeuristic journeys that the men were able to have. Bruno continues with this line of study to show the way in which the cinema served as another means to achieve that sort of experience. The women, who were able to venture to the cinema because it was still an essentially private space, not completely public like the street, were able to *travel without moving* to distant places by absorbing the images on the screen.

Guano takes a different methodological approach from Cresswell and Bruno, conducting a study of the role of female antique dealers in a Genoa [2006]. Since the 1970s, she says, middle-class women served as the cultural managers for their families. The mid-90s saw a renovation of the Genovese street markets with the inclusion of a newer antiques market, and during this time the women, and their inherited family heirlooms, spilled out onto the streets to participate. The goods sold in these newer markets were geared towards the culturally refined, rather than the cheap products sold by the rough-and-tumble vendors of the old market. As Genoa began to push for an "aestheticized urban experience" [ibid., 108] these women were able to capitalize on their "gendered expertise in bourgeois symbolic capital" [ibid., 115]. Guano stresses, however, that many of the women working in these markets sit "carefully on the fence between the public and domestic sphere. Even though they add a somewhat subversive public layer to [their domestic lives]" [ibid., 116]. The street market is public enough so that the women can interact with customers freely, but domestic enough so that they can both seem to be engaging in the profession as a hobby, so as to not shame their husbands or take on too prominent of a social role, but at the same time be free from a commitment to a storefront in the case that their family duties took precedence. The involvement of these women in the urban landscape serves to transform both their own identities and the identity of Genoa the city. They become bigger players in their urban environment by capitalizing on a blurring of their domestic duties as they transform into public identities. It is, however, not just a mandate by the city of Genoa to change its structure and open up new markets that brings change but also, "Other transformations are needed at the level of collective spatial practice and experience. In Genoa, this role is fulfilled at least partly by highly educated women who create niches of small-scale self-employment at the margins of a labor market from which they have been consistently excluded, thus becoming 'cultural intermediaries' who popularize high culture and sumptuous consumption styles to market them to broader publics. Women active in

Genoa's culture industry are creatively responding, and contributing, to a redefinition of 'culture' that is simultaneously local and global, thus staking out a space for themselves within existing structures of gendered capital and power" [ibid., 117].

Guano, like Cresswell and Bruno, also discusses the ways in which women bridge the gap between public and private, but her work is ethnographic, rather than historical, in nature. Guano emphasizes the way in which the personal choices of the women she studied enabled them to hold jobs which they would normally be excluded from, due to their public nature, but at the same time illustrates how these individual choices gradually affected greater cultural change within the city. Thus positioning individual actions within a greater socio-cultural context that changes with *time*.

Pitkin takes another approach, motivated by an anthropological study but working more analytically, towards exploring the bridging of the public and private in his essay on the Italian Urbanscape [1993]. Pitkin lived in Sermoneta, Italy while doing a community study for his dissertation. Being raised in America he tells of the striking sensation that public life in Italy feels like an extension of the home. Indeed, it is commonplace in Italy, especially in the south, to see people bring chairs from their home out onto the street to chat with passersby, for citizens to colonize the area outside of bars to play games of cards for hours on end, for children to play football in the streets. According to Pitkin, this blurring of inside and outside is essential to the development of one's identity, and is fundamentally intertwined with the development of urbanization itself. For him, the quintessential act facilitating this is the *passeggiata*, during which people strive to make an impression on one another. "The development of that social self, responsive to the authority of shame induced by the evaluation of others, is widespread in the Mediterranean world, precisely because of its relation to the emergence of the classical city-state. That early urbanscape where private and domestic were mediated by the exigencies of social and public afforded a crucible for the selection of an exteriorization

of self, placing on such beliefs as the evil eye the onus of social control with its reliance on visual interaction" [ibid., 98] Seeing, and being seen, walking about the city was, and is, then fundamental to the formation of both individual and communal identities in Italy. Pitkin contrasts this sharply with the idea of city life in northern Europe, stating that urbanization came to the north much later than it developed in the south of Europe, and that the ruling elite found validation outside of the major European centers, residing instead in large manors in the countryside. He argues that in these Protestant spaces of the north, the distinction between inside and outside, between the street and the home, is much stronger. This stands in strong opposition to so-called Catholic spaces where the domestication of public life (or perhaps vice versa) is so clear. In these spaces, he argues, that one's presence is necessary in order to engage in the political process, generally construed. Being present allows one to evaluate, and be evaluated by, others. Like Pitkin, Rodman, in her essay about the relationship between community formation and architecture in Toronto's social housing, comes to argue that, "The division of space inside the house and between the house and outside is contextual and relational" [1993, 128]. However, as we saw, Pitkin goes further to say that not only is this inside/outside division "socially constructed, continuously contested and known experientially" [ibid., 101], but that it also contributes to the formation of communal and individual identity.

Sheller, on the other hand, takes a more strongly analytical approach by reviewing a large and diverse body of work addressing technology, mobility and collectivity [2004]. Her work presents what she terms a "more 'fluid' modeling of these complex socialities through an exploration of the impact of mobile communication on the formation of shifting sites of publicity and privacy" [ibid., 40]. Sheller argues that as transportation and technologies for personal communication, work and entertainment become more and more intertwined, so too do our experiences of the public and private. That is to say, that there are no longer "a set of spaces or institutions that can be easily distinguished from the private sphere" [ibid., 40]. Public and private, then, are not *a*

priori concepts, but notions which represent a set of enacted practices. Jarvis argues similarly that the temporal boundaries between such things as home and work are breaking down, and that this progression will only continue [2005]. Yet Sheller is positing something a bit more complex, rather than a mere breakdown of boundaries to form something homogenous, she argues that these boundaries exist but are created, as it were, on the fly. Sheller believes that her notion of 'mobile publics' can be best "envisioned as capacitators for moving in and out of different social gels" [ibid.,50]. In other words, the boundaries between public and private are not crumbling, rather they are now created and dissolved more spontaneously, with the help of technology,

These works are decidedly more analytical in nature and focused on the public as a whole. They explore how people en masse are bridging the gap between public and private as a kind of shared social practice. Pitkin motivates how *corporeal engagement*, physically being on the street, is essential to Italian political life. And because it is so fundamental, many people take to blurring the gap between public and private, living most of their time in a sort of hybrid state; sitting at tables just outside of their houses for hours at a time, chatting both with close co-present friends and taking the opportunity to converse with anyone who happens by. Methodologically Pitkin bases his work in anthropology, but in this essay he presents something more towards the analytical side by bringing in historical literature, and postulating about Italian society in general. Sheller on the other hand is mainly analytical, synthesizing numerous works to draw conclusions about how mobile technologies have created not only new spatialities for public interactions but also new temporalities. She argues that new forms of mobile technology allow people to transition more easily between public and private modes of interaction and thus affecting both *traveling without moving* and *time travel*, a notion echoed by Jarvis.

What we see have seen from all of the cultural geography works thus far is the way in which moving through the city can be thought of as an opportunity to, or even a condition which necessitates that people, bridge public and private realms. By gathering these works together, I have then shown that mobility is a fluid thing, and that it is a practice which actively combines, rather than merely transitions between, a variety of life activities.

Within this theme of bridging the public and private realms it is notable that there exists little urban-focused work within ubiquitous computing. In Perpetual Contact, Fortunati discusses the way in which mobile phone users often have very private conversations, by means of their personal technology, in very public places, and concludes, "The mobile instead leads to the spread of shared senses of the dimension of intimacy itself, even if it is an intimacy often mortified precisely because of its public exposure and limited by its being incomplete" [2002, 50]. Here, then, we Fortunati highlights a clear example of the ways in which mobile technology is actively being used to bridge the gap between the public and private. However, while there has been much work done regarding designs for private spaces such as the home, or even the workplace, there has been little design work that highlights or attempts to negotiate this bridging from the urban side. This of course suggests that there is space within ubiquitous computing to explore this theme further.

5.3: Mobility as an Experience of Alterity (Hostility)

This third section will begin with an examination of a theme which also emerges from historical and analytical work from cultural geography, the idea that mobility is an experience of alterity, and that this otherness is often regarded as hostile. I will first discuss the historical works where this theme is raised, and then move on to a set of

works which are comprised of detailed ethnographies that are characterized by a particularly individualistic approach. Finally, I will review the ways in which some of the ethnographic ubiquitous computing work from the first section have relevance here, and conclude a series of designs which deal directly with urban alterity.

Looking back to a 1973 essay, Levine et al. talk of the societal rules which govern subway transit and how they are used in common to maintain "proper social distance" between riders [1973]. They conclude that, "In the subway people are more on their own, and protection is afforded by particular seating arrangements, the affording of civil inattention, involvement shields to maintain physical distance that are brought with the passenger, and taboos against physical contact. Only during exceptionally unpleasant times, such as during rush hour or when passengers feel threatened by rule violations, will subway travelers ignore the rules, compromise their defenses, and help each other avoid the dangers of riding underground" [ibid., 216]. Here, then, Levine et al. speak of a collective method for non-interaction that is only ignored during unpleasant times. Interestingly, they make no mention of the happy times in which social barriers break down, perhaps, for instance, in the joyous atmosphere on the way to one of Augé's football matches. Though the subway, then, is described as being inherently hostile. For Levine et al. the otherness, the alterity to use Augé's word, presented by those around us is something to guard against.

Beckmann, on the other hand, speaks about how cars create a different source of distance, particularly by introducing new spatio-temporalities that allow for the swift expansion of suburban spaces 2001]. The car allows access to certain spaces, like drive-throughs, that are otherwise off-limits to those on foot. He goes on to say that roads and highways are new spaces, not just for cars to move through, but they are spaces where humans meet. Echoing Levine et al.'s sentiments he says, "The driver as the

significant other is a potential enemy, a threat to one's private space within the metal cocoon" [ibid., 598].

Lofland highlights another aspect of alterity [1973]. She states that the inhabitants of modern, as opposed to pre-industrialized, cities use location rather than appearance to make sense of the others around. Lofland argues that, "In the modern city, a man is where he stands. A homosexual male is a man in a homosexual bar and not necessarily a man in a pink ruffled shirt. A prostitute is a woman standing alone in the "Tenderloin," and not necessarily a woman in a revealing costume… A university professor is someone who stands facing the students in a university classroom. And the fact that he may look like his students, like a Wall Street lawyer, or like a skid row bum should not be allowed to obscure this simple truth" [ibid., 82-3]. Lofland argues, then, that the importance of seeing others lies with the location in which that sight takes place, rather than the particulars of the person being seen. Clearly, Cresswell would disagree on behalf of the likes of the imperial lady travelers that *how* those women presented themselves to others made a significant difference in their ability to move through a space. However, Lofland's point is not to be completely dismissed. Location does play an important roll, though perhaps not the only one as Lofland might assert. The women Bruno describes might have been judged as prostitutes when idly strolling the streets outside of their homes, but the open-air cinema, equally out of doors, was a space in which that label did not apply. Additionally, Lofland hints at a slightly less rigid side of her conception, talking about two forms of urban play both of which she dubs as "unconventional games." She describes two kinds of games: identity games which involve deceiving others as to who you are (e.g., passing, pretending and performing), and interactional games which involve deceiving others about what you are up to (e.g., hustling and haggling). These games, however, are relatively one sided; there is the player, or players, and then there are those being played.

These works, as I have said, are mainly historical and analytical in nature. In examining subway behavior, Levine raises issue of *corporeal disengagement* by saying that people collectively keep a physical distance between one another on the subway. Here, otherness is something that people collectively guard against, and interaction with strangers is something people attempt to avoid, a notion which echoes the work of Bull which I described in the first section. Beckmann echoes this need for separation. He begins by describing how automobiles introduce new kinds of spatio-temporalities allowing for a form of *time travel* as people are able to move through disparate places at a faster pace, effectively connecting locales in new ways. As people travel through these places on freeways, highways and throughways the use their cars as cocoons to shield themselves from the others around them. Further these massive roadways create a type of space within themselves that are effectively off-limit to people without cars, producing yet another level of distance. Lofland, however, back within the realm of the subway, speaks of *corporeal engagement* in a different sense, saying that we use people's locations to make sense of who they are; where people's physical bodies actually are, then, is used as a cue to understand something about them. Still, we keep at distance from strangers, but here we regard them with curiosity and perhaps want to discover a bit more about them. In this vein, she also touches on the idea of *urban play* in describing one-sided identity games that people often engage in. These games draw a square distinction between the player and the played; we can trick strangers about who we are and revel in doing so. Yet, there is a level of engagement here that moves beyond isolation and cocooning.

Others have attempted to dive in and gain a true understanding of this alterity as Maspero does with his journey on the RER through the suburbs of Paris [1994]. Accompanied by a photographer, Frantz, Maspero sets out to make a journey to each station on the RER B line starting from Roissy (which we more often refer to as Charles de Gaulle). Though people frequently travel through the suburbs around Paris on their

way to the airport, Maspero argues that no one outside really knows these places, and so he embarks on a journey to find food and lodging in each town on the line, documenting his experiences along the way. He seeks to paint a continuous picture of the varying physical and social landscapes as they transform from town to town. The work is a compelling journey into the backyards of Paris, but at the same time Maspero is fully rooted in his alterity; he is a traveler 20 minutes from home but decidedly out of place. The mere fact that he chose to never return home during this adventure which lasted for weeks, lends a touristic and even voyeuristic tone to his travel, which Allen picks up and discusses at length [see Allen, 2000]. Maspero is not understanding the others he rubs up against everyday, but is rather engaging in a study as if he were on the other side of the globe.

Swerdlow, however, studied an area closer to home, and become even more involved [1998]. A sociologist who was also active in the Transit Workers Union, she became one of the first female subway conductors in New York City in part for life experience and in part for research purposes. Most of her account centers around her first-hand experience of the trials and tribulations of being a subway conductor—grueling routes, difficult working conditions, and being hit in the head by passengers whilst leaning her head out the window to check the platform. Her observation of riders, then, comes through a very specific lens. Swerdlow often talks of feeling like a scapegoat for riders' frustration about the system and says that, "The most common saying about riders was, 'You can't do enough for them;" [ibid., 204]. While she also talks about objects found in the subway, this comes again from the perspective of the conductor. She talks of a tool called the shoe slipper, found in every cab, which is officially used to fix a dislodged power shoe of a train, but was far more commonly used as a self-defense tool by conductors. Her work, then, also serves to reinforce the notion of the hostile subway environment.

These works are more ethnographic in nature, but rather than looking at community-wide practices, they focus on the individual. Maspero ostensibly sets out to get an idea about what other people living in neighboring areas of Paris are like, but his study, rather than exploring alterity, acts as a revelation about the author himself. Much like the work of Augé, Maspero ultimately reflects on his being in a sea of otherness, rather than exploring what that alterity consists of. Swerdlow also reflects on her first-hand experiences, but in this case they are experiences which range over the much longer period of time during which she was a conductor on the New York Metro. The focus here is also strongly on the individual, but here, the mass which she is pitted against is seen as a very hostile one, similar to the descriptions of Levine and Beckmann. As a conductor she struggles to fend off the population both mentally and in terms of *corporeal* harm and harassment.

What we see have seen from all of the cultural geography works thus far is the way in which moving through the city can be thought of as a lived experience of other city-dwellers. However, this experience is often characterized in terms of either hostility, isolation, or individualistic engagement. Similar to the voyeurism of section one, alterity is something that one engages with, or disengages from, rather than something one is a constituent part of.

Now I will turn to the way in which ubiquitous computing literature explores this theme of urban mobility as an experience of alterity. I will first briefly discuss two ethnographic works which appeared in section one. These works, in many ways, mirror some of the concerns raised by the cultural geography literature above, looking at the ways in which people shield themselves from one another during their travels through the city. Concluding this section, I will discuss two ubiquitous computing designs which cast alterity in a different light. Rather than focusing on the individual or hostile aspects of

the mobile experience, they approach alterity as an opportunity for discovery and possibly interaction.

We can clearly see echoes back to two research efforts detailed in the first section of this chapter, the work of Ito et al. [2009] and Mainwaring et al. [2005]. One of the creative space-making practices which both papers highlighted was the notion of cocooning – the way in which objects can be used to shield and isolate ourselves from the world around us, to create a personal bubble. In this way, then, the themes which I am presenting in this chapter can be seen not as isolated, but as overlapping aspects which are interwoven by both cultural geography researchers as well as those in ubiquitous computing.

The following two works echo different aspects of Lofland's research. Paulos & Goodman created a device which allows people to explore alterity, but rather than using one-time cues like where people are, they rely on patterns of coincidence that recur over *time* [2004]. Their design, the Familiar Stranger device, is meant to be worn or carried by many people, and when these devices sense another nearby, they record this interaction, and over time the accumulate a history of people who have come in contact with. This information is displayed in terms of collective, rather than individual, presence, in a very low resolution way. Here then, contrasting with cultural geography works of this section, alterity is not painted in a hostile light, but rather a *playful* one which people are encouraged to explore. Likewise, with Benford et al.'s game Can You See Me Now? *urban play* takes center stage [2006]. Here identity games are folded into a broader scheme as they are borne out in a combination of the physical and digital worlds. In this game online players move through a virtual representation of a city while performers (equipped with GPS an WiFi technologies) chase them through the actual urban landscape. What is interesting here is the way in which both online players and in-game runners learned to utilize not only the specific properties of the physical world

and the technological networks, but the way in which these were intertwined. Also, similarly to Treasure, players began to create new social interactions with other players, strangers, that they did not previously know.

What we can see from these ubiquitous computing works is twofold. First, that the practices of isolation and cocooning described in the cultural geography literature are supported by a variety of technologies. And second, perhaps more importantly, that technology can also support another range of practices which center around alterity as an opportunity for connections. Here then the ubiquitous computing literature points to new avenues of research on both the cultural geography side, for understanding the various ways in which people approach alterity, and for the designs of new technologies which take these practices into account.

5.4: Mobility as a Way of Creating Communities & Cohesion

In this section I will examine a theme that is most prominent in works focusing on the modern city, the idea that mobility can be a means for creating communities and cohesion. As with previous section I will begin by discussing cultural geography work which in analytic in nature. However, in the case of this section, these works focus on the more modern urbanscape. Next, I will highlight a selection of qualitative works. These too differ from previous sections in that the ethnographic observations tend to focus on the experience had by groups, albeit still relatively large and heterogeneous, rather than single individuals. Then, I will present another series of studies which address the way a particular medium or technology can transform a journey through the city. Finally, I will look at a group of works which effectively form another thematic subsection; the idea that mobility is not purely an act of physical movement but also a way of maintaining connections over a distance. After reviewing the cultural geography

literature, I will once again turn my focus to ubiquitous computing. Here I will highlight first a series of works that take an ethnographic approach which is again focused on smaller sub-groups of the overall city population. Then I will present a piece which bridges the ubiquitous computing approaches of ethnography and design by deploying a probe into a particular urban context. And finally, I will conclude with a set of designs which foster the creation and cohesion of a community.

Lemon's study of the Moscow Metro moves in this direction of understanding the community building nature of mobility by attempting to debunk the notion that a subway experience is rooted firmly in a single passenger's interaction with the built space he finds himself in [2000]. On the contrary, she says, "When it comes to social mediations of space, it is necessary to have more levels of agency than the dyadic relation of an individual to a built structure. In other words, articulation of space—and practices enacted within them—draw from diverse spaces, cross media and genre, and involve many speakers, if even indirectly" [ibid., 18]. Here then Lemon begins to move the discussion from individual experience and towards collective interaction.

Crang & Travlou present a very unique conception of the city; the urban fabric, they say, can be read as a text, reflecting our collective memories, past and present [2001]. Further, they argue that this relationship is cyclical; what we read from the city prompts new interactions on our part. They argue that a reconsideration along these lines yields several insights. "First, the opposition of space and time is recast. No longer is time opposed to stasis, but homogeneous times and spaces are opposed to pluriform times and spaces. Second, and consequently, space becomes not simply a container for preserving memories but an opaque and not entirely knowable medium. Third, stories in the city become spatially as much as temporally driven" [ibid., 172]. This urges us, then, to consider the deep, mutually-constitutive nature of the relationship to the times and spaces we experience, individually and collectively, as we journey through our cities.

Finally, the work of Jacobs is perhaps the deepest inquiry into understanding the cohesive nature of urban mobility [1961]. Railing against the push to "organize" cities, to create single-purpose districts, to replace heterogeneity with homogeny, Jacobs expounds on what she believes is the vital and oft-overlooked function of the neighborhood. She argues that the top-down type of organization which seeks to promote safety for the citizens on the street will, in fact, never achieve its goal. Instead, Jacobs illustrates the ways in which the intricate social fabric already present in, and constituent of, the urban neighborhood serves to provide not specifically safety, but rather a community which, among other things, is aware of, and looks after, itself.

These works represent three very distinct analytical approaches to understanding urban mobility as a way for creating communities and cohesion. Jacobs's book represents perhaps the most seminal works addressing this theme. She is one of the first researchers to motivate the importance of considering that the communal, social life of a city's inhabitants directly affects the nature of the city itself in a cyclical fashion. Jacobs details how *corporeal engagement* with urbanscape, how being present on the streets and interacting with one other, ultimately constitutes the creation of the city itself. Making the case that social interactions is not merely something that happens in the space, the container of the city, rather that it is the city. Lemon's work also serves to provide a rationale for moving beyond describing the urban experience, in this case specifically that of the subway, as being one defined by interaction solely with the static, built space around you. She hints towards the notion of exploring how more complex social aspects of moving through the subway can constitute the mobile experience. Finally, Crang & Travlou present a compelling new way to conceive of this urban fabric, saying it can be thought of, and read as, a text. Here the text is one of collective *metropolitan memories*, which, as we interact with and move through, affects our personal actions, which in turns contributes to a cyclical rewriting of this text. Further,

they stress, that these stories we create and experience through our mobility are not only spatially, but also *temporally*, driven. The urban fabric, then, represents a multitude of interacting and overlapping spatialities and temporalities that exist not in only parallel, but are wound together to greater a greater whole, the city itself.

Maines, on the other hand, begins a set of studies which address cohesion in the subway using a quantitative approach [1977]. His first study categorized the race and gender of passengers, noting their positions (both in terms of space and body posture) with respect to others around them. He concluded from his observations that "buffer zones" of personal space are formed around passengers "when blacks and whites or males and females find themselves sharing the same strap [hand-hold] or sitting next to one another rather than in same-race or same-sex situations," and finally concluding that, "Race and sex redefine physical distance." [ibid., 107]. Maines attempts to drive home the point, then, that while subways may appear to be an undifferentiated heterogeneous mass, there are small pockets of homogeneity which passengers create, which are not entirely random. This study was conducted in 1977, and Maines himself admits it is a simplification of the possible factors which influence positioning (indeed, what about the appearance of other passengers, the activities they are engaged in, if they appear to be alone or in a group, etc.). What is important here is an echoing of Augé's much more qualitative statement that the subway is full of a diverse group of individual actors making singular choices. When taken as a whole, the subway might seem completely random, but this work points to the importance of looking more deeply into the details.

Maines himself in a later study tries to probe further, attempting to understand how passengers choose which car to ride in on the Times Square Shuttle in the New York City Metro, specifically if they ride in the car the enter, or continue down through the carriages to use the carriage at the end of the train, thus cutting down on walking time

upon arrival [1992]. He attempts to count the number of passengers walking through versus sitting down and determines that in the trains going from Times Square to Grand Central passengers tended to cluster in the lead car, whereas on the reverse journey the distribution was more even. Maines then begins to develop hypotheses supposing that passengers going towards Grand Central Station are more in a rush to catch a train, and thus are attempting to be, as he says, "more efficient." He remains frustrated by the data and decides to poll people and ask the people in the lead cars if they always walk through the train to the front. Maines admits that from this he was still unable to discern a rationale for the overall pattern he was seeing. I would argue that perhaps his approaches lacks a broader perspective. He focuses his inquiry on whether or not the passengers are efficient, rather than trying to understand the broader variety of experiential reasons which might contribute to their choices. Also, perhaps, overlooking the diversity within the individual riding experiences; maybe one day a passenger is tired, the next in a rush, and the next not wanting to sit beside someone eating a large sandwich.

del Negro, takes an even more rigorously ethnographic approach to her study of the community building practices in a small Italian town [2004]. She examines, in depth, the ways in which the *passeggiata* serve to contribute to the life of the town as a whole. The *passeggiata* is an activity mostly carried out by locals where individuals or groups of friends walk back and forth on the main pedestrian street of a city on weekends in the hours before or after dinnertime when the weather is pleasant. While performing the *passeggiata* people chat with each other about their lives, swap interesting gossip, window-shop, and, perhaps most interestingly, watch other people doing the *passeggiata*, sometimes with the intention of meeting specific acquaintances. In this case, the mobility of the townsfolk is a predictable and relied-open event. Rather than moving people apart, it brings them together.

These two works embody a more ethnographic approach to studying the communities which mobility serves to create. They represent a different level of focus than other cultural geography studies we have seen in that they examine the experience had by groups, albeit still relatively large and heterogeneous, rather than single individuals. Maines begins by gathering quantitative data about passengers' movements within the New York City Metro, and then continues on to try to unravel the rationales behind their choices. Though the studies are somewhat narrow in their conception of people's motivations, he does make the important point that the actions he observes in the subway are not purely random and heterogeneous. Rather, he observes that while people make very singular choices, a theme we saw in the first section of this chapter, there are community-wide affects of these choices which result in the formation of pockets of homogeneity. In other words, the individual decisions we make serve directly to create a subtle form of cohesion within the subway. del Negro, on the other hand, studies, and conceives of, the act of strolling in Italy, the *passeggiata*, as a much more explicitly social activity. Here, like Pitkin, she believes that *corporeal engagement* with the city is part and parcel of the formation of Italian urban communities.

Willis approaches the notion of mobility as creating communities similarly to some of the cultural geographers in section one, by looking through the lens of a particular medium, and understanding how the motor-bike served to bring people together [2003]. He believes that while motor-bike culture of 1969 England was often seen as strong break from the rest of society, it was actually an amplification and reflection of the times. According to Willis the motor-bike was "allowed to make a full dialectical register on human culture" [ibid., 139]. The feeling of riding raw against the wind allowed bikers to reconnect with the spaces around them, but also stripped of concerns like mortality, they were able to connect with one another, to help stranded kinsmen and speak bluntly among themselves.

Garrioch looks to another medium, ambient urban sounds, to understand the formation of communities [2003]. He describes the ways in which noise in the historical city was a vital source of information, it conveyed news, helped people locate themselves in time and space, and made them part of an auditory community. He asserts that sound helped to foster both identity construction and the formation of relationships; sonic neighborhoods emerged, creating distinct locales in which the semiotic system of sound was understood differently by different types (in terms of class, gender, or origin) of people.

In her study of the subway, Tanenbaum also speaks of the cohesive effect that sound, in this case music, can have [1995]. She says that, "Over the course of a day, New Yorkers have the choice of seeing the diverse population that constitutes the city either as an annoyance or as a source of learning and a cause for celebration. Subway music gives public encounters form and focus. It enables vastly different lives to intersect. If repeated often enough in the same stations, it renders many people … real and familiar to one another. As a result strangers begin to appear nonthreatening and actually safe" [ibid., 225]. Tanenbaum's study points towards a further area of exploration, an investigation into how the subway supports or subverts collective, social experiences.

These works all address the way a particular medium or technology can transform a journey through the city. Willis' study is similar to the two presented in the previous section, and likewise notable, in that it is an ethnography of a subgroup of the overall urban population. Further, he studies a very select group of participants, men who ride motorbikes. Here *corporeal engagement* is of utmost importance, but it is also mediated by a technology, the bike itself. Willis describes how the raw feeling of interacting with the motorways by means of a bike, rather than a car, created a unique bodily experience. And further, that this experience was so powerful it actually was a means for creating a very cohesive community brought together by the strong experiences

each individual had. We can see, then, that the individualistic, extremely personal, experiences, described in section one, can also contribute to the opposite end of the spectrum, the binding together of a community. Garrioch and Tanenbaum, on the other hand, look at a very different medium, sound. Garrioch, working historically, explains the importance of the way in which sounds conveys spatial and *temporal* information. However, this is not merely one sided. The ambient sounds of the city are something which people directly contribute to themselves, and so again we see a cyclical relationship between individual and place. Further, Garrioch goes on to say that the urban soundscapes we experience contribute to the creation of auditory communities, who experience a shared and common set of everyday sounds. Tanenbaum describes another way in which these auditory communities are formed by modern urban sounds, specifically live music in the subway. She argues that busking has, in effect, replaced the church bells and the like described by Garrioch. Here subway music serves to create pockets of a kind of safety below the city, creating a cohesive affect among fellow passengers, and giving them the opportunity to allow their lives to intersect with one another: a moment somewhat *out of time* to come together and share an experience. Finally, Mackenzie looks at yet another, very relevant, technology, WiFi [2005]. In unpacking the description of WiFi as a kludge, Mackenzie highlights an interesting point the notion that many wireless projects seek to not only making communications infrastructures visible, but in doing so those infrastructures are transformed into sites of communal, social interaction. Here, then, even a relatively invisible technological medium fosters the creation of communities.

As we saw with Mackenzie's work previously, spatio-temporal co-location is not a strict prerequisite for the formation of a community. Indeed, these following three works explore more explicitly the way that connections can be maintained over spatio-temporal distance. Laurier examines how the mobile phone serves to connect people in a very different way than the landline [2001]. Whereas previously when placing a call to

a landline, one was likely to be trying to connect to a particular place – in hopes, perhaps, that a particular person was present there – now when calling a mobile phone we are attempting to connect with a particular person, irrespective, often, of where they might actually be. Yet, these phone calls do not become placeless, rather, when we *travel without moving* via cell towers to speak with someone, the called party often discloses, in some way, their location. Thus, the mobile phone does not take people out of place or *time*, rather it serves connect people together across, but still firmly within, place and time in a radically new way. Jarvis et al. detail another way in which the mobile phone figures into this space-time continuum [2001]. Here, they describe how the mobile is used to coordinate people over a distance and facilitate their co-presence. Groups of people then arrange to come together from disparate places, thus affecting a new kind of connection across those locales.

Finally, Urry represents one of the most active researchers on this topic, attempting to understand connections over a spatio-temporal distance [2004]. He states that all societies, not just technologically enhanced ones, rely on connections at a distance, and in the very least, a complex pattern of presence and absence, of being there and being away, but he argues that generally the social sciences have focused on geographical proximity rather than the connections that bind society together over a distance. Urry concludes, alternatively, that, "There have always been complex connections of presence and absence but the current century seem to be ushering in some rather exceptional changes in those recurrent patterns of what it is to be present and absent, as we dwell within an increasingly populous world of inhabiting machines" [ibid., 36]. He goes on to predict that in the future this may lead to a new way of being copresent by working on "parallel screens" and that, while physical copresence of groups of people will still occur, there might be an "epochal change in how, when, and where such small worlds do meet up" [ibid., 36]. While, I believe that we are in fact technology supports new patterns of interaction, both during moments of physical copresence and at times of remote

communication, Urry seems to overstate the changes occurring. Looking back on both the historical and contemporary cultural geography works we have seen in this chapter, I would argue that characterizing this new era as a radical shift, the likes of which have never before been seen, as both reactionary and dangerous. It is, in fact, dangerous, because it has the potential effect of urging us to abandon previous understandings of the ways in which mobility can contribute to cohesion and to rethink the topic entirely. I would argue, contrarily, that the introduction of modern technology represents a progressive step, rather than a seismic break. Indeed, Urry seems to have come to this conclusion by oversimplifying the difference between copresence and remote interaction, by arguing that copresent encounters that occur when people have traveled somewhere to meet together are characterized by mutual attentiveness rather than civil inattention, and that remote communications are "more functional and task oriented, and less rich and multifaceted. Compared with copresent conversations, letters, memos, faxes, and e-mail would seen less effective at establishing and sustaining such long-term trust relations" [ibid., 32]. For Urry, the focus seems to be on establishing a separation between distant and copresent interactions, but the works in the remainder of this section will point towards another conception: the notion that these two modes of interaction support each other, and are more fundamentally intertwined, than Urry might like to believe.

What we see have seen from all of the cultural geography works thus far is the way in which moving through the city can be thought of as a way to create communities and cohesion, and further how this can happen, through technology, over a distance as well. Interestingly, within these works that address this theme, and perhaps due to the community oriented nature of it, I have also given several examples of qualitative studies which focus explicitly on sub-groups of the city-wide community which had not been seen within the cultural geography works of the previous sections. Also, I have

shown ties to the work presented in section one in the ways in which individual journeys contribute to the broader creation of the community.

Now I will turn to the way in which ubiquitous computing literature explores this theme of urban mobility as a way of creating communities and cohesion between people. I will first discuss a series of ethnographic works. Then, as with previous sections, I will discuss a series of projects which facilitate community creation and social interaction through design.

The 73 Urban Journeys project was one of the first ubiquitous computing studies to focus explicitly on the experiences had on public transport [2004]. The project focuses on a single bus route which cuts through a variety of neighborhoods in London. Using a wide range of techniques – observation, qualitative interviews, personal experience recording, and the creation of a blog soliciting 73 word stories from riders of the 73 bus – Jungnickel attempted to probe the intersection between mobility, technology and social relations. This study presents a unique approach in that it utilizes a variety of techniques, at times unconventional, to tackle a multi-sited ethnography. Jungnickel seeks to explore the range of experiences to be had by all people riding, working on the bus, and sharing the road with the 73. Her findings urge to consider the bus, "as a location that can be excavated to reveal layers of memories, experiences and events that connect people" [ibid., 28]. Here, then, Jungnickel's focus is not only on personal experience, but how these experiences intertwine and overlap with one another, to form a greater whole, the community of the 73.

Williams discusses the ways in which cohesion and communication takes places on the road [2006]. She states, "The car in Bangkok is a place for social interaction… on the cell phone. Arrival times are unpredictable, so the phone is considered "necessary" to inform anyone you're meeting of your real, rather than planned, arrival time. You also need it to

get driving directions, in case participatory driving needs to extend beyond those physically in the car. You would not use Google maps; it's more fun to talk to your cousin, your cell phone – unlike a laptop with internet – is always with you, and besides, he knows where the construction is happening this week. And if you're going to be in a particular neighborhood, you use it to call your friends there to arrange dinner. That said, I never saw people drive and talk on their phones at the same time – that would be foolhardy in the extreme given the nature of the traffic. Passengers act as intermediaries" [ibid., 3]. Here then the mobile phone binds together driver, passengers, and remote friends, allowing for a coordinated, multi-person driving experience.

Finally, Paulos & Jenkins, explored how the objects we encounter in our cities as we pass through them can contribute to cohesion [2005]. In order to do this, they introduced a technique they call 'Urban Probes' which involves deploying lightweight functional artifacts into the urban landscape in an effort to "inspire direct discussion from people about their current and emerging public urban landscape" [ibid., 343]. One such probe, called Jetsam, was comprised of three parts. First, they watched the interactions happening with and around a San Francisco trashcan. Next, they left some trash of their own, in the form of completed, stamped postcards which appeared to be appeared to be accidentally dropped, and waited to see if they would be slipped into mailboxes by good Samaritans. Finally, they built and deployed and augmented trashcan which projected its current contents onto the sidewalk in front of itself. The authors state that with this work they hope to move "explicitly away from the dominate research themes that continuously promote efficiency and productivity" and instead "embrace the full scope of urban life with all of its emotions and experiences" [ibid., 342]. Though the work acts as a provocative piece, it pushes ubiquitous computing researchers to address the ways in which technologies are not only utilized by one individual, but often by whole communities, and further, that these technologies shape and are shaped by the everyday actions surrounding them.

These three works all focus on how a range of, loosely construed, mobile technologies can help to create certain kinds of urban journeys. Jungnickel, like Maspero, focuses on a single public transportation route. However, unlike Maspero she goes into more depth in attempting to explore the experiences which other people have. Using a broad range of ethnographic techniques, and, like previous work presented, exploring the intersection of spatial, social and technological networks, she examines the ways in which the bus serves as a repository for not only individual but also collective *metropolitan memories*, similarly to the city of Crang & Travlou. Williams tackles another mobile space, the automobile in Bangkok. Unlike research into the car from sections one and three, Williams examines the way in which the automobile is a place for communities to form. She details, similarly to the work of Jarvis et al. and Laurier, how mobile phones, in concert with the car, connect people both at a distance and those co-present, as they are used as a tool for achieving the Thai-style of effective collaborative driving. Finally, in a project which bridges the ubiquitous computing approaches of ethnography and design by deploying a series of probes into a particular urban context, Paulos & Jenkins examines not only how objects and technologies shape people's individual actions, but how these technologies are used in common by, and help facilitate the creation of, communities. The augmented trashcan which they deployed can be seen as a technological embodiment, and a response to, the *metropolitan memories* we create through our waste.

These works all describe the deployment of designs which either facilitate the creation of a variety of communities through technology. Galloway & Rabinowitz's Hole-In-Space was one of the first projects to explore the creation and intersection of communities across a vast distance [web: Hole-In-Space]. Here, complete strangers from opposite sides of a country are brought together through a shared voyeuristic experience, one community peeping in on another. This *traveling without moving* afforded cohesion and

interaction between distant people, as well as a way for co-located strangers to come together with one another through this strange, common experience. Uncle Roy All Around You highlights the ways in which people build relationships over a distance in another way [2004]. Here, players in the game come to know one another by interacting with and in the city. Building trust with distant players was necessary to experience the game as one moved through the city, and this was both facilitated and complicated by the technology and the distance. Further, the online players experienced a kind of *traveling without moving* as they were directly effected by and participating in the goings on in the city where the game was being played. Finally, the elements of *urban play* at work here echo Lofland's notion of identity games in that players, though aware it was not so, felt that every stranger they encountered in the city, by virtue of just being in the city, could be part of the game. Bassoli et al., on the other hand, focus more explicitly on small, localized groups of friends and strangers [2006]. tunA attempts to transform the solitary personal-stereo experience described by Bull into a communal one, more akin to what Tanenbaum speaks of, allowing nearby users to "tune in" to whatever their neighbor is listening to. tunA also acts as a window into the identity of strangers around us, allowing people to peek into the playlists of those around them, and fosters a new type of interaction through the personal-stereo; rather than one of cocooning, listening to music becomes a way to share something about ourselves, and come together, with co-present city dwellers. OpenStreetMap serves to creates communities by aggregating our individual actions in a new way [web: OpenStreetMap]. Arguing that maps, especially in the UK, are controlled and owned by government agencies and big companies, this project urges people to create their own maps in collaboration with others; "The ability to do so allows you to regain a little bit of the community you live in - if you can't map it you can't describe it" [ibid., FAQ]. This project seeks to create truer representations of the cities we live in by compiling collective patterns of people's everyday journeys. By collecting these *metropolitan memories* that we trace out across our cities through our lived *corporeal engagements*

with those places, the designers of OpenStreetMap seek to create a community from the individual choices we make, and to place this community firmly within the hands of its creators. In many ways, this projects represents an antithesis to the ideals of the state which were highlighted by Scott in Chapter 2. Interestingly, as more people participate prominent thoroughfares emerge, rather than a representation of which streets *ought* to be more prominent as imposed by a state.

What we have seen from all of these ubiquitous computing works thus far is an active approach towards supporting the ways in which urban mobility can contribute to the creation of community in a variety of ways, on several scales, and through many forms of media. The technologies we bring to, and find within, spaces are integral to community-building practices. Further, these technologies shape the ways in which cohesion comes about, and that in turn shapes the technologies we bring with us to these spaces on our journeys.

5.5: Mobility as a Lived Tension Between Groups

In this final section I will examine a theme that is also very prominent in works focusing on the modern city, the idea that mobility can seen as a lived tension between groups of people. I will begin this section by focusing on a series of cultural geography works that grapple with specific examples of such tensions, and then move on to looking at two higher level analytical discussions. Finally, the section will conclude with two ethnographic works from the ubiquitous computing domain which examine the way in which these tensions are borne out through technology.

The following works all attempt grapple with specific examples of tensions which arise between groups due to differences in their mobility. Suzuki's work is one of the earliest

to address the notion of mobility as a form of lived tension between groups [1976]. Here, the way the practice of walking is carried out by two different ethnic groups, the *corporeal embodiment* of their movement, gives rise to disagreements and anger on the streets. What is important here is the way in which Suzuki highlights both the fact that there are a diverse range of mobilities, and that these mobilities do not always sit harmoniously side by side. From the work of both Grengs [2004] and Hutchinson [2000] we see a deeper exploration of these racial tensions. These studies reflect the politically charged nature of the ongoing conflicts in Los Angeles over funding for public transport. Indeed Hutchinson underscores at length the racial tensions embodied by the bus, "Thus, the bus system—conveyance of the raced body, the transient, the low-income, the immigrant—has metamorphosed from being the model of "modern" transit infrastructure in the 1930s and 1940s, into an emblem of the postapocalyptic vision of Third World dystopia. ... Driving past the MTA bus stops on an early weekday morning, "they," the riding public, are invisible to the street traffic, testament to the otherworldly economy of L.A.'s sidewalks, to the now clichéd observation that "nobody" walks in L.A. Despite sixty years of the streetcar, to be car-less in L.A. is to be faceless, possessed of an unenviably intimate knowledge of the rhythms and cadences of the city's streets, of the grinding commerce of each intersection and transfer point. The city bus imposes a certain burden of consciousness on the individual rider, one that is manifest in an "unnatural" familiarity with one's fellow passengers. During the streetcar era this familiarity implied an onerous breach of class, race, and ethnic boundaries. In the highway era, the auto has strenuously protected against this threat. For, as much as the convenience of being able to "go where one wanted, when one wanted," the buyer of the automobile was buying private space in a fraction of the time of fixed path transit, fulfilling one of the most important rights of American citizenship. In transit, behind the wheel, alongside the center divider, the racial boundaries of cityhood could be preserved." [ibid., 117-118]. Hutchinson highlights the deep divide between bus riders and car drivers, and goes further to say that the socially acceptable distance from

otherness is no longer a seat away, but rather several car lengths. The bus in Los Angeles is seen as a repository for bleaker *metropolitan memories* – than those that Jungnickel highlights – as it embodies long standing racial acrimony. Further, the car not only acts as a buffer from one another on the roadways, but echoing Beckmann, it creates a firm division between those with access to cars and those without. Finally Schaeffer & Sclar draw a strong connection between this theme and the one presented in the previous section, in saying that the tension between groups of people arises due to an overabundance of mobility, and with this removed, cohesion would be restored [2003]. Their rallying cry culminates in the statement that "people need not just transportation but collocation as well — forced, peaceful togetherness" [ibid., 126]. I, however, do not necessarily agree with this conclusion but it is worth noting the relevance of the connection it puts forth.

Hubbard & Lilley have a somewhat different understanding of the effects of modernization [2004]. Indeed, their work, along with that of Graham, takes a somewhat broader analytical approach to tensions between groups that can arise through mobility, looking more generally at the notion of a diversity of mobilities. In their study of modernizing changes that occurred in Coventry, Hubbard & Lilley emphasize the fact that the oft discussed conflict between fast-spaced urban spaces and lazy rural ones, obscures more than it reveals, saying that, "In fact, the conflict between different senses of time was probably as acute *in* the metropolis as it was *between* town and country" [ibid., 276]. By devoting study to further understanding not only the spatial, but also the temporal changes, wrought by modernity they come to the strong conclusion that this change is not singular. Time, indeed, is still experienced in a multitude of ways, and they say that their "localised account of (high) modernity in Coventry alerts us to the uneven production of time and space that modernisation entails, and the different senses of speed and slowness that is required to support different state- capital formations" [ibid.,291]. Hubbard & Lilley draw our attention to the idea that there is not

a single temporal experience to be had of a certain place or mode of transportation, and that this diversity is not merely an outcome, but rather it is a necessity. By presenting this concept of 'speed politics,' they argue that changes in the urban landscape might create the experience of a city which was sped up for some people, but slowed down for others. Here, then, the *temporality of travel* is not universal, and over looking this fact can have deep consequences. Graham & Marvin look, in even more detail, at the multitudinous ways in which the urban landscape, and the technologies used to support it, creates deep divisions between its inhabitants [2001]. Here, the diversity is one of extreme inequality, an inequality which is closely bound to the technologies and practices in use. These technologies run the gamut from mobile phones to streets to sewers and beyond. What is of note here is that almost anything can become an instrument of separation and segregation, and from Graham & Marvin we realize that even new technologies we may design can either contribute or counteract this splintering effect.

What we see have seen from all of the cultural geography works thus far is the ways in which moving through the city can be thought of as lived tensions between groups. With this theme we see strong ties, and opposition, to the idea of mobility as community creation presented in the previous section. From these works, however, we can see how harmony and discord are sides of the same coin.

Now I will turn to the way in which ubiquitous computing literature explores this theme of urban mobility as a lived tension between groups. Here I will present only two papers from one set of authors, with a discussion of the implication of this to follow. It is notable that both of these works come from the same set of authors. While I presented an abundance of research from the ubiquitous computing domain that related to the theme presented in section four, here, in this complimentary section, we see a notable lack of complimentary work. Okabe & Ito speak of a different kind of shared experience

[2005]. One in which youths who use their mobile phones on Japanese trains come together by being collectively shamed by the other passengers around them. The Japanese youth Okabe & Ito speak of were often the source of ire for their bad *keitai* [mobile phone] manners when talking too loudly on trains, so much so that the posting of notices and regular announcements asking passengers to keep their *keitai* quite have been steadily on the rise. Here the use of the mobile phone binds together the group of youngsters, both those co-present and afar, and pits them against the rest of the travelers seeking a bit of silence. Ito & Okabe, further describe how text messaging between young people leads to the creation of intimate places, where youth can be in touch with one another, and apart from others [2005]. They argue that mobile phone messaging defines "a social setting that is substantially different from direct interpersonal interaction characteristic of a voice call, text chat, or face-to-face one-on-one interaction. These messages are predicated on the sense of ambient accessibility, a shared virtual space that is generally available between a few friends or with a loved one" [ibid., 10]. In this case then, in excluding adults and all but a select number of friends, a space of intimacy is simultaneously created. Here we can see how technology plays a role in bridging the gap between cohesion and tension. This work in general points to a future direction for ubiquitous computing research: exploring how technology can both create communities and separate them, acknowledging that these two things are fundamentally intertwined.

5.6: Discussion

Each of the subsections within this chapter has served to bring together a diverse range of work from both cultural geography literature as well as ubiquitous computing literature. I have illustrated, first, through this wide range of work that there are a multitude of ways one can experience the city through mobility. I have outlined five

distinct, yet fundamentally interwoven, themes which represent different conceptions of the aesthetic, experiential aspects of urban mobility. I have shown: how individualistic, creative journeys in aggregate also contribute to the creation of communities; how cultural geography often speaks of alterity in the same ways it discusses voyeuristic journeys, whereas ubiquitous computing aligns the experience of alterity more strongly with the opportunity for cohesion; how the ways in which mobility serves to create communities is not so different from the ways in which it can contribute to inter-group tension, and how ubiquitous computing has thus far conducted far more research relating to the former rather than the latter.

Further, I have highlighted the various approaches to the study of urban mobility taken by both cultural geography and ubiquitous computing. The cultural geography presented tended to by historical or analytical in nature, approach urban mobility through the eyes of a single individual, or discuss urban mobility as it is facilitated by a particular medium, type of interaction, or technology. Within the ubiquitous computing literature, on the other hand, many of the works focus on how a particular design is conceived of, implemented, and deployed within an urban setting. There are also many works which focus on sociological studies of urban mobility, differing from cultural geography in that they are often explicitly focused on the use of emerging technologies, and they often directly study medium-sized groups of city dwellers.

With this chapter then, I have presented several avenues for further exploration within ubiquitous computing that are inspired by work from cultural geography. First, ubiquitous computing work presented in section one extends the notion of voyeurism and creativity which the cultural geography literature motivates, and points towards an attempt to continue to manifest this theme within the design of new technologies for urban mobility. Second, I have shown that there exists little design work with ubiquitous computing that highlights or attempts to negotiate the bridging of the public and

private realms through mobility. This suggests that there is space within ubiquitous computing to explore this theme further. Third, ubiquitous computing extends the work of cultural geography by demonstrating how technology can also support another range of practices which center around alterity as an opportunity for connections. Here then the ubiquitous computing literature points to new avenues of research on both the cultural geography side, for understanding the various ways in which people approach alterity, and for the designs of new technologies which take these practices into account. Fourth, while I have shown that ubiquitous computing takes an active approach towards supporting the ways in which urban mobility can contribute to the creation of community in a variety of ways, on several scales, and through many forms of media, there is a notable lack of work focused on approaching mobility as a lived tension between groups. This suggests that there is a need within ubiquitous computing to recognize the other side of this duality, exploring how technology can not only create communities but also separate them, acknowledging that these two things are fundamentally interwoven. Finally, in highlighting the different methodological approaches for the study of urban mobility of both cultural geography and ubiquitous computing, I have attempted to highlight an avenue for further exploration. Namely, I believe it would be beneficial for future ethnographic studies regarding the role of technology in aesthetic experiences of mobility to be conducted on a scale like those presented among the ubiquitous computing work, but with a cultural and thematic depth like those studies originating from cultural geography. Indeed, Sheller & Urry assert that new forms of 'mobile ethnography,' which necessitate "participation in patterns of movement while conducting ethnographic research," are becoming increasingly important and that new techniques for studying the intersection of mobility and technology must be created [2006, 217]. The work of this chapter, then, has been to identify and define a space within ubiquitous computing research for this research to be situated, and the work of this dissertation will be to outline and execute a series of

principles which will put to use this new understanding of the role of mobility within ubiquitous computing.

6: Aesthetic Journeys

Both Chapter 4 and 5 presented approaches towards answering my second research question: *How can we expand (through conceptual resources) the relationship between mobility and technology in useful ways?* The conception of the Aesthetic Journeys study in Chapter 4 laid the groundwork for answering this question empirically by arguing that we can expand the prevailing ubiquitous computing conception of the relationship between mobility and technology in an actionable way. To do so, I proposed that ubiquitous computing could begin approaching the study of mobility with new techniques and that it ought to examine not only the functional aspects of urban navigation but to look at the variety of experiences people have in these public spaces. In Chapter 5 I analyzed the way in which two different disciplines, ubiquitous computing and cultural geography, have approached this idea of an aesthetic experience of space. This literature review served to provide a complimentary approach towards my second research question.

In Chapter 4, then, I proposed to approach the diversity of the urban mobile experience empirically, and in Chapter 5 I demonstrated how this diversity of aesthetic experiences can also be approached more theoretically. This chapter will describe the results of the Aesthetic Journeys study proposed in Chapter 4, and approach the analysis of these results through the theoretical lens presented in Chapter 5. Consequently, the achievements of Chapters 4, 5 and 6 taken as a whole will then lead to the answer to my second research question. What is presented in this chapter, then, represents a theoretically- and empirically-grounded set of conceptual resources which serve to expand the understanding of the relationship between mobility and technology for ubiquitous computing.

This chapter will present three useful categories, which emerged from the analysis of the Aesthetic Journeys study, for describing the different aspects of journeys in the London Underground: *Platform for Art, Ecology of Objects,* and *Emergent Sociality*. The development of these themes represents an example of a means by which, through empirical work, ubiquitous computing can expand its conception of the relationship between technology and mobility in a useful and actionable way. By reflecting on these themes, and their interrelations, I will then present five inspirations for new design directions that ubiquitous computing might take: *Designing for the Expert Journey, Designing Ecologies, Designing for Engagement, Designing for the Buzz*, and *Designing for the Flow*. These inspirations for design, in a complimentary fashion, also serve to demonstrate that there is the potential to identify avenues for creating technological responses towards an expanded vision of mobility and technology. These actionable nature of these inspirations for design will be then further explored by the design work presented in Chapters 7 & 8.

6.1: Platform for Art

The rich and varied approach taken by the study, as detailed in Chapter 4, yielded three useful categories for describing the different aspects of journeys in the London Underground, the first of which I came to call, *Platform for Art*. The name *Platform for Art* is taken from the old name of Transport for London's program which has since been rebranded to "Art on the Underground" (web: TFL Art). This program is one in which artists have the chance to display their works within the Underground in a variety of formats ranging from posters to books to enormous station-sized installations. In Figure 6.1 you can see one of the main pieces from the summer of 2006, a massive mural installed at the Gloucester Road station. Beyond explicitly curated works of art, the Underground also has a long history of architectural design. Great care was put into

the design of stations, with distinct looks emerging for each different time period during which they were built. Even the Tube map itself is famous for its design. But, in the context of the Aesthetic Journeys study, the idea of *Platform for Art* does not end with the top-down decision of the London Underground to support artistry within its tunnels. In fact it only begins there.

Figure 6.1: City Glow, Mountain Whisper, in Gloucester Road Station, by Chiho Aoshima

Tube riders surely recognize and often embrace the program of art which Transport for London supports. Of the mural pictured in Figure 1, one of my participants said:

It's not typical because there aren't any other stations like Gloucester [Road]. In a funny sort of way that would be the opposite extreme. I mean that's a very common scene, but

that's very characteristically and uniquely London Underground. It simply couldn't be anywhere else. —Oscar

Further though, I saw that this practice of fostering artistry was coming from the bottom-up as well. During observations I saw many examples of people's personal aesthetics, their fashion sense, transforming the feeling of the space around them. In Figure 6.2, the woman on the left brings a unique "look" with her that goes beyond just the clothes she is wearing and extends to her purse and matching pink mobile phone, a Motorola RAZR. I do not mean to claim that fashion is unique to the Tube, but rather that these cues play an important role in this tightly packed space, and they work in

Figure 6.2: Personal aesthetics in the Underground

concert to actively create to the visual landscape of the Underground. On the right of Figure 2 you can see a photo of three people, strangers, who have managed to sit in a

color-coordinated fashion. The bold orange and turquoise highlighted with flecks of white is truly striking. That is of course not to say that the effect was planned by these passengers, but rather that the Tube is a place where these sorts of serendipitous alignments can, and do, happen.

The passengers contribute to the constitution of the experience of the Underground (for themselves and for others around them) in a variety of ways that go beyond just their personal styles. Choices must be made, each and every day, by each and every individual riding the Tube about what path to take through the station, where to sit, what line to ride, etc. People are not merely cargo being shuttled about by an automated system—they have agency and the ability to make choices about how to exercise or relinquish this agency. In studying the various ways in which people move through the Tube, I began to see several distinct styles emerging.

One can easily imagine the lost tourist who bumbles along not knowing where to go, getting on this train or that, and often blocking traffic by stopping to gain their bearings at complex junctures. Pushed along by the tide of daily commuters, they often struggle to fight their way out of the places they have arrived at in error. I began to see, however, that there was a style of riding which on the surface may seem similar in character, but in reality was a sort of elegantly studied decision to *go with the flow*. Here one of the passengers I interviewed relates his active choice to be swept up by the tide of London transport:

Sometimes I do that or if I am in a real hurry to get somewhere I will just get on one, get off the last place I know and look at a bus map and hop on another bus. I find there is no point waiting for the direct bus if there is one coming and you know you can get off just down the road and hop on another one rather than just walk down there. You won't

get lost on the way you will just get there. Change busses, change again, change again. Doesn't matter. —Carey

Although Carey is talking about the bus in this specific case what we can see is that his faith in the system is one way to define *riding well*. It would seem that a novice would not blindly jump on a bus assuming that he could easily find his way. But Carey's idea of the fastest way to get somewhere is taking the first opportunity available. Waiting for a direct bus, as he says, is pointless. We can see that he has developed a sort of expertise, a trick of the trade, for getting around, and it is something he is both confident in and proud of. Part of it involves giving up some of his agency to the movement of the buses, but this empowers him in a different way. It gives him a sense of style and accomplishment. The ability to be blasé is quite an achievement.

While *going with the flow* is one particular style, another one involves a more active approach. Here, Maxwell tells about his love of making *insider choices*:

And I just really love doing it. I love fitting all the pieces together. That's part of the pleasure, yes. Obviously most people would see this as a negative to actually sit down with maps and things and work out the best routes, but I do enjoy it and it would be a shame I think if they actually linked everything together perfectly so that the lines crossed each other actually had intersection, you know at interchange stations. I like the fact that they don't. I like the fact that the Northern line goes straight underneath the Circle line. There's no actual junction there at all <laughs>. If you go to the surface you can walk across and you can do it, but you need to actually know it's there. Where as the French would actually build a link, a walkway, and that would just spoil it somehow.
—Maxwell

It is a special skill to be able to navigate the complicated system, to have insider knowledge and know the secrets and tricks. While Carey preferred to be carried along by chance, other participants like Maxwell felt an ideal Tube journey would be comprised of a series of little victories. It could be about a series of connections being made in record time, knowing which is the carriage most likely to have a free seat, or finding a secret exit route. However, when a person who likes to ride in such a style involuntarily loses their sense of agency, it can have quite a negative affect. When I asked Andrea to describe for us a miserable journey we had the following exchange:

The most miserable [journey] would probably go to the airport and be stuck on the train and it is being really, really slow and you being late for your flight. That would be the worst.

Has it ever happened to you? *Yeah. Well, no. I was actually meeting somebody but it was pretty stressful. It was horrible. I thought, "I am driving next time." That's just it. There's nothing you could do. There's just nothing you can do.*

So you were very late? *No I wasn't actually. It just felt like I was. Do you know what I mean? <laughs>* —Andrea

Another one of my participants, Sadie, had developed such a fear of the loss of control she had experienced when being stuck in a carriage underground that, that she had stopped riding the Tube altogether. Instead, she stuck with buses for getting around the city, saying:

With the bus I just feel in more control with it and more at ease with taking it. I know where they all go and stuff, but it's not as convenient at all. Going to east London ... it's

a couple of buses, sometimes three and it can take well over and hour and half sometimes. ... But you can look into the distance, you can relax more. —Sadie

For Sadie, although she felt the buses to be inconvenient, they were not as frightening for her because being above ground allowed her to get off, theoretically, at any moment. Whereas Carey gives up his agency to the buses because he felt they were so reliable, Sadie rides the bus to empower herself. What I want to emphasize here, then, is that the feeling of riding well isn't merely about an objective metric like the absolute time a journey takes. Carey, Maxwell, Andrea and Sadie all have different ways of judging, and expertly crafting, artful journeys for themselves, journeys that work the system in ways that they feel comfortable with.

6.2: Ecology of Objects

As I mentioned in the previous section, the atmosphere of the Underground is shaped in large part by the passengers themselves. Likewise, this extends to the objects which they carry with them on their journeys. The important thing to note here is the plurality of 'objects.'

When riding the Tube one of the first things one notices is the multitude of objects passengers are engaged with simultaneously. On the left of Figure 6.3 we see a man reading one newspaper while holding another between his legs, and on the right we see a woman rummaging through her purse with one hand while clutching two grocery bags and her Oyster Card (the RFID-based train ticket used in the Underground) in the other. These types of activity are the norm in the Tube—passengers seemed to have their hands constantly engaged in a sort of ongoing juggling act. Even when people carried

music players they busied their hands with the player itself, a newspaper, a book, or any another object available.

Figure 6.3: Passengers keeping their hands full

What I want to stress, then, is that it is not only the individual objects that are important, but the ways in which they work, and are worked, together. Over time passengers begin to cultivate mobile kits (Mainwaring et al., 2005) with unique inter-dependencies, such that bringing one object would necessitate that another be carried as well. In describing the essential contents of the satchel that he always takes, Carey told me:

I also have a sketchpad in there as well just so it didn't wrap around my leg, so it always stayed flat against my leg. But it's kind of creased and rumpled and horrible. —Carey

Here, the sketchpad is used not really for drawing, but primarily to change the shape of the bag. While Carey admitted that he could ride the Tube without it, he said that in order to bring the satchel containing the items—wet wipes, pens, a book, a stone with special meaning for him—he considered important, he would have to include the pad to make his bag comfortable.

Oscar, on the other hand, carried different items with him depending on which day he was traveling. He normally brings with him two bags, on for his laptop and the other for paperwork.

I'm more likely to be using the laptop on the way home and in the morning I usually do read the paper. ... And this varies depending on the day of the week. I buy the Guardian on Mondays. I get the Independent the rest of the weekdays and on Saturdays I buy the Guardian and the Independent. But I don't buy anything on Sunday. … Occasionally I pick up the Metro. Oh, on the way home I get the Evening Standard although I hate it. —Oscar

Oscar's journeys vary, then, according to which paper he is angling to pick up, and this depends on what time and day he is traveling. Maxwell, however, explained to us that he finds the paper less essential, especially when he is on the bus:

When I'm underground I read books and newspapers the same as anybody else. I don't, the minute I get above ground, or if I'm on a bus, I don't read. I do like to look out the windows and see what's going on. Because I don't believe in iPods and things. I always feel if you're actually traveling somewhere you should be appreciating where you're going and looking out the window. You shouldn't have music in your ears. You should be looking out because there will be something. There will be a bus stop in Turnham's Green that has, for some reason, a packet of bacon on top of the bus shelter. ... I'm

quite happy sitting there without the paper or book because there will be people getting on and off the whole time and you can observe them and try and think of stories as to what they might be doing or going. So, yeah, normally underground I would read the paper, but I'm fine without it just because people come and go. —Maxwell

Sometimes Maxwell is content not to bring anything with him then, and he went on to tell me how sometimes the things which other people bring can act as social windows, especially when they break established norms of what one would expect to see. These objects could function as points which spurred on interaction, or acted as fuel for the imagination:

I was at Old Street station and there was, I don't know why that station is so cool, but it's quite lovely, and there was a girl sitting next to me on the seat reading a leaflet called "Fun Things to do in Hertfordshire." I don't know if you've ever been to Hertfordshire, but there are no fun things to do in Hertfordshire. I mean I don't know why she had this. I mean I'm guessing she was Chinese, but she might not have been, that's a guess, and you just think why do you come all the way from China, Singapore on a proverbial song… I mean the train goes out to Hertfordshire ... and she's obviously picked up this leaflet of fun things to do. There really isn't anything fun to do in Hertfordshire ... You just want to tap her on the shoulder and say how many fun things have you done? And how many are there? Are there 23 fun things? I'd be surprised. Five possibly. —Maxwell

From one little pamphlet Maxwell began to build a complex imaginary life for the girl seated next to him, something which he professed to doing often. Yet later on in our interview he told us:

I mean I tend to always have a bag with me. If it doesn't have a book or a newspaper it will have a notebook. So if I'm not reading something I can be writing something. So I would never be just sitting there just gazing blankly. I don't know how people, when you see people in the Tube and they're not doing anything, I think I don't quite understand how they do it. I mean possibly they're having great thoughts and possibly they're devising… I can't believe people genuinely can just switch off and be completely blank for the duration of the journey. I couldn't do that. —Maxwell

Maxwell felt a need to be constantly engaged, tuned in to his journey in *his* way. Although his statements appear contradictory, what I would like to underscore here is the fact that a single person can create journeys of different natures often using different objects. Whereas Maxwell places listening to an iPod and gazing blankly on the same par, classing them as unfulfilling, another participant, Jin-Mae told us of how her iPod was an integral part of her commute. Because she listened to the same album everyday for over 3 months, one particular song became inextricably linked to the moment the train pulled into the stop her office was at. The song became a symbol of her journey.

We begin to see, then, that the objects which people carry can be used to support a multitude of styles—Oscar's mobility becomes a chance to engage with world at large through newspapers, Maxwell's journeys are times to actively uncover hidden surprises in the people and places around him, and Jin-Mae builds a mnemonic narrative, tying the music she loves to the city in which she lives.

6.3: Emergent Sociality

People bring many of their belongings into the Underground but there are also items in the Tube of a more communal nature, such as newspapers, as I previously mentioned in Chapter 4. During rush hours, there are newsagents who stand outside the entrances of the station distributing copies of free newspapers. At the time of this study the Metro was the only free paper available, but as of 2008 there are now a host of free papers competing with the Metro including the London Paper and London Lite. Because of the abundance of these free papers, it is common, even expected, in the Tube for people to leave behind the copies they have picked up when they have finished reading them. This practice is so pervasive that many of my participants relied on it to find reading material in the train carriages when they forgot to bring something with them. Further, this subtle social gesture of passing on the papers acts as a channel for unspoken exchange through which riders can express an awareness and an acknowledgement of current and future passengers. Indeed, Carey and Oscar both told us that they often intentionally left behind their copies of The Guardian (a purchase-only newspaper) encouraging other riders to read this paper which they believed to be more enriching than the Metro.

Like newspapers, tickets for the Underground also change hands. Before the advent of the Oyster Card (the RFID based ticketing system) the Underground operated solely on paper tickets. Many types of passes exist on both the Oyster Card and paper tickets but the day travel card, which allows for unlimited journeys on the Tube, gave rise to a very particular sort of behavior in its paper form, as one participant describes:

We were just standing there looking at this huge line. I think it was at Liverpool station. We noticed in this big line up there were all these people waiting to get a ticket and we saw this one guy who was leaving the station. Without exchanging words or anything he gave his ticket to this woman who was kind of near the back of the line. It was just

procedural. She just kind of looked at him and took it and she left the line and just went in. —Fred

Fred, who was new to London when he witnessed this, was surprised by this silent exchange which has grown much less commonplace now. Many people used to pass along their paper day travel cards when they were done with their day's journeys because they were no longer needed. However, with the introduction of a technology meant to supplant the paper ticket – the Oyster Card is meant to be personal, permanent and re-usable ticket – this practice of exchange occurs much less often.

It is worth noting that these, and other practices, are primarily exclusive to the Underground. Newspaper and ticket exchange do not happen in any given location within the city—even on the buses one would be hard pressed to recall such an encounter. Though the Tube is clearly part of, and influenced by, the culture of London itself, it is a sub-polis with a character of its own. However, having an awareness of the practices that contribute to that character, does not necessarily imply that one must follow those practices. This came out during the large group interview as participants spoke about where to stand on the platform while waiting for the train:

I'm always afraid of getting pushed under the train ... and that is why I don't really stay close to the [edge]. —Ariel

I do! I stand at the back. —Jin-Mae

I like that sense of walking on the edge that annoys [other people]. We did it today. I kind of enjoy that feeling of being on the precipice. —Andrew

I get really scared for those people who walk along the edge, I'm like, "No! You can't! The yellow line, look!" —Kylie

It's a nice feeling [even during rush hour]. The busier the better! —Andrew

I do too, when I'm trying to get to a particular carriage and avoid all the [people]. [The yellow line which passengers must stand behind] is only artificial. I'm not [scared]. What's the difference between ten centimeters or twenty centimeters either way of some silly yellow line? It's good because most people obey the yellow line thing and if you want to get to a particular carriage further down, you can just pass everyone by and walk to your destination. —Nigel

Ariel, Jin-Mae and Kylie are afraid for their own safety, and the safety of others, and so they stay well behind the yellow line that marks the edge of the platform (see Fig. 6.4). Andrew, on the other hand, gets a thrill from being at the edge, and Nigel uses his knowledge of the fact that people will stand behind the line in order to get where he is going more quickly. Conforming to, railing against, or manipulating common social practices all lead to different sorts of journeys. It is important to recognize that all of these techniques are at work simultaneously within the Underground.

Figure 6.4: A passenger toes the line

Sometimes there are collisions between the common practices surrounding different aspects of riding. For instance, the Tube is often glossed as a place where people do not often speak to stranger. This presents a challenge, though, when one wants to gracefully give up their seat to another in need, as Manny describes:

You can't speak to anybody; you don't speak to anybody. You know and so, it is quite embarrassing to say "excuse me." That is the hardest bit, touching them. I usually just get up and they go, "Oh, thank you," and then they sit down. I find that easier. —Manny

In a sense, then, there is a right way to give up a seat within the Tube, and this is something one comes to learn over time. Though, as I mentioned in Chapter 4, open verbal exchanges are not the norm, many of my participants, described the Underground as a place where one could be content to feast their eyes on the panoply of other passengers within the carriages, as we saw with Maxwell in the previous section. Manny, however, emphasized to us the need to exercise restrain when engaging in this practice:

There is obviously a kind of flirtation thing that is going on. Sometimes you might have contact with somebody or you might catch somebody looking at them and you do that whole kind of flirtation thing, but it never really comes through. I think a lot of the time it is curiosity. It is people looking at each other and you accept that someone has been looking at you and as long as they are not holding their gaze. —Manny

Like Maxwell, several of our participants related to us how they often spent time imaging what the lives of the other people around them might be like. In fact Andrea was even able to detail for me various cues – such as style of dress or the station a passenger boards the train at – that she would use to mentally expound on the histories of the people she encountered. While Andrea and Manny restricted themselves purely to

musing, Carey told me that on some occasions he would change his route to continue to uncover more about another person:

[I will go out of my way] probably only one stop extra or something like that, or I will just walk a bit slower. Mmm. This makes me sound incredibly shallow. But it's fun and it's something to do. Ohh. You sit there and think, "You're cute I'll sort of walk behind you until the entrance and we will go our separate ways and I will fall in love again when I get back on the Tube. And there will be another small romance later on." <sighs> God, travelling into town I must fall in love about 20 times. —Carey

Going out of one's way to indulge in a bit of imagination might sounds slightly odd, however it is not only typical but, I would argue essential, for the life of the Tube. Being attuned to the others around was often a pleasure for my participants, not least because in rare moments this awareness would blossom into a more in-depth encounter. Typically this would occur when there was a departure from normal routine, allowing passengers to converse about the unexpected event. These small exchanges were taken as enjoyable surprises, and, when one was in the mood, could greatly alter a person's day as Maxwell told me:

[The train was closing and] I was aware the girl sitting opposite wasn't moving and everybody else got off the train and she obviously hadn't picked up what was going on. She was from Thailand and she was reading a guidebook and you could tell from the writing on the front that it was from Thailand and of course she was the only one left in the carriage. I actually went back inside and stopped and said you have to get off and she looked surprised and got off and I said "can I help you, where are you going?" And she said she wanted to go to Harrods, which seemed a bit depressing, so I tried to explain [that] to her and ... I actually ended up going to Harrods [with her] and getting my picture taken. —Maxwell

Maxwell enjoys strange detours such as these, but when discussing the possibility of chatting with other passengers, Sadie displayed quite a different opinion:

Sometimes you always get somebody on the train going, "Why doesn't anyone talk to each other?" Well because we don't want to. Shut up. —Sadie

We begin to see the spectrum of ways in which passengers can choose to interact with the others around them: from Fred's fresh-eyed surprise, to Sadie's studied silence, from the imaginings of Manny, to the detours of Carey, and finally the curious day-trips of Maxwell. This intense range of potential that the Underground offers – like a current one could tap into or merely ride along in – was summed up quite well by Oscar:

But people often say people who are car commuters they particularly like being on their own, in their own space, despite the fact that it may take them twice as long to drive, they actually seem to enjoy just being in their own space and not being bothered by anybody else, but I can see some of the advantages of that, but at the same time I don't particularly want to go through life kind of casting off those around me and the fact that it doesn't matter that you don't talk to all those people on the Underground, it's just other people being around you and it's quite life enhancing really. You don't have to make a particular meal of it. So all these expressions people used to use about it being the rat race and the pressures of London, I mean, sure, there's some of that, but at the same time you also get quite a buzz for being part of that. —Oscar

The palpable energy of the people around, the pulsing of the life of the Underground, has an inescapable effect on every journey taken.

6.4: Inspirations for Design

The study of the London Underground, deepens the work presented in Chapter 3, and further serves as a motivation to move away from the notion of mobile computing for a single "mobility" and highlights the importance of considering the multitude of ways that people, even a single person, might move through and interact with the space around them. By studying in depth the types of journeys that are supported by single infrastructure like the Transport for London, we begin to test the limits of what an all-encompassing notion like "mobility" might have to offer. In turn, the approach of ubiquitous computing towards understanding, and designing technologies for, these settings is transformed.

Revisiting my second research question, *How can we expand (through conceptual resources) the relationship between mobility and technology in useful ways?*, we can see that not only the three themes which I have developed to describe the variety of mobile experiences of the London Underground, but also the approach (as presented in Chapter 4) to, and the framing for (as presented in Chapter 5), the ethnographic study which lead to the development of these themes, represent a theoretically- and empirically-grounded set of conceptual resources which serve to expand the understanding of the relationship between mobility and technology for ubiquitous computing. The development of these themes represents an example of a means by which, through empirical work, ubiquitous computing can expand its conception of the relationship between technology and mobility in a useful and actionable way.

The contribution of this work is then both the process of the work itself as well as its products. By adopting a new approach to the study of mobility, I have been able to identify a different understanding of the ways in which people experience their urban movements. In the remainder of this chapter, I will present and reflect on a series of principles which I have generated to inspire and guide new designs for urban mobility.

The presentation of these inspirations for design serve to demonstrate that the work presented in Chapters 3, 4, 5 & 6 is not only theoretically-sound, but also useful and actionable for ubiquitous computing. Here, then, I am able to begin to answer my final research question: *What principles can we create for a reformulated ubiquitous computing view of mobility and technology?*

By reflecting on the themes presented in this chapter, and their interrelations, I have developed a series of five inspirations for new design directions which ubiquitous computing could begin to address. Before explicating these themes I would like to preface them by acknowledging that an attempt to tailor a technology to the unique styles of each of my participants, would seem to be a humorous challenge at best, and radically misguided undertaking at worst. While my study of the Orange County transport system was preliminary and exploratory, it provided a contrast to my more in-depth engagements with the riders of the Tube. Accordingly, then, the inspirations for design which I detail in the remainder of this chapter draw from the London Underground study. Here, as with the previous chapters of this dissertation, instead of trying to focus on an over-generalized notion of mobility, I will look to the specific and diverse experiences which urban mobility offers. Consequently, I will focus on the themes from the Aesthetic Journeys study to reveal an alternative set of principles that ubiquitous computing might begin to design for.

6.4.1: Designing for the Expert Journey

As we can see from Chapter 5, the notion that there is more to moving around a city than just getting from A to B is not new. But what else besides better navigation and optimized travel times should we be designing for? The theme of *Platform for Art* motivates the potential for designing for various types of expertly crafted aesthetic journeys. Instead of supporting measurable quantities, we could focus on crafting

interfaces to support the feelings of *going with the flow* or alternatively *making insider choices.* My participants, Carey, Maxwell, Andrea and Sadie, all had very different, yet highly specific, ways of moving through the city. What is important to note here is the importance of experiential, and arguably subjective, nature of these journeys. While both Carey and Maxwell felt that their method of moving through the Transport for London system was the fastest, it is crucial to recognize that it is the *feeling* of speed rather than the *objective measurability* of that speed which is crucial to their satisfaction. It is this agency as crafter of one's own journey which lends Sadie a sense of empowerment in her travels despite the fact that she is paralyzed by fear when confronted with the claustrophobic spaces of the Tube.

It is important to recognize, then, that systems designed for purely objective metrics of speed, allowing users to arrive to their destination "as fast as possible" overlook the importance of the more complex nature of the experience of efficiency, and further, could be seen to detract from the accomplishment of being able to craft an expert journey on one's own. I do not mean to suggest that navigation systems ought to abandon attempts to provide expedient routes of travel, but rather that it is worthwhile to recognize that there is a deeply experiential aspect to the feelings of speed, and slowness, and expert users, rather than tourists, for instance, often eschewed such aids, like Transport for London's journey planners, because they were seen to be inferior. I suggest, however, that this inferiority is not merely a function of a lack of excellent map data, or truly real-time traffic updates, but rather that this system does not take into account the importance of finding hidden connections, or beautiful views out the bus window. Consequently, I propose that ubiquitous computing might benefit by tackling the challenge of keeping these advanced users stimulated, and, rather than designing for the lowest-common-denominator journey, to look, instead, towards aiding in the crafting of the expert journey.

6.4.2: Designing Ecologies

While many interfaces designed for mobility are intended to be used anytime and anywhere, we saw that many people only used certain devices at specific times, and that the devices which our participants thought were appropriate for the Tube varied greatly. Maxwell shunned iPods while Jin-Mae swore by them; Oscar would only read specific papers at certain times, and Carey used his copy of the Guardian to make a social statement. The key here is that these devices and objects form a vast ecology, as the theme of *Ecology of Objects* suggests. Instead of designing single interfaces for a universal mobility, it would be a worthwhile pursuit to consider designs which not only respect but actually rely on other objects—not only objects carried by the user, but all of those found in the space.

Too often interface design stops with the interface itself, but if ubiquitous computing has truly moved (and it seems clear from this study that it has) off of the desktop and into the everyday world, this approach is no longer beneficial. No more is it safe to assume that if a user is interacting with a computational device that they are not engaged in any other activity. Computers are no longer mainframe devices or even desktop PCs. They are mobile phones, Oyster Cards, and iPods. They are objects in our everyday lives, just like datebooks and newspapers. But unlike datebooks and newspapers, computational objects have the potential to be designed to be more flexible, adaptable and reactive. As designers of those objects, however, we must cross the difficult hurdle of acknowledging that there is a life outside of our interface. We can no longer demand the full attention of a user, but rather than fighting that tide, I propose we begin to embrace it. By designing new interfaces with an eye to what lies just beyond them, ubiquitous computing has the opportunity to become more relevant, more integrated and arguably more aware. By expanding our scope and beginning to design for the complex relationships between objects and the different sorts of journeys they support, we can begin to respond to the meaningful interactions that span across

multiple people and devices and our interfaces can become integral aids, rather than obtrusive barriers, to those relationships.

6.4.3: Designing for Engagement

We saw many different kinds of engagement at work in the Tube, but what is notable is that we rarely witnessed a *lack* of engagement. Riders seemed to constantly occupy themselves with the here-and-now, whether it be reading the paper, imaging the lives of strangers, or listening to music. This stands in sharp contrast to the time of reflection and musings which were often prized by the bus riders of Orange County. The need to keep occupied, then, is not a universal truth of public transport, but rather a contextualized practice present only in some places, like the Underground as I identified within all three of the themes presented in this chapter.

This engagement, however, takes on a wide variety of incarnations. Here too, then, it is important to go beyond the surface and see the complexity of the meaning of engagement, which exist not only for a series of different passengers, but for one rider himself. Being engaged can mean listening to your iPod while reading the newspaper or imagining the life of a stranger. What is crucial, then, is to recognize that there is a variety of modes of engagements and a host of objects, people and places one might be engaged with or through. For the design of new ubiquitous computing technologies, we then find impetus to expand our focus from designing hands-frees to hands-ons, from all-in-ones to one-too-manys, from invisible interfaces to unmissable ones. Through this design principle we can recognize that technology need not, and in fact in some cases should not, always fade into the background; the Tube is a testament to the merit in keeping the hands occupied, the eyes engaged and the mind stimulated.

6.4.4: Designing for the Buzz

Currently there is a strong divide between the technologies that support anytime/anywhere cocooning or intense productivity (e.g., iPods and Blackberries) and those that act as explicitly social friend finders (e.g. LoveGety [Getty Study Group, 1998]). We have seen, though, through the theme of *Emergent Sociality*, that the depth of social interactions which people engage in has a wide range. As we can see with someone like Maxwell, sometimes he seeks out verbal exchanges, but at other times he is content with his musings or happy to read his paper. Further, while Carey might go out of his way to modify his journey so as to observe someone from afar, Andrea was much happier to quietly ponder the lives of the other passengers in the carriage, and Sadie had absolutely no desire to interact with strangers at all.

This points, then to an overlooked design space between the two extremes of social detachment and full-on interaction. The London Underground is the host to a range of tacit social exchanges which, while not completely at the foreground of everyone's experience, are not entirely absent. I argue, that it these subtly social moments are too often ignored within ubiquitous computing. My participant, Oscar, among others, highlighted the importance of this middle-ground; the feeling of being co-present with strangers, with the potential, rather than the imperative, for interaction is essential for many city dwellers. This being alone together is not a problem which Oscar seeks to overcome, but rather a state which allows him to thrive and recharge. The lack of these moments, felt by Oscar so strongly when he moved from the city, are not unimportant lulls, but rather the stuff of which cities are made of. Accordingly, rather than an all or nothing approach to social interaction in cities, ubiquitous computing can, and ought, to begin to tap into the Buzz which Oscar speaks of by creating interfaces which allow users to easily cross this gamut, and acknowledge the importance of its center, rather than merely the extremes.

6.4.5: Designing for the Flow

Building on the fourth principle, it is worthwhile to note how often that the focus of people's attention in transit is the transit of other people. Though we might think of the flows of public transit in terms of trains, busses, and their routes, what really flows here are people (see Fig. 6.5), engaged in complex journeys that employ multiple forms of travel and that intersect in rich and complicated ways. Drawing inspiration from the notion of relational aesthetics [Bourriaud, 1998], we can recognize in the themes a concern with the ways in which ones positionality with respect to these flows and with respect to the particular others who exemplify them is an aesthetic consideration. It is part of the experiential fabric of urban travel. This suggests that there is some scope to think about journeys rather than routes, to think about journeys as iterated and intersecting, and to think about the link between people and larger collectives, all as sites for design engagement and intervention.

A central theme of this dissertation has been conceiving of the multiplicity of mobilities, rather than seeking to identify one defining, overarching form of movement. With this final principle, I seek to highlight the importance of addressing, through design, the multiplicity of mobilities as a whole. While, the preceding principles have stressed the variety of experiences a single person might have, here I want to step back even further and acknowledge the ways in which a multitude of journeys intersect, overlap, reinforce and impede each other, not only in a given space, but also through time as well. What this principle suggests, then, is that it is worthwhile for ubiquitous computing to begin to address the role which technology plays within this concert of journeys, how it serves to weave together a variety of people and places over time. *Designing for the Flow* might well be the most challenging principle I have proposed. However, it can be approached through an active rethinking and recontextualizing of the work which ubiquitous computing does. By recognizing that technology figures into, and reconfigures, this broad landscape of urban mobility, and by stepping back to address journeys more

holistically, rather than focusing on the minute details of which they are composed, we can begin to account for the ways in which technology can be designed for the urban scale and the flows which distinguish it.

Figure 6.5: The flow of people underground

6.5: Conclusions

So what does urban mobility look like? If mobile technologies are major sites for research and development, this dissertation has asserted that we need to step back and consider what it is to be mobile. Rather than thinking about mobility as a property of certain kinds of action, the property of geographical flexibility, I have presented a theoretically- and empirically-grounded body of work that attempts to consider urban mobility, instead, as a form of living. Mobility is an aspect of how people live; it is a way

that people act, and a site at which cultural meanings are produced. This was brought home by the Orange County study in which I began to recognize how many elements of travel and transit featured in people's accounts, beyond the instrumental. Mobility is not simply about getting from A to B.

The Aesthetic Journeys study has demonstrated then what mobility might be *beyond* just getting from here to there. With this work I have demonstrated how ubiquitous computing can move past many of the stereotypes surrounding both the uses and users of mobile technologies. By trying to understand the different ways in which people might be mobile, I have been able to highlight new opportunities for design that lie within the experiential aspects of everyday movement. In exploring these "aesthetic" facets of mobility, this chapter encompasses more than simply traditional formalist aesthetic considerations, but looks to an aesthetic which is actionable for ubiquitous computing design, one that is both performative and relational.

When the aesthetic diversity of mobilities becomes the focus of our concern, we are able to go beyond merely making interfaces "pretty." Technologies and infrastructures are equally the sites at which these performative, experiential, and aesthetic considerations come in to play. This has at least two major consequences for ongoing interactive systems design. First, we need to acknowledge the relevance of these considerations and the fact that our systems are always already enmeshed in social and cultural settings that make them meaningful in the ways I have highlighted here through a presentation of a series of themes; and second, thinking of the aesthetics of collective experience provides a fruitful new starting point for design, which I have expounded through a series of principles.

In this chapter, then, I have concluded the answer to my second research question: *How can we expand (through conceptual resources) the relationship between mobility and*

technology in useful ways? The analysis of the Aesthetic Journeys study gave rise to three actionable categories for describing the different aspects of journeys in the London Underground: *Platform for Art, Ecology of Objects,* and *Emergent Sociality*. Taken together with the achievements of Chapters 4 & 5, what is presented in this chapter, then, represents a theoretically- and empirically-grounded set of conceptual resources which serve to expand the understanding of the relationship between mobility and technology for ubiquitous computing. The usefulness, the actionability, of these conceptual resources, these themes, was demonstrated through the presentation of five inspirations for new design directions that ubiquitous computing might take: *Designing for the Expert Journey, Designing Ecologies, Designing for Engagement, Designing for the Buzz*, and *Designing for the Flow*. I described these principles in an effort to begin to answer my final research question: *What principles can we create for a reformulated ubiquitous computing view of mobility and technology?*

However, to evaluate the usefulness of these principles I must explore their potential for giving rise to new technological responses towards an expanded vision of mobility and technology for ubiquitous computing. Accordingly, the answer to my final research question will be further elaborated by the discussion of two design projects which I created. The actionable nature, then, of these inspirations for design will be then explored by the design work presented in Chapters 7 & 8. Finally, before concluding this chapter it is important to mention that these design principles act as a demonstration of the ways in which some of the future directions for ubiquitous computing, as presented in Chapter 5, might take shape. However, I would like to postpone a discussion of the relationship between the theoretically-grounded work of Chapter 5 and the empirically-based conclusions of this chapter. The relationship between these two chapters is a complex one, whose discussion will explicate some of the ways in which the new principles posed here help to support, and flow out of, the expanded version of ubiquitous computing. For the reader, I believe it will be beneficial to first address the

ways in which the principles can be expanded and reflected upon through design, before elaborating, in Chapter 9 of this dissertation, on the ways in which the theoretical and empirical contributions of this work are more deeply intertwined.

7: *undersound*

The work presented in Chapter 6 lead to the development of five inspirations for future design direction ubiquitous computing might begin to take. These principles served to lay the foundation for an answer to my final research question: *What principles can we create for a reformulated ubiquitous computing view of mobility and technology?* Outlining and explicating these principles, however, is only the first step towards an answer. As I have stressed, at the crux of this dissertation is an attempt to explore not only how the view of mobility and technology might be expanded for ubiquitous computing, but to do so in an actionable way. It is important to understand, then, if the principles which I have developed can lead to the creation of new designs which also serve to reinforce this expansion of the relationship between mobility and technology. In order to accomplish this task I have developed two new interfaces which draw directly from these principles.

The first of these designs, called *undersound*, will be presented in this chapter as a means through which I will explicate the utility of the design principles. This chapter, then, will focus not only the qualities of *undersound* as a design, but also the way in which *undersound* serves to explore the potential of the inspirations for design presented in Chapter 6. In this chapter, then, I will begin by presenting a scenario of the use of *undersound* in order to immerse the reader in the experiential nature of the design and to set the stage for a more in-depth discussion. I choose to begin with the scenario because, as I have stated, the presentation of designs within this dissertation is intended to serve as a means by which I can examine the experience-oriented and interactional potential of interfaces created through these new guidelines. Following the presentation of the scenario, I will then present a more detailed overview of the design, to ground its experiential nature within a more technical realm. In the context this

experiential and technical foundation, I conclude this chapter with a discussion of the ways in which the design draws specifically from, articulates, and serves as a tool of exploration for, the inspirations presented in Chapter 6.

7.1: An *undersound* Scenario

In this section I will present a possible scenario of use for *undersound*. The purpose of this narrative is to describe the experiences which a group of users might simultaneously have with the system. In order to provide a context for this scenario, I will first give a brief description of the system, the same type of description which a user would encounter.

undersound is a music application comprised of three parts. A mobile phone client allows emerging musicians and audiophiles alike to wirelessly upload their tracks at upload points inside the ticket halls of Underground stations. This same phone application allows users to download tracks from download points on the train platforms as well as from other users in proximity. Finally, metadata gathered during each music exchange is collected by the access points throughout the undersound network and used to drive the large visualizations positioned in the ticket halls which reflect the movement of the music through the network.

With this overview in mind, let us turn to the scenario: *Matt is a filmmaker in his mid-20's who uses the Tube every weekday to get to work. Tonight, he is traveling from SoHo to Angel to meet friends for drinks. To get there he plans to take the Victoria Line to Euston where he will change to the Northern Line toward Angel. On his way, he wants to try out the new application he has installed on his mobile phone, undersound. In the ticket hall of Oxford Circus station he notices three attractive girls carrying instrument*

cases who are gathered around the undersound upload point. Ellen, Carolina and Alice, 17 year-old students in a band called Zot, are using undersound to get some free publicity. At the station's entrance, Ellen browses their music on her phone. As they know each track can only be uploaded to undersound once, she chooses their best song for this station, one of the busiest in the Underground. Alice suggests that they add the date of their next gig as a note to the track. Heading down to the platform Matt wonders what kind of music the girls make. While waiting for the train a message pops up on his phone, asking if he wants to download the latest track from the station. Assuming the song was probably uploaded by those girls, he accepts the download. Once in the carriage, he starts listening to the song but it turns out to be a bit too punky for him. He then checks other features of the application, and discovers that he can browse the playlists of people in proximity and download their undersound songs. "It's good I have something to play with," Matt thinks, "otherwise I would get bored on my way to Angel because I forgot my book." He checks people's profiles and their songs, and notices one person has a different kind of icon by their name. He checks him out and realizes they have the same track.

While Matt's thoughts are wandering, Stephanie, a woman in her early 50s, gets on the train. She is tired from work and is looking at other people wondering who they are and where they are going. When she sees Matt she thinks, "that's the kind of guy that would be perfect for my daughter." She notices he's listening to music with his phone, and opens undersound, which her daughter recently installed on her RAZR. She looks through the other users' profiles to see if she can guess which one Matt is. As she is browsing, she suddenly realizes one of the icons that she has not had a chance to look at yet has disappeared; Stephanie looks up around the carriage and is disappointed to see that Matt is gone. In the meantime, Matt had become so engrossed in undersound that he missed his stop at Euston and only realized at Finsbury Park. Matt feels a bit strange because he used to come to this stop all the time to see his ex-girlfriend, but he

realizes he has not returned since their break up last year. When suddenly he sees a message on his mobile phone, alerting him that someone is downloading the song from Zot, he is reminded how his ex always hated punk music. As the train is approaching, he looks around and makes sure that the download is completed; he feels like part of the undersound community already.

Steve, who just downloaded the song from Matt is on his way home from work. Although already late for dinner, he cannot resist the temptation to check if anyone has new undersound songs because he is really interested in being one of the top collectors and distributors. Upstairs he checks the undersound public display to get an update on the music traffic and recent hotspots of activity around the Tube. While he is checking the display, he notices a new message on his phone from an undersound buddy: "Hey are you in the station too?" It is Clive, the friend he was supposed to meet for dinner. He happened to see Steve by chance on undersound while he was exiting the station. It turns out they were both late.

This scenario serves to introduce the reader to the potential of an application like *undersound*. In keeping with the design principles presented in Chapter 6, the service has been designed to both reflect and augment the variety of experiences Tube riders engage in every day. Through this envisagement we begin to see that a single application can be crafted with the intention to afford a variety of interactions for a diverse body of users and with the goal that this heterogeneity can act as a stepping-stone, rather than an impediment, to communal experience. However, before discussing the underpinnings of the interactional possibilities which this scenario exemplifies, I would like first to discuss the technical foundation which would support such experiences. In the next section, then, I will describe the design of *undersound* in detail, giving special consideration to the ways in which the technical foundation has been

specified in order to be not only feasible in the loosest sense, but actually possible without necessitating future technological advances.

7.2: The Design of *undersound*

In this section I will discuss the process of the interaction design of *undersound* which took place over the course of a year beginning in March of 2006. Before detailing the interaction design itself, though, I would like to give a brief overview of the history and context in which the work was carried out. Most importantly, I would like to note that the design of *undersound* is a product of my collaboration with two colleagues, Arianna Bassoli, from the London School of Economics, and Karen Martin, from the University College London. We three served as co-designers of the application, and while we have each used the design as an entry point into deeper explorations aligned with our own research interests, the overall specification of the system belongs to no one person. However, as I mentioned, the importance of *undersound* for my dissertation is the lens which it provides, through which I can evaluate and explicate the applicability of the design guidelines presented in Chapter 6. Accordingly, my contribution with this chapter will be not solely the design of a novel system, but, more importantly, the analysis which follows.

Finally, it is important to note that *undersound* was implemented in various prototypical stages during the course of the EU funded project BIONETS[2]. However, it has not yet

[2] The aim of the BIONETS (www.bionets.org) project was to develop a next-generation localized peer-to-peer communication network inspired by biological principles. One of the key components of *undersound*, as highlighted by the scenario in the previous section, is the peer-to-peer sharing of mutesic files, and, consequently, our design proved, for the BIONETS researchers, to be an interesting application capable of running on top of the platform which they were in the process of creating. Because *undersound* became a part of the larger BIONETS project it was used to act as a showcase for the lower-level technical aspects of the BIONETS network. This implied that it needed to run on a specific networking architecture and be developed as a modular service. However,

been deployed. The specifications for implementation exist but real-world collaboration hurdles, as well as complexity of negotiating with Transport for London made not only implementation, but deployment, challenging. Thus the discussion of design which follows turns on interactional specifications rather than code-based instantiations.

With all this in mind, then, I will turn to a discussion of the interaction design of *undersound*. As highlighted by the scenario, *undersound* is comprised of three distinct, but deeply interrelated, technological pieces; permanent Bluetooth transfer points located in each Underground station for uploading and downloading music in the *undersound* network, Bluetooth-enabled mobile phones used for storage, playback and exchange of music, and situated visualizations providing a station-specific overview of activity within the *undersound* network located at each station. These three technological components also correspond to the three central design concerns which were developed to represent the core experiences embodied by *undersound*: *a situated understanding of the space*, *localized interpersonal interactions*, and *emergent large-scale flows.* As designers we worked within these three aspects of our design, using them, rather than primarily technological concerns, to shape the development of the application. Accordingly, I will present a description of *undersound* in terms of these three categories, which acted as the foundation for a series of design choices that define how undersound works on a practical level, in order to reflect the ways in which we, as designers, approached the conception of this novel application. Before delving into the

---

as designers, we chose to describe the specifications of *undersound* independently of this specific underlying technology. Though considerable work was also done to bring the design of *undersound* more closely in line with the technical requirements of the BIONETS project, this chapter will leave these details aside because the specific implementation challenges posed by the BIONETS network are not relevant to the design of the application in itself—especially given that the BIONETS project as a whole attempts to address research challenges of its own. Further, this chapter focuses on the design of *undersound* as a system intended to run on currently existing technologies, inclusive of networking protocols, reflecting the main work of the design process rather than focusing on the, somewhat, extraneous effort required for integration with BIONETS.

depths of this description, however, it is worthwhile to give the reader a brief overview of the main design features of *undersound*.

The primary components of *undersound* are a mobile phone application and a series of transfer points located within Underground stations. Through the mobile phone client musicians can upload music to these transfer points and users can download, and listen, to the tracks. Through the mobile phone application, users can also interact with other passengers running the software on their phones. *undersound* allows users to see what music other passengers have, view the profiles of other users, add other users to their list of buddies, download music from one another, and send messages to each other. Finally, in addition to the transfer points, in every station there is also one large-scale display which provides a visual overview of the movement of the music through the *undersound* network, with an emphasis on which Tube line's tracks are the most popular. This display is driven by metadata collected when users interact with the music in the system. Beyond being informative, because these displays represent the collective participation of the riders from different lines, we opened the possibility for a sort of competition, a long-term massive multiplayer game, to emerge. With this high level description providing a broad picture, let us now turn to a more detailed discussion of the ways in which the three central design concerns of *undersound* gave rise to these, and other, features which define the system as a whole.

7.2.1: Situated Understanding of the Space

The first step of joining the *undersound* community involves downloading and installing the application onto a Bluetooth-enabled mobile phone. Though *undersound* can be obtained from the internet, the primary means of acquisition is an in-place download in one of the Underground's many stations. Because the application was envisioned to support and reflect the self-contained network of the London Underground, it is

important that users be able to enter into the *undersound* network in the very same place.

The application relies on user-generated content, and, consequently, in order for *undersound* to grow, users must upload music into the system. To populate the *undersound* network with new music users "check-in" tracks (in MP3 format) by uploading them from their Bluetooth-enabled mobile phones to any station's designated transfer point. These ticket-hall transfer points are dedicated Bluetooth-enabled servers which reside within each station to store the tracks and to communicate user activity, via Internet, with the central *undersound* server. A track may only be checked-in to the *undersound* network once, and the station transfer point where the track is first checked-in will be considered its "place of birth," that is, its point of origin. Further, given current issues surrounding music copyright, *undersound* allows for only Creative Commons [web: Creative Commons] licensed music to be added to the network. As the scenario in the previous section implied, the content-providers of the *undersound* network were envisioned to be emerging musicians, holding the licenses for, and eager to distribute, their music.

In order to check-in audio files, the user providing the content, then, must personally go to the station where they would like their file to reside. Checking-in can be done only within the main station hall, where tickets are sold; thus the user must be physically present in the common, central area of the station, through which all passengers entering or exiting must pass. If a user is uploading content for the first time, they are required to accept a terms and conditions agreement in which they agree to upload only tracks which they are licensed to distribute, and to register as a content-provider within the network. This registration requires users to be accountable for the content which they upload; because *undersound* is a community of users sharing with one another,

uploaders are made aware that they bear the responsibility for their personal actions within the system.

After a musician has checked-in their track to a station it becomes, correspondingly, immediately available for download, or "check-out," at the station. Because of the limited range of Bluetooth, transfer points for checking-out tracks are also placed on station platforms so that users may download tracks both within the main ticket hall as well as the areas of the station where they spend time waiting for trains to arrive. When a user running *undersound* on their mobile phone enters Bluetooth range of a transfer point, a message pops up on their phone asking the user if they would like to download either or both of the station's most recent track or/and most popular track. The user is then prompted with the options to check-out these tracks, to browse all of the tracks available at the station, to check-in a new track, or to do none of the above, thus closing the pop up message. This alert is meant to be as unobtrusive as possible, while still generating continued interest and interaction with the system, and disappears from the phone's display once the user has exited the Bluetooth range of the transfer point. If the user does choose to check-out a track, once the transfer is complete it will be immediately available for playback on the user's phone, allowing the user to listen to the music while still in the station where it was "born," that is, from which it originates.

Finally, each time the transfer of music occurs within the *undersound* network, metadata about this transfer is locally recorded on to the phone of the user receiving the track. This metadata captures a variety of information which will be discussed in the following sections. However, it is important to note here that when a user checks-in or checks-out a track from station access point, this metadata stored on the user's phone will also be uploaded, with no explicit effort on the part of the user, to the transfer point, thus adding a small overhead to these transfers.

7.2.2: Localized Interpersonal Interactions

Though *undersound* allows for checking-out tracks within the stations themselves, there is more to both the Underground and the *undersound* network than a discreet series of transfer points. Much of a passenger's time in the Tube is spent riding through the tunnels which wind below the city. Accordingly, much of the interaction with and through *undersound* occurs in the Underground trains themselves. Whether a user is traveling on a train, waiting on the platform, or queuing in the ticket hall, they can choose the option to "check-out" their neighbors from the main menu of the application. When users search for neighbors in Bluetooth range running the *undersound* application they are presented with a list of user names and icons of other people nearby. Checking-out a particular user, one can see more information about that user including: the user's profile, if they are already a "buddy" (a user they have befriended within the system), the number of times they have previously encountered that user (indicating if the user is a "Familiar Stranger" [Paulos & Goodman, 2004]), the number of *undersound* tracks they have in common, an option to explore the tracks that user has, a further choice to add or remove this user as a buddy, and, finally, the ability to send the user a message through *undersound*.

Users may check-out one another anonymously, the same way a passenger might glance around the carriage to get a sense of their fellow riders. As mentioned in the previous section, the metadata which is gathered by *undersound* also includes information about the number of times a track has been played, its place of birth, and comments attached to the track. All of this information is displayed when a user chooses to explore the tracks of another passenger, and when a user's interest is piqued they are able to go deeper and download the track from their fellow passenger, add them as a buddy, or send them a direct message. These explicit actions constitute a more direct form of interaction, and consequently, they cannot be done anonymously. When a user decides to check-out a song from another passenger, a message pops up on that passenger's

phone, informing them that someone is downloading one of their tracks. Likewise, adding a user as a buddy will prompt a notification on the other passenger's phone, and clearly sending another user a message will be non-anonymous. In this way, *undersound* allows for a tiered form of interaction. One can casually discover more about fellow users, but at a certain point, to interact more actively, a user cannot remain unnoticed, as it were. Within *undersound*, then, a user cannot download a track from another passenger without letting that passenger know, just as one cannot pick up a newspaper lying on a seat without the ability for other passengers to notice this action. There is, then, a social visibility to downloading tracks, befriending, and messaging other users, yet these actions are not broadcast to *all* users within range, maintaining a level of intimacy between users who interact with one another. It is, of course, possible to ignore the pop up messages generated by these active interactions. One might even choose to move out of Bluetooth range while another user is downloading a track, thus interrupting the transfer, breaking off the exchange. But it is possible that a user might instead choose to linger, to pass on that digital object.

In keeping, then, with flexibility and range of interaction which passengers engage in with one another, *undersound* presents users with the same sort of choices they make everyday while riding the Underground. On a given day I might not be interested who is downloading tracks from me, but on the next I might become curious, and reciprocally glance through the tracks of the user checking-out my music. I could go even further, looking around the carriage to see if I could guess who the downloader is. *undersound*, then, does not prescribe specific forms of social exchange, but rather relies on users to negotiate these interactions, within and, as the already do, outside of, the system.

7.2.3: Emergent Large-Scale Flows

Each of these local, interpersonal and situated interactions contributes to a broader trend—every time a user listens to a track, checks one in at transfer point or downloads music from another user, they have an effect on the overall state of the system. These effects, however, go beyond just the recommendations for the most popular tracks at a given station, the comments a user sees from browsing another's tracks, etc. The sum of each user's personal actions are aggregated and displayed on large public displays installed near the check-in transfer points within the ticket halls of the stations. These displays serve to convey the most recent state of the *undersound* network; rather than presenting the movements and activities of *undersound* users, the public displays reveal the journeys and lifetimes of the tracks. Focusing on the travels of the digital content that fuels the system, *undersound* offers a new perspective, allowing users to consider the way in which their actions alter the spread of music beneath the city. Each station's display uniquely reflects information pertinent to that station, presenting users with a quick visual overview of what the station has to offer. In this way the public displays give the users an impetus to check-out new music while they wait within the station, and serve as reflection of the totality of individual choices, allowing users to see that they all have a direct influence on the system. Because a user can see that their personal choices have a global effect, they might even choose to change their behavior given that knowledge.

These displays are driven by the metadata mentioned in the previous sections. As I stated earlier, the design of *undersound* was a collaborative effort, yet each of the designers also spearheaded various parts of the project. My role included focusing on the part that the metadata played within the system, and consequently I will provide, in this section, a detailed discussion of this aspect of the design. There are five actions which trigger the logging of metadata: checking-in a track to a station transfer point, checking-out a track from a station transfer point, checking-out a track from another

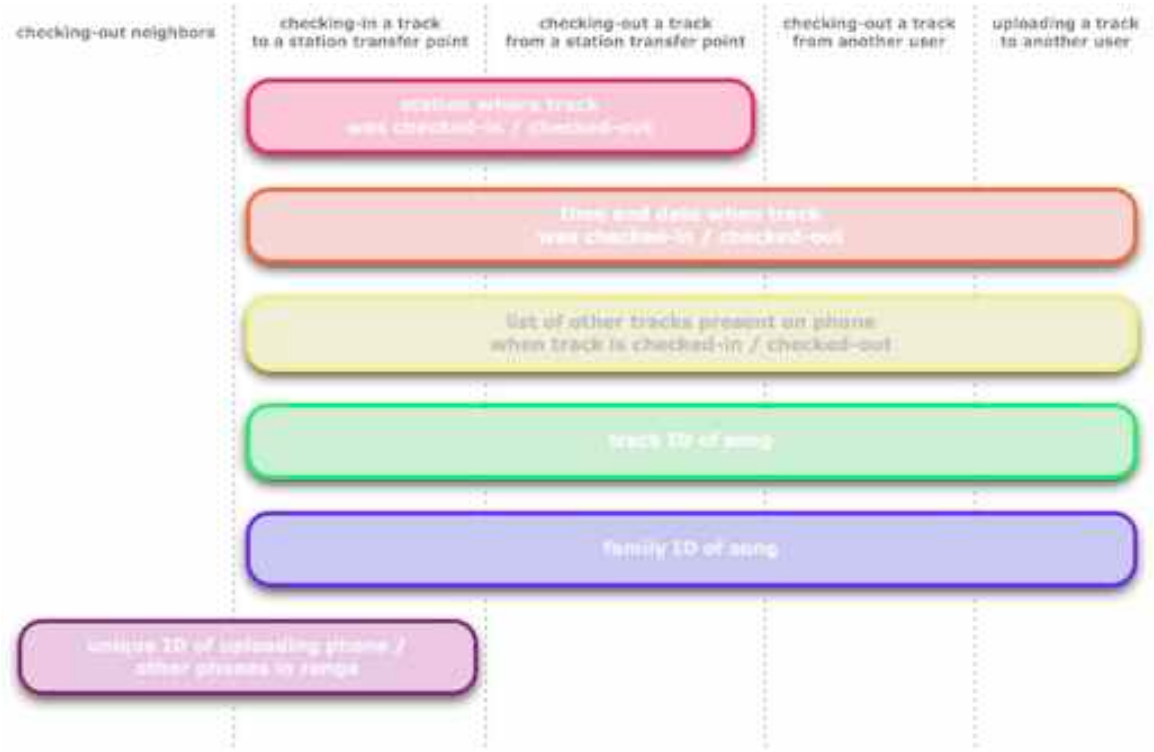

Figure 7.1: Types of *undersound* metadata

user, uploading a track to another user (that is, allowing for the transfer of a track to another user to complete), and checking-out neighbors (that is, searching for other users in Bluetooth range). Different actions trigger the collection of different types of metadata (see Fig. 7.1). There are six different types of metadata which include: the station where a track was checked-in or checked-out, the time and date when the track was checked-in or checked-out, the list of track IDs of other tracks present on the users phone when a track is checked-in or checked-out, the track ID of the song, the generational ID of the song, and the unique ID of the phone uploading the track or a list of unique IDs of other phones in range. All of these types are self-explanatory with the exception of the generational ID, which will be discussed in further detail later on within this section.

In order to address each of the types of metadata, I will focus on the variety of interactions which the metadata is used to support. Rather than taking a data-centric approach to the design, looking at what information *undersound* is able to gather and then exploring the ways in which this information might be relevant to the users, I chose to use an experientially-oriented approach, focusing on what types of interactions I wanted to support with the system, and then exploring the types of metadata that would be meaningful for those sorts of interactions. Put differently, within the design of *undersound* I intended the metadata that was collected to be used as a channel through which a dialogue about the system may occur, rather than the more typical one-way model in which users are passively sensed and have no control over how that data is interpreted. Consequently, the remainder of this section will unfold as an explication of the ways in which the metadata was used as the foundation for three potential interactions with and through the *undersound* system: fostering *reflection on personal actions*, opening the opportunity for *collective participation*, and *improving the system* itself.

7.2.3.1: Reflection on Personal Actions

In order to allow users to engage in a dialogue with the system we must first make transparent to them the results of their actions. The first step towards this is simple but critical—*undersound* only collects information when the application is running on the user's mobile phone. Clearly this decision is motivated in part by practical concerns as it simplifies some potential programming issues with the mobile phone. Moreover, though, the use of *undersound* is intended to mirror the ways in which people move through the Underground. I know that if I remove a book from my bag and open it in a public space anyone can see what I'm reading, likewise, if I activate *undersound* on my phone, then other users in Bluetooth range can see my tracks. This philosophy extends to the collection of metadata. Metadata is only collected when the user is engaged in

some interaction, be it checking-in a track, checking-out a track, listening to a track or searching for other users. For the user to gain something (e.g., a new track) there is a social cost (i.e., the gathering of metadata). However, in order to allow the user to possess some power over their data, beyond only allowing information to be gathered when the user engages in some action, it is crucial to make clear to the user what that data is. This is done in two ways: users are able to view the playback statistics, comments, and generational information about the tracks on their phones and users repeatedly encounter the large public displays within the stations. All of the metadata generated by the user can be seen by examining the tracks on their phone or by viewing their statistics, and all of it drives the visualizations that are physically present in the Underground. Because of this, the metadata being collected is carefully selected in order that it might be meaningful for the users; rather than collecting all the information possible, the goal is to allow the users to produce and reflect upon the information which matters to them.

The metadata, then, was intended to allow the users to reflect on their interaction with *undersound* in ways that go beyond purely listening to music, though that is an important goal of our project. The first type of metadata gathered - the station where a track was checked-in or checked-out – serves to highlight the birthplace of a particular track. This allows users to see which stations they have gathered the most tracks from. Over time this can highlight to users which stations have repositories of music that best correspond to their taste, perhaps spurring them to search for tracks from a certain place or even to visit those stations more frequently. Further, tying the tracks to specific stations opens up the possibility for reflection on the places where the users have been. As we saw in Chapter 6, and as Augé discusses in his work [2002], Underground stations often are closely tied to the mnemonic narratives generated by the passengers as they travel below the city (for more on this see [Bassoli et al., 2007]). By reminding users of the birthplace of a particular track, memories tied to that station are also

invoked. Finally, this type of metadata also facilitates a form of "collection." There is a Guinness World Record competition for visiting all of the London Underground stations in the fastest possible time which is informally known as the "Tube Challenge" [web: Tube Challenge]. This concept then, was reinterpreted by *undersound*, allowing users the possibility to meet the challenge of collecting tracks born in each and every station.

7.2.3.2: Collective Participation

In addition to allowing users to reflect on their personal actions in isolation *undersound* also provides a means for the users to understand how their choices contribute to the system as a whole. This is achieved mainly through the public displays. However, because the visualizations are driven by the metadata generated by each user's personal actions they were intended to serve as an observable correlation between personal actions and collective trends for the users. Rather than acting as a generalized or detached overview, the large-scale public displays act as the locus through which users can observe and actively engage with collective behavior—a communal artifact that, through their daily actions, they can affect.

Turning to the composition of these large displays, the visualizations they present were intended to be rendered with a 2D graphics engine, making them suitable for display on either a large LCD/plasma screen, or by means of a projector. The visualizations differ slightly from station to station creating a unique and localized perspective at every point in the *undersound* network. However, the displays are not entirely disjointed. The visualization is composed of two graphical "layers," one overlaid on top of the other. The "background" layer is the same on every display—giving a common representation of the state of the *undersound* network. The "foreground" layer, however, is specific to each station—summarizing the activity of the *undersound* network that is relevant to

that particular place. Thus, the displays create a common thread which ties all of the stations together while simultaneously allowing their individual characters to emerge.

This foreground layer relies on motion for its key element of visual presentation and focuses on representing the flow of tracks emanating from the station, placing that station firmly at the locus of this aspect of the visualization. If a user frequents a specific station, for instance, the one nearest to his house, he will perhaps hope that the tracks from his home station spread further into the network, gaining popularity. One can imagine this layer acting like a spring, showing the tracks flowing forth. Each of the three currently most popular tracks are represented by individual shapes: the number one track as a star, number two as a square, and number three as a triangle (the decreasing vertices being used to represent the hierarchical nature of the ranking). The remaining tracks are undifferentiated, to avoid visual clutter, and are represented as smaller circles.

This background layer, on the other hand, is a motionless, but regularly updated, representation of the overall state of the *undersound* network. In order to facilitate a different sort of engagement through the large displays, this layer is designed to function, in part, like a massive multiplayer game. Early on in the design process we discussed the possibility of attempting to depict the spread and influence of all of the tracks within the network, but we quickly realized that such a visualization could easily be interpreted as sort of territorial map. From the Aesthetic Journeys study presented in the preceding chapters, I found that people often had close affinities with their home stations and lines, and so we decided that the visualization, and indeed the overall interactions with the system, could make use of that relationship and explore the idea of gaining territory through the collective spread of music. In order, then, to facilitate this type of interaction – which also takes a cue from the practice of the Tube Challenge mentioned above, but in this case with a focus on collective participation rather than

individual action – the *undersound* application provides the opportunity to participate in a sort of slow-moving massive multiplayer game. Participation is not compulsory, or, more precisely, not every user must think that he is playing a game, but the opportunity to treat the system as such exists for those users who might be inclined to do so. In the Aesthetic Journeys study we saw often that users took pleasure out of gaming the system, that is, the Underground, though its primary function is intended for transportation and not play. It is this recognition that large-scale public systems have a potential to give rise to playfulness that we chose to embrace rather than ignore. However, that is not to say that *undersound* is designed as a game, rather, it was crafted with a respect for the propensity that Tube travelers have towards finding a bit of fun while moving through the city.

The potential for "playing" *undersound* is rooted in a simple user profile setting. When a user first joins the *undersound* network, they are asked to choose a particular line of the Underground to be affiliated with. We envisioned that user would likely select the line on which they live, but they are free to choose any line they like as we often encountered riders who had affinities towards branches based upon their individual aesthetic characteristics or as sites of particularly significant events in a riders life. When a user selects a line, then, they effectively become a player for that line. The visualization of the background layer then acts as a depiction of the dominance of the tracks and players from each line over the others. In this way large-scale teams are formed and each individual's actions will be aggregated together and compared to one another. This provides a particular perspective of the overall state of the system. Rather than being a completely generic aggregate, it harnesses the personal relationships which users have with the various Tube lines, and acts as a channel through which the users can relate to, and perhaps strive to influence, the large displays. The reach and spread of the tracks born in each line through the system is an ongoing process, and consequently a game based around the movement of the music is not intended to have a particular end.

Rather, it is unending, and ever changing, shift of balance, the presentation of which, we hope, allows people to engage with the *undersound* network on yet another level, one of collective coordination.

To present this information, the background layer is laid out in a way similar to the Underground map, but rather than using the lines as the dominant visual feature, it is the white space between the lines that becomes prominent. The branches of the Tube are then used to define boundaries, and the areas between are treated like territories to be gained. When the players for a particular line collectively succeed in being the most active players in a given area, that area becomes filled with the color of the line which they are playing for. Thus, a quick glance at the display lets one see what color visually dominates the background layer, and consequently what line is currently the most influential within the *undersound* network.

For the large-scale public displays the metadata we gather is meant to support these two layers of the visualization. The foreground layer explores the popularity of tracks. This popularity, however, is not calculated based on reviews, but instead we look to the spread, the distribution, of these tracks. The metadata described previously allows us to think of popularity not just in terms of how many people have a track; the information we gather allows for a more nuanced perspective. First, when gathering the time and date when the track was checked-in or checked-out we are able to gauge activity based around that track, and even if there are thousands of copies of a track in the network, if no one has checked-out that track for months we can use this information to temporally bound popularity, asserting that if a track is not being checked-out by new users it is no longer as popular. Second, by recording the list of track IDs of other tracks present on the user's phone when a track is checked-in or checked-out we can see the physical spread of particular tracks. This information allows us to see how far a track has traveled from its birthplace, and we can say that for a track to travel from one side of

the Underground network to the other, it must be quite popular as it has moved far away from its local neighborhood. Third, we use what we call the generational ID of the song to see how many times a track has been transferred between users. Every time a user checks-out a track from another user, we assign a new generational ID to that track. This ID is essentially used to construct the family tree of a given track, in the sense that we consider each digital object, each track, to give rise to the next generation of that track when it is transferred between users. In other words, if a user downloads a track directly from the station it will be of the first generation of tracks, but if another user checks that track out from him, this will create a new branch of that track's family tree, and this second user will have a second generation track. We can say then, that a track is very popular both if it has spawned many new generations, as it is transferred many times between users, or if a high proportion of users have a first generation version of the track, meaning that they went directly, and possibly out of their way, to the birthplace of that track to get a copy.

The background layer, on the other hand, is rooted in the aggregate activeness of the users of each line. This activeness is broken down into two categories. First we look at the individual users and calculate their personal level of activity in the network by using the metadata to see: the number of users that checked-out tracks from them, the number of users they have checked-out tracks from, the number of users that have checked-out a track which they created and checked-in to the system, the total number of tracks in their collection, the total number of first generation tracks in their collection, the percentage of stations from which they have collected tracks, and, finally, the percentage of stations from which they have checked-out first generation tracks. The individual achievements of all of the users associated with a line are then combined to form one component of a line's overall score. This information, however, is not associated with any particular areas of territory yet. In order to conquer a section of the Tube map, represented by the background layer, the team must capture a set of given

stations which enclose that area by being the most active team at that station. So, for instance, a team which captures four nearby stations, which on the Tube map define a square of empty space, gains that area of territory, and that space is filled in with the color of their line. In order to determine which team is most active at a given station we then compute the second component of activeness. Again, using the metadata we can see for each station: which team has the highest number of mobile phones appearing at that station within a set period of time, and which team has had the highest number of tracks, of the youngest generations, originating from their line appearing at that station. In this way, we calculate how active both the individual members of a particular team are, as well as how their collective movements help to influence the spread of music throughout the *undersound* network.

Taking a step back, it is important to note once again that the large-scale displays act as both a site of action and a point of reflection. They serve to allow users to see the manifestation of their engagement with the system, and bring into scope the ways in which their personal actions contribute to an emergent, collective behavior. Further, though the displays allow for the opportunity for users to go out of their way to attempt to boost the success of their team, it is not necessary for other users to even conceive of *undersound* as being "game-able" in any way. The essential point, here, being that one might be spurred on by the displays to use *undersound* as more than just a music-sharing application, but that potential is part of, rather than extraneous to, the design of the system as a whole.

7.2.3.3: Improving the System

Finally, the metadata which is gathered by *undersound* also allows us to improve the system itself. As I mentioned above, it was important for us as designers to provide a clear way for users to understand the sort of data that they were generating and feeding

back into the system. Consequently, we do not gather extra data beyond that which was mentioned above. However, as this data is what we felt would contribute to a meaningful design for our users, so too do we think that this data is the most meaningful, and beneficial, for understanding concerns about the system as a whole which are important to ourselves as designers. The metadata we gather provides a detailed picture of the flow of data throughout the network, and allows the designers, when viewing the data over time, to, for instance, see points in the system that are overworked, or under utilized, in order to better allocate resources to those places. What is important, again, is that this data is already meaningful to the users and so we have the opportunity to more directly reflect on the ramifications that potential changes to the system might have.

7.3: The Reflection of the Inspirations for Design within *undersound*

Now that I have presented an overview of both the ways in which *undersound* might be used, as well as detailed description of the design of the system itself, I can use this foundation as a basis upon which to discuss the ways in which *undersound* draws specifically from, articulates, and serves as a tool of exploration for, the design inspirations presented in Chapter 6. This section then will bring this dissertation further along towards the goal of answering my final research question: *What principles can we create for a reformulated ubiquitous computing view of mobility and technology?* Here, then, I will explore the actionable nature of these principles by highlighting the ways in which they served to guide and influence the design of *undersound*.

The principle of *Designing for Engagement* acted as a great inspiration for *undersound*. It was a key goal of the designers to craft an interface that would keep the riders of the Underground occupied. However, as an application it does not have a single mode of

use, that is, one, and only one, way of interacting with it. We wanted for our users to be able to experience a single system in a multitude of ways, to occupy themselves through listening to music, getting to know their fellow passengers, going out of their way to discover new artists, sending messages to their friends, reflecting on their past journeys while they create new ones, and so on. While *Designing for Engagement* suggested the importance of providing an interface for Tube riders that would allow them to keep themselves occupied, we pushed ahead with this principle in the design of *undersound* striving to create a system which could be engaging for a variety of passengers through the use of a *single* application. This unification *through* the interface to deepen the social aspects of the system is evidence of *undersound's* reach beyond a single principle of design, to try to integrate the variety of inspirations proposed in Chapter 6. Finally, this diversity of engagement applies not only between all users, but also within the scope of a single passenger himself. Here the key lies in the flexibility of *undersound*, which allows for deep interaction, or only lightweight use. The push, in this case, is not to design an interface that requires it *always* be deeply immersive, but that it *can* be.

In a similar fashion, our approach towards *Designing for the Buzz* sought to craft an interface which can support both social detachment and full-on engagement for the variety of passengers who might use it. Looking back at the three passengers mentioned during the presentation of this principle in Chapter 6, *undersound* represents an interface that someone like Carey could use—being able to go out of his way to seek out a song uploaded by a co-passenger, or spending time to allow another rider to check-out a track from him. Yet, it also allows Andrea to look through the tracks and profiles of other passengers to get to know the people in the carriage with her a bit better, and to fuel her imagination. Or, finally, it respects that Sadie does not have a desire to interact with the other passengers at all, but prefers to see her use of the system as being focused on the music itself. More importantly, however, our design process sought to create application that also supports, and indeed relies on, the middle

ground, the flexibility. Again, this is captured by Oscar who spoke about the buzz and the way in which the gray area between social engagement and detachment is a place where he can recharge. *undersound* relies on the power of this buzz by allowing, even encouraging, users to thrive in this often overlooked area of social engagement. Just knowing that there are other users out there, all around, that there is a current which you can tap into or ride along in, provided an incredible benefit for Oscar and *undersound* tries to reflect the importance of that state of daily city travel

Designing for the Flow, on the other hand, led us to think about the multitude of journeys and how they intersect, overlap, and form a whole. For *undersound* the large displays are the embodiment of this principle, and at the same time they also rethink this principle in a way. Rather than conceiving of journeys as physical routes people have taken, we can also look at the ways in which the digital objects accompany the journeys of the passengers and indeed conduct journeys of their own. Here, then, the multitude of journeys which come together is not directly that of the riders, but rather the displays of *undersound* further explore the complex relationship between flows of not only people, but also digital objects. The importance here is that the design of *undersound* not only acknowledges these larger flows, but rather tries to make them visible to the users and in doing so directly addresses the way in which technology can, and does, reconfigure these flows.

To a lesser extent, *undersound* has also drawn from the remaining two principles. With respect to *Designing for the Expert Journey*, while creating *undersound* we considered how advanced users might benefit from the system. One might imagine that, with *undersound*, users could begin to engage in a new type of expert journey, one which spurs passengers to alter their travels to gather music from different stations or riders. Users might begin to craft routes with respect to this new layer of complexity, of content, that runs through the Underground tunnels. Finally, we also considered how we

might incorporate the principle of *Designing Ecologies* into *undersound*. Because we recognize that users already carry a multitude of technologies with them on the Underground, rather than building a new, stand-alone device, we thought it wise to exploit the mobile phone. Instead of competing with a device passengers already use to keep themselves engaged, we wanted to position *undersound* within the already existing ecology of applications on the phone itself, and to utilize that device's integration within the larger ecology of artifacts that riders carry with themselves. Further, by creating large displays in the stations we also add to the wide ecology of devices and media which users encounter in the Tube, extending, rather than constraining, the reach of *undersound*. Lastly, because *undersound* was designed to support varying levels of social interactions while spanning across this range of devices (from the public displays to the variety of phones users might carry) we aimed to embrace the meaningful interactions that span across multiple people and device and to position our interface as an aid, rather than a barrier, to those relationships.

If we look back to the beginning of this chapter and revisit my final research question – *What principles can we create for a reformulated ubiquitous computing view of mobility and technology?* – we can see that this section helps demonstrate the ways in which these principles can be used in an actionable way. *undersound* stands as an example of the product of these principles, providing insight into how we might go about creating new designs which also serve to reinforce, and rely on, the expansion of the relationship between mobility and technology. Looking more broadly, though, while Chapter 6 presented the series of inspirations for design as a set of principles which ubiquitous computing might benefit from, this section serves to point out that these inspirations are not entirely distinct from each other. While a designer might choose to focus on addressing the concerns highlighted by one, or a subset, of the principles, ultimately the focus of one blends into the others. This has become clear in our discussion of the ways in which *undersound* found inspiration in these principles.

While explicating the ways in which our decisions were shaped by the inspirations for design, allows us see that *undersound* design process represents a viable and alternative approach towards mobility and technology, it is important to note that the way in which we used the principles is not the *only* way in which they might have been worked in harmony. In other words, *undersound*, as a design, is not the *only* possible product of such an alternative approach. We will see this in the coming chapter which addresses the challenges of the inspirations for design in a very different way. What I highlight here, then, is engaging with these principles through the design of *undersound* made clear to me that they ought to be used *concert* with one another, rather than as isolated concerns, to create a stronger and more balanced design. To explore this further, in the next chapter, I will present another, very different, design which also draws from the Aesthetic Journeys work. In this way I aim to begin to describe this alternative for ubiquitous computing as a space of possibility rather than a singular endeavor. This, then, raises the issue of process, as our discussion moves away from merely the products of design, and towards the way in which those products were created. However, I will postpone a reflection on the ways in which both the design processes presented in this chapter, and in the next, when considered together, begin to represent the overall position of this dissertation until the final chapter.

8: SeeShell

The research presented in Chapter 7 demonstrated one way in which the design principles introduced in Chapter 6 could be applied to produce a novel design for ubiquitous computing. This chapter will further answer my final research question: *What principles can we create for a reformulated ubiquitous computing view of mobility and technology?* Recall, though, that the culmination of this dissertation does not rest on a singular design product. Rather, this work strives to identify a novel approach towards the concept of mobility for ubiquitous computing and to explore the potential of an emerging design space defined by a repositioning of technology within the urban landscape. Put differently, the goal of this dissertation is to investigate how rethinking the ways in which we as researchers conceive of the relationship between mobility and technology can lead to the creation of new designs which then, in turn, can be used not merely as resultant products, but as concrete points of departure to further reflect on this relationship. Instead of moving linearly, then, through the design process, closing this circle requires us to more thoroughly consider the variety of ways in which design principles can translate into design products. Though there might be a variety of means to accomplish this task, for the purposes of this dissertation I have chosen to explore the application of the inspirations for design by crafting a second interface which stands in counterpoint to the first in order to begin to discuss not merely a single new design, but, rather, a new space for design. Consequently, this chapter of the dissertation will present a second design, SeeShell, which draws from principles presented in Chapter 6 in a very different way than the design presented in Chapter 7, *undersound*.

Because SeeShell, as we will see, is a design with different aims, and accordingly, an alternative scope, than *undersound*, the presentation of the design in this chapter will follow a different structure than that of Chapter 7. First, I will present a brief overview of

the design followed by a description of the technical foundation of the design. Next, I will introduce a series of design sketches to aid in the discussion the aesthetic qualities of the interface. With this holistic view of the design in mind, I will then present a group of vignettes which serve to explicate the ways in which SeeShell might be used. This chapter will then conclude with a more detailed reflection on the manner in which the inspirations presented in Chapter 6 served to influence the design of SeeShell.

8.1: The Technical Design of SeeShell

In this section I will begin with short description of the design itself. Following this, I will discuss the real-world system which SeeShell is based upon, and attempts to amplify, in order to provide the reader with a more detailed understanding of both the technical and social context for which SeeShell was created. With this foundation, this section will conclude with an in-depth discussion of the challenges encountered, and responded to, during the technical design and prototype implementation of SeeShell.

Briefly, SeeShell is an augmented holder for an Oyster Card (the RFID-enabled Underground ticket) which displays, over time, the journeys a rider has taken. When a user passes their Oyster card (which is inside the SeeShell) over the touch-in point at the gate to the station they are entering or exiting, the SeeShell, using RFID, senses which station the user has just passed through and over time a permanent, ink-based representation based on the stations they have visited begins to emerge on their Oyster Card holder.

SeeShell, then, is designed as an amplification of an already existing system, the Oyster Card, rather than an entirely new proposal like *undersound*. Accordingly, it is worthwhile here to spend some time describing the underlying system which SeeShell makes use of

and enhances. As mentioned previously, the Oyster Card system is an electronic, RFID-based, ticketing system for the London Underground. According to Transport for London, over 17 millions Oyster Cards have been issued since the system was introduced in 2003, 38 million journeys are made each week using Oyster and over 78% of all journeys on the bus and Tube are paid for using the system [web: TFL Oyster Facts]. Clearly, then, the Oyster Card stands as the primary means by which passengers pay for their travel, not least due to the incentives which Transport for London introduced in order to promote the use of the card. Previously, tickets were issued in a paper form and paid for with cash. While it is still possible to travel in this manner, in order to reduce the overhead of a cash and paper system, the Oyster card offers substantially cheaper fares than those associated with paper tickets. For example, a journey within Zone 1, the central area of London, costs £4 when taken on a paper ticket, versus £1.60 with the Oyster Card. Beyond the reduced fair of single journeys, using the Oyster Card also offers price capping, guaranteeing that a rider will always pay less than the cheapest combination of paper ticket single journeys and day travelcards (unlimited rides over a set time period) on a given day. Finally, when an Oyster Card user purchases a weekly, monthly, or yearly travel card that card must be registered, and in the case that the card is lost or stolen the rider is entitled to apply for a replacement. These discounts, however, require that a user divulge their contact information, associate their account with a valid credit card, and, most significantly, allow a record of their journeys to be kept in order to calculate the cheapest possible fare.

The Oyster Card system, then, tracks and stores the movements of passengers in a database owned by Transport for London. Though a passenger directly generates this data, accessing that information is restricted in a variety of ways. On the most basic level, the Oyster system relies on smartcards (plastic credit card-sized RFID-enabled artifacts) which use NXP/Philips' MIFARE Classic chips. The RFID chips in the Oyster Cards are passive, transmitting data only when they encounter a signal from a reader in

relatively close proximity. Further, the cards work in an asynchronous fashion, storing data about journeys and card balances which is only periodically uploaded to a central database. However, the MIFARE Classic chips rely on a closed system of security and, consequently, the data stored on the Oyster Cards is only intended to be read by the readers within the Transport for London network. In other words, Oyster Card users are not meant to access the data on their cards, and indeed, by means of encryption, are prevented from doing so. Ostensibly this security is in place to prevent both tampering with the cards and the gathering of data by, possibly malicious, third parties. Yet, one major consequence of this choice is the resultant prevention of data-access for the legitimate owners of the Oyster Cards. It is possible to view one's card balance and eight most recent journeys on kiosks in Underground ticket halls, on-board buses by request, and as a print-out from ticket agents. Buses are quite busy and during my ethnographic research, and indeed during my personal time spent in the city, I never once observed a passenger requesting their journey information from the driver. Likewise, queuing to speak with a ticket agent is often quite time consuming which creates a strong barrier for hurried passengers to obtain this information. In any of these cases, however, it is not possible to obtain a complete digital history of the journeys one has taken with their Oyster Card, despite the fact that Transport for London has access to this information. Thus, a divide is opened between those who are producing the data (the riders) and the entity which collects and stores this information (Transport for London). Finally, it is important to mention that it is possible to view the recent journeys one has taken through the Transport for London website, if the Oyster Card has been registered, separately, online and money has been added to that card online. Still, this requirement is prohibitive and restrictive, and serves to make access to historical journey data challenging.

In summary, the Oyster Card system already tracks users' journeys but there is no convenient way for the users to access or make use of that data. While it would be a

worthwhile effort to mount a campaign lobbying Transport for London to allow its riders to more freely access their journey histories, the goal of this dissertation is not so overtly political. Rather, I would like to investigate considerations not merely about data access, but about the ongoing creation of meaning that takes place through the embodied nature of the journeys riders make every day. The design which I present in this chapter, then, acts as a forum for the exploration of a living system which goes beyond the storage of data by a massive entity like Transport for London, and instead focuses on the personal and aesthetic qualities of moving through a city. Highlighting the hurdles involved in accessing journey information is necessary to provide a context for this work, but now I would like to move on towards the essential focus of this chapter by turning towards a discussion of the ways in which we might *make use* of this information through the creation of an engaging design. By building SeeShell, then, on top of this already existing system, I hope to show how lived patterns of mobility might be used in novel and meaningful ways by the very people who are already deeply immersed in the creation of those patterns. In order to explore how I attempted to achieve this goal, I will begin by providing a technical description of the way in which SeeShell functions and is constructed.

As mentioned at the beginning of this section, SeeShell is an augmented Oyster Card holder. As such, it is designed to mimic the basic features of a standard Oyster Card holder, being a credit card sized bi-fold plastic wallet with two internal pockets, one of which is meant to hold the Oyster Card itself. Unlike a standard Oyster Card wallet, the outer shell is a clear, rather than opaque, plastic enclosure. Directly underneath the plastic is a continuous piece of white cloth and sown to the backside, that is, underneath again, this piece of cloth is a series of soft plastic pellets of ink which are each encased in a small coil of resistance wire. When current is applied to this wire it warms to such a temperature that will gently melt the plastic around the ink, releasing that ink into the cloth, and creating a permanent mark visible below the protective

plastic enclosure. The cloth acts as display medium for an enduring representation, in ink, of the journeys a rider has taken. This tangible display occupies the front side of the Oyster Card wallet, while the reserve side is blank, housing the electronic components which drive the display. The SeeShell system is controlled by an Arduino Diecimila [web: Arduino] which processes incoming data about a journey, and then activates the appropriate piece of resistance wire to burst the relevant pellet of ink. This data can enter the Arduino in a variety of ways.

Originally, SeeShell was designed to be an entirely self-contained interface capable of operating in-place as users moved through the London Underground network. My goal was to create a stand-alone artifact which would automatically sense the journeys a rider had taken, and activate the display as the user passed through a station's turnstiles. SeeShell could, potentially, achieve this level of embodied interaction but as I refined the technical design of the device I encountered several challenges which led me to divert from my original course.

First the MIFARE encryption mentioned earlier made both the data written to the cards as well as the RF communication between the reader and the card inaccessible. During the course of my work on SeeShell the MIFARE Classic encryption scheme was broken [ref: MIFARE encryption-break]. I contacted two of the researchers, Karsten Nohl and Henryk Plötz, who were able to crack the encryption prior to the release of their paper in order to obtain more information about how it might be done. They informed me that in order to read the data off an Oyster Card in my possession I would first need to sniff a legitimate communication between a reader within the Transport for London network and subsequently mount a brute-force attack on that transaction. In order to accomplish such a task I would need to bring a separate piece of hardware into the Underground, using it to listen in on a transaction between my card and a reader. It is a breach of the terms of service for the use of the Oyster Card to access the encrypted

data stored on that card, and further sniffing transactions between a card and a Transport for London reader seemed to blur the line of legality or, at the very least, would pose an unacceptable risk given the heightened security within the Underground. Finally, were this strategy for on-the-fly data reading to be implemented it would require that once the encryption for a given card was broken, a separate piece of hardware, acting somewhat like a cloned-card, would also need to be integrated into the design of SeeShell. This second card would serve to sniff each transaction as it happened with the reader, and communicate that information to the Arduino. Such an interface, then, would need to be considerably larger than a standard Oyster Card wallet, but more significantly, it would clearly violate the wishes of Transport for London and subsequently place an undo burden of responsibility on potential users (for more on fines associated with the hacking of Oyster Cards see [web: Oyster Watch]). For all of these reasons, then, I concluded it was not possible, given the current restrictions placed on this real-world system which SeeShell intended to integrate with and expand, to create a design which would function according to my original intent. Yet, that is not to say that these technical design efforts were wasted. This work served to reveal the complexities involved in the creation of new ubiquitous computing technologies designed to blend with complex urban systems we use every day.

From a higher-level perspective, this initial plan for implementation also serves to highlight three significant design goals which stem from, and rely on, the tangible nature of the interface: *variability*, *separability*, and *automation*. First, because the display is analog, rather than purely digital, in nature, it is not entirely standardized or regularized. Its hand-crafted nature coupled with the use of liquid ink renders the display somewhat unpredictable, uncontrollable and imperfect. Using the SeeShell *in situ* would add an additional layer of *variability*; if a passenger swiped his SeeShell over a reader in the Underground, the resulting pressure and motion would create a unique distribution of ink, ensuring that even two riders with the same travel patterns would

have unique displays. This physical design choice is then a deliberate one, chosen to blend with the envisioned means of embodied interaction and to give rise to the potential for further individualization and personalization of the interface. Secondly, because SeeShell was designed as an augmented Oyster Card wallet it retains one simple, yet significant, property of a standard card holder; the Oyster Card can be removed from SeeShell at any time. This fundamental, tangible, property of the design would allow users to both choose when the SeeShell activates (because the device would only work when in close proximity to a reader) and to use an unlimited number of SeeShells over time, either in series or interleaved (as any one interface is not permanently coupled with an Oyster Card in the physical sense, SeeShell is essentially a temporary sleeve). Finally, the embodied nature of the interface would also allow for a form of *automation*. Because SeeShell aims to mesh with everyday, lived practice, it was intended to gather information about a rider's journeys on the fly, without any extraneous, explicit, user input. When a passenger performs the simple, necessary, action of swiping the Oyster Card across the turnstile reader, SeeShell exploits this opportunity to collect the data used to drive a new channel of interaction, to augment urban mobility with an alternate perspective on our daily movements.

These three design objectives of *variability*, *separability*, and *automation*, then, served to guide ideation for alternative technical designs. For the reasons mentioned previously, implementing SeeShell in such a way that it would function entirely *in situ* was not possible, and consequently it was necessary to turn to an alternative means of data gathering. While it would be feasible to create a novel method of input for Arduino that might allow for use within the Underground, such as a series of Morse code style button clicks, such a design would require users to adapt to an overly complex interface too extremely at odds with the goal of *automation*. I chose, instead, to aim towards a balance of the design goals by making use of a computer-based interface for SeeShell,

requiring that after a passenger completes a journey, or series of journeys, they dock and sync their SeeShell via USB with their computer.

This objective, then, presents two potential scenarios of interaction for syncing and updating SeeShell: background-style automated update of the device or a method which requires explicit user input. As mentioned earlier, if an Oyster Card user registers their card and tops it up online it is possible to retrieve journey information through the Transport for London website. It would be possible to create an application which would scrape the website for relevant journey information and transmit that data to Arduino directly, though such an application would require some level of user intervention as one would need to log into their Oyster online account prior to synching the SeeShell. While being relatively *automated*, such an approach would sacrifice the goal of *separability*, never allowing users to chose which journeys would be displayed by SeeShell. Alternatively, Arduino's text-based console interface could be employed to manually update SeeShell, requiring users to directly input the start and end stations of their journeys. Though this second option necessitates a compromise on the goal of *automation*, it is important to recall that the system was originally envisioned to rely on the embodied act of passing through the ticket barriers, rather than on a generalized concept of *automation*. Not being able to attain a situated form of automation, I chose, then, to focus on a support of *separability*, permitting users to choose which journeys they would like to register through a simple textual input.

This technical design, then, represents a practical response towards the challenges posed by crafting an interface which intends to work in harmony with a massive, real-world system. These actionable specifications were explored further, through the implementation of a tangible prototype. The prototype itself can be essentially conceived of as two interrelated parts: the back-end hardware (and accompanying software) and the front-end display. For the implementation, I fabricated an Arduino-

driven multiplexed circuit which is capable of driving both the permanent ink-based displays, as well as an LED-based display used for testing and demonstration (see Fig. 8.1).

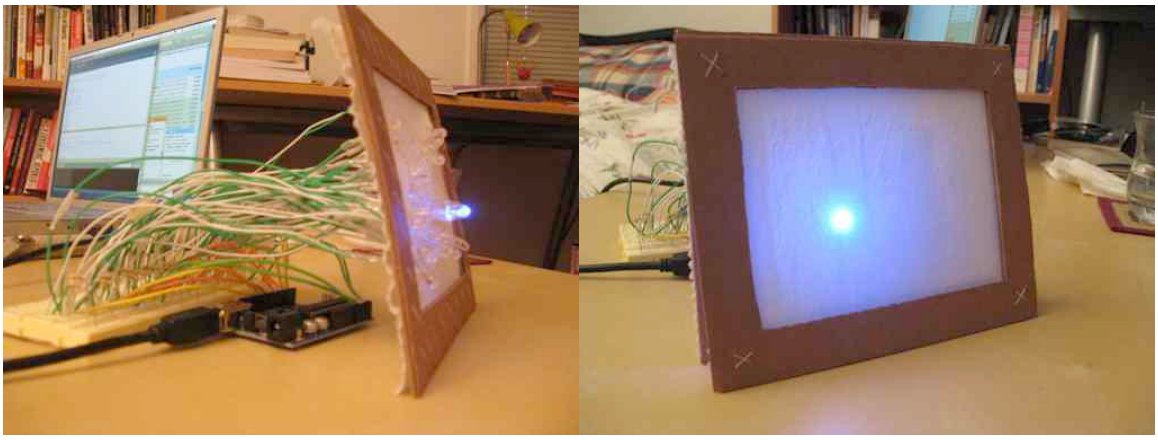

Figure 8.1: LED-based testing display connected to Arduino-driven back-end

Ultimately the current implementation design of SeeShell acts as a best fit for three goals. It remains variable in that it is a partially analog display, each instance of which will be unique given the inherently unpredictable qualities of ink. Further, SeeShell is separable from the Oyster Card which it relies on both in the physical sense, and given the fact that a user has control over what data will be gathered and displayed by the interface. Finally, the implementation is somewhat automated in that it relies on a familiar computer-based docking procedure that only requires a lightweight, text-based, mode of input from the user.

Because any detailed discussion of the functionality of the prototype will inevitably address not only technical, but also aesthetic, concerns, I will momentarily step back to provide a more complete context for the aesthetic design of the SeeShell prototype. This section has thus far revealed that the technical design and implementation of a interface like SeeShell needs to tackle, and in doing so, sheds light on, the complexities of data generation and access in a lived system like the London Underground. By underscoring

the significance of not only conceptual design but also the deep examination of technical challenges, the foundation of responses to real-world obstacles presented in this section lays the groundwork for the deeper discussion about the aesthetic qualities of the interface, to which we will now turn.

8.2: The Aesthetic Design of SeeShell

Because SeeShell was envisioned to be an augmented Oyster Card holder it was necessary to consider a range of technical concerns, discussed in the preceding section. However, the proposed form-factor also gave rise to a series of constraints which influenced the aesthetic qualities of the interface. These two aspects of design, though presented serially within this chapter, were not approached independently. That is to say, the ink-based display was equally a technical decision as well as an aesthetic one, chosen to satisfy the goal of crafting a portable, interactive artifact for use in the London Underground.

Earlier, the features of the Oyster system were recounted in order to provide a context for the technical implementation of SeeShell. Likewise, here, I will give a brief overview of the aesthetic qualities of existing, standard, Oyster Card wallets, which, in turn, acted as inspiration for the design of SeeShell's display. Oyster Cards, since their release, have always been given to customers inside of a plastic holder, which, rather than being inexpensive give-away, stands as an integral part of the Oyster experience. Indeed, in the pages of the instructional Oyster Card pamphlet, to best care for the cards, riders are instructed to "Keep it [the Oyster Card] in its wallet and use for intended purpose only" [web: TFL Oyster Pamphlet, 16]. Early trial cards were bundled inside of wallets sponsored by advertising from either the Yellow Pages or Direct Line (see Fig. 8.2), but with the official release of Oyster, Transport for London began distributing the cards

with a wallet which mimicked the design of the cards themselves (see Fig. 8.3). Subsequently, a variety of specially designed, art-focused Oyster Card wallets have been issued, such as the Thin Cities series (see Fig. 8.4) which was sponsored by the Platform for Art initiative for the centenary celebration of the Piccadilly Line [web: Thin Cities], and the wallets designed for the Arts Council England's Art in Your Hand project (see Fig. 8.5) [web: Arts Council England]. What we begin to see here is that the Oyster Card wallet is an important space for design. It is an artifact which has come to stand as a valid stage for the presentation of a variety of media. Where the Arts Council England utilizes the Oyster Wallet as means for "making art available on everyday objects" [ibid.], at the time of writing, the official Oyster Card wallets are being used *en masse* as an advertising campaign, being fully branded and sponsored by Ikea (see Fig. 8.6). It is, however, not only large organizations that take advantage of this platform; the London-based band Dragonette distributed a series of promotional Oyster Card holders which play off the traditional design (see Fig. 8.7). Similarly, Bad Oyster sells satirical wallets which feature common gripes about Tube travel, using the Oyster Card holder as a forum for critique of the system it represents [web: Bad Oyster]. The Oyster Card wallet, then, is more than merely an insignificant piece of plastic meant to protect the "pearl"

Figure 8.2: Early sponsored Oyster Card wallets

within, rather, it is a tangible artifact which acts at once as the piece of the Underground passengers take with them as they return above, connecting them with the Tube, and as a point of communication, a massive distributed display which supports overlapping dialogues between individuals, corporations, artists and organizations on topics running the gamut from advertisement to art, satirical critique to fashion, and whatever else one might want to express.

Figure 8.3: Official Oyster Card wallets

This collection of tiny spaces acts as a series of windows of opportunity for design which SeeShell attempts to approach. The preceding discussion of the history of the Oyster Card wallets allows us to see that the holders can be addressed as both discrete, personal objects as well as cohesive space for collective display that is at once fluid and fragmented. Having demonstrated that the Oyster Card wallet is, then, a legitimate space for aesthetic exploration, I will now turn to a discussion of the ways in which SeeShell attempted to work within the complex scope constituted by the Oyster Card wallets.

In the first section of this chapter I characterized SeeShell as an interface which displays, over time, the journeys a rider has taken. Now, I would like to return to this description not as fact, but as an aesthetically-oriented design goal. With SeeShell, I intended to

allow users to “look into” their Oyster Cards to reflect on their journeys. These journeys are at once both digitally within the Oyster Card while at the same time they form the tide in which the Oyster Cards themselves are swept along by their owners. This complex nature of the journey is echoed in the fact that the Oyster Card holder is at once personal and public, like our journeys it is both something that everyone can see yet it is deeply individual.

It is this duality, then, that SeeShell attempts to address. My design goal was to create an interface which would draw upon the journeys which riders craft to create a representation which could be allow for both personal expression and reflection as well as interpersonal and collective communication. Accordingly, SeeShell needed to strike a

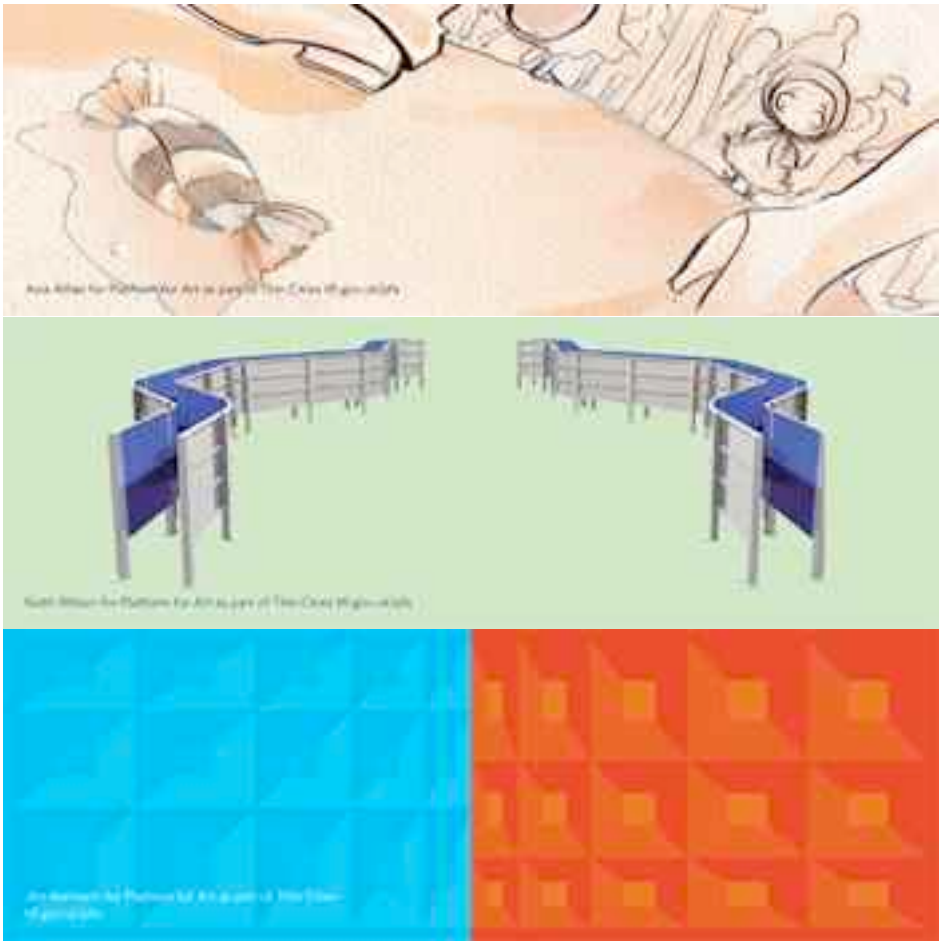

Figure 8.4: Thin Cities wallets

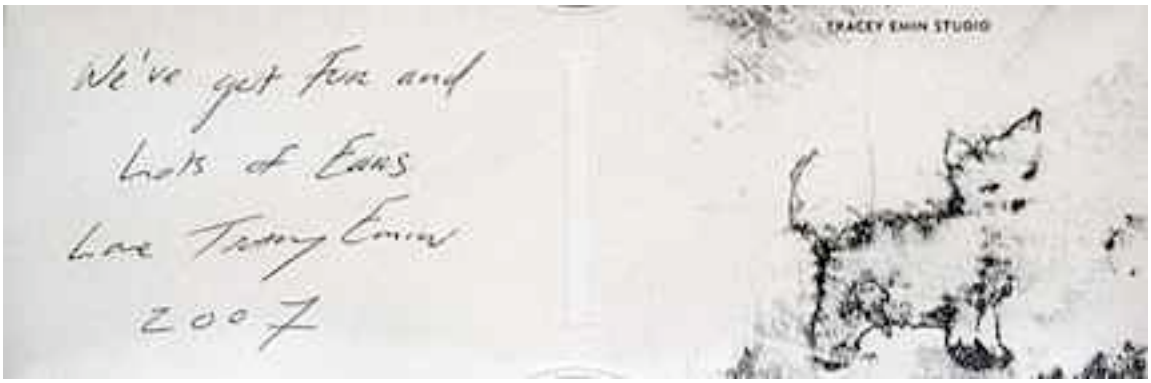

Figure 8.5: Tracy Emin's Arts Council England Oyster wallet

balance between the specificity of personal experience and the open-ended interpretation of public presentation. A visualization which precisely recounted the journeys of a rider would be revealing, perhaps, too much information, not only in the sense of privacy concerns, but also in such a way as to curtail imaginative speculation both on the part of the rider himself and of those who happen to catch a glimpse of his SeeShell. Conversely, a visualization which was overly general would run the risk of being incapable of supporting any meaningful interpretations or sense of attachment.

Figure 8.6: Ikea sponsored Oyster Card wallet

The negotiation of these design aspirations, complex in itself, was simultaneously tempered by the technical considerations presented in the previous section. The display of SeeShell was to be driven only by the information regarding the stations of the Underground which users swiped in or out of, and that display needed to be feasibly

implementable on a small scale. As mentioned earlier, I chose to use permanent ink on white cloth as the medium for display. Later, I will discuss the overarching motivations for this choice, but first I would like to move to a more practical discussion of how SeeShell was designed to look. Two distinct aesthetic design concepts were created for this interface, and one was brought forth to the prototyping stage; I will address each in turn.

Figure 8.7: Dragonette promotional Oyster Card holder

The first display design concept for SeeShell is rooted in an icon of the Underground, the Tube map. At the outset the augmented Oyster Card wallet is purely white. As a rider passes through stations splotches of ink appear in a pattern which is similar to the map of the Underground found throughout the Tube network. The official map is comprised of both edges (the lines of the Tube) and nodes (the stations where the trains stop). SeeShell, in this case, uses daubs of ink to represent the stations a user has visited without creating an explicit connection between them. The display, then, emerges as an unconnected graph of the discrete points a user has passed through. More specifically, the only points represented correspond to junction stations – that is, stations through which more than one Underground line passes – found within Zone 1,

the central area of London. For this concept I created a series of more detailed sketches which explore a variety of possibilities for the aesthetic details of an implementation (see Fig. 8.8).

It should be noted that the sketches shown below all depict SeeShells which have been completely activated, that is, SeeShells whose owners have traveled to every junction station in Zone 1 (31 in total). The first two sketches depict a SeeShell which uses only a single color of ink, creating a display whose potential for variance relies chiefly on the distribution pattern of the unique bursting of each pellet of ink. While the first of these two sketches does not reveal a direct orientation with the Tube map, the latter features pre-sewn colored stitches which follow the mapping of the four major lines of the Underground (e.g., the Circle, Central, Northern and Piccadilly lines). These threads provide a clearer affinity with the Tube map and serve to provide a more literal context for interpretation of the display. The second two sketches, on the other hand, use four colors. Though the ink daubs also represent the junction stations, these stations sit on more than one line, and thus assigning them different colors involves a decision on the part of the designer to characterize the station by choosing its color. Again, the colors of the four main lines are used (red (Central), yellow (Circle), black (Northern) and blue (Piccadilly)). As these colors emerge, they begin to suggest the paths of the Tube lines more clearly than the monochrome version. The fourth sketch is the most literally cartographic as both the lines are present and the set of stations appears more distinctive and differentiated. This display concept ultimately acts as a sort of representation of absences; over a long term the pattern of lacunas in a user's travel emerges. While the ink splotches highlight the places I've been, the territory I've marked, stations which remain unactivated, the land into which I have never ventured. Overall, then, this aesthetic concept promotes a type of reflection on one's journeys which is heavily spatial, strongly identifying journeys by the physical area through which they are traced.

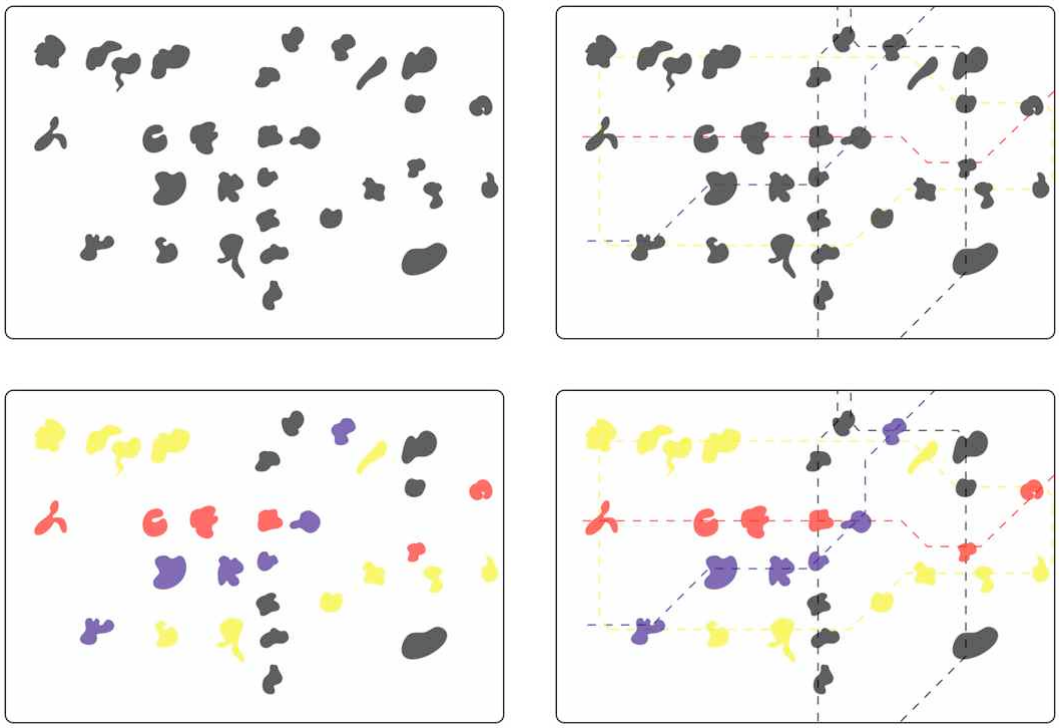

Figure 8.8: Variations of the first SeeShell display design

This suggests that there is also an opportunity for an aesthetic design to highlight the temporal aspect of the journeys and to allow users to draw their attention to the patterns and rhythms that emerge from our travel. Whereas the first display concept emphasizes a strong spatial representation, the second, instead, moves further away from the Tube map in an attempt to depict journeys in a more holistic fashion, rather than as specifically identifiable points with which that journey intersected. To this end, the second aesthetic design uses the same colors of ink as the first, but these pellets are arranged in four intersecting lines ten beads in length. In the beginning, the SeeShell is completely white, but as a rider enters or exits a Zone 1 station on either of the Circle, Central, Northern or Piccadilly lines, a pellet of ink of the corresponding color is burst, each successive bead of ink extending the reach of a given line (see Fig. 8.9). Stations which are served by more than one line are assigned a single color in such a way that there are 20 stations which are considered to be on the Circle line, 11 on the Central

line, 12 on the Northern line and, finally, 11 on the Piccadilly line. The lines of red and yellow beads are arranged horizontally across the SeeShell, while the black pellets are laid out vertically and the blue beads cut a diagonal across the card holder. This arrangement very loosely corresponds to the routes which the Circle, Central, Northern and Piccadilly lines trace across the Tube map. However, in contrast to the first display concept, each pellet of ink does not correspond uniquely to a particular station. Consequently, a particular SeeShell does not reveal specifically the places its owner has been. Nor does it even represent a highly accurate tally of the journeys a rider has taken on a particular line. The data which SeeShell relies on (entry and exit stations) is somewhat open to interpretation; while it would be possible to make an reasonable guess as to which lines a passenger has ridden, one cannot be sure given the granularity of the data. It is this ambiguity which this display concept builds upon, rather than tries to overcome. Associating junction stations with only one line serves to move away from precision and towards pattern. The key here is that while a variety of collections of journeys might trigger the same series of ink pellets, it is the intimate knowledge of a rider's journeys which allows him to understand, uniquely, the pattern developing on his SeeShell. The linearly increasing abstraction of the Tube lines stand in counterpoint to one another, providing an insight into the rhythm and regularity of one's journeys.

From a broader perspective, we can examine these aesthetic concept designs, contrasting them with the, arguably, more traditional choice of ubiquitous computing to rely on modifiable displays, e.g., LCD screens. While a small screen would be compact enough to serve as a SeeShell display, the feedback such a display provides is temporary and fleeting except in the case where the display is continuously powered. A key goal of the work with SeeShell is to augment an existing artifact in order to promote reflection, rather than to replace it wholesale with a different piece of technology altogether. The analog nature of the display was chosen, then, because of its enduring and unobtrusive nature. As we have seen in this section, the Oyster Card wallet stands as a valid space

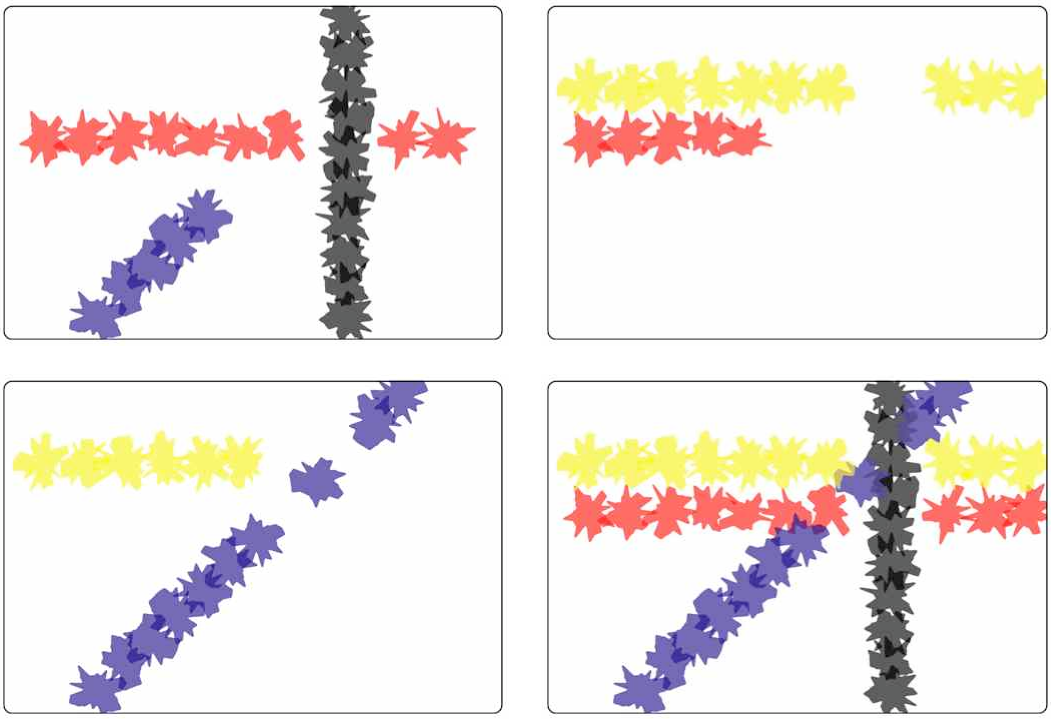

Figure 8.9: Four examples of possible emergent patterns in the second SeeShell display design

for the presentation of a variety of media, but it is the variety of frequently repeated encounters with these semi-public, graphical objects from which meaning can be derived over time. A seasoned traveler is well aware of both the historical nature of light blue Oyster Card wallet as well as the recent introduction of the Ikea sponsored holders. A quick glance at a stranger's Oyster Card wallet could then serve to, even mistakenly, date the purchase of their card, and perhaps provide a basis for understanding that person as either an expert rider or a newcomer to the city. Through the use of the ink-based display, SeeShell not only seizes on the notion that the Oyster Card wallet stands as a valid space for aesthetic expression, but further it tries to aid passengers in reflecting on their journeys through its permanence of representation. It is with these enduring patterns which we can build a relationship. SeeShell renders visible the traces of our ephemeral journeys; precisely because the display is not fleeting it allows for a

persistence of engagement which encourages an active considerations of the patterns which materialize over time.

Yet, SeeShell itself is not intended to be used infinitely. While the display is permanent, the artifact itself, just as the standard Oyster Card holder, is a consumable object; it wears out. Taking a cue from the disposability of the traditional wallets, SeeShell is designed to be an artifact which is meant to be used for a period of time and then replaced, which is reflected in the relatively inexpensive materials of which it is constructed. This property encourages the appropriation of SeeShell as a sort of snapshot of time and, when a rider uses them in series, as a set of diary-like images. So, while one carries with them a short history of the recent past, it is possible to create a collection of patterns of movement over much longer periods of time. Finally, SeeShell as a collection of artifacts allows for comparisons between the artifacts to arise, prompting users to consider why their October SeeShell differed greatly from their November one, or why their flatmate's wallet looks incredibly different. It is the essential qualities of SeeShell as an augmented artifact rather than a continuously refreshing LCD readout, that allow for passengers to hold two SeeShells side by side, to glance at a stranger's SeeShell as he swipes out of the station, and to collect and reflect on the variety of patterns which arise from the journeys we take every day. The underlying technology of the display is decidedly just that, it is positioned out of the spotlight, utilized in so far as it amplifies the basic qualities of the Oyster Card by driving a permanent display which acts as a platform for the personal creation of meaning.

As SeeShell relies on these inherently physical qualities of its display, in order to explore the potential of the interface further I implemented a series of prototype of the ink-based display. In the upcoming section, then, I will present a more detailed description of the prototype and reflect on the types of journey patterns it produced.

8.3: The SeeShell Prototype

With the holistic understanding of the inspirations guiding both the technical and aesthetic design of SeeShell, there is a proper context in which to discuss the insights generated by the actual implementation of the interface. The SeeShell prototype was crafted as two separate pieces: a processing back-end a series of front-end displays. As mentioned earlier in this chapter, for testing purposes and LED-based display was created, however, in this section I will focus on the creation and activation of the permanent ink-based displays.

In order to implement a prototype with the equipment available in our Fabrication Laboratory it was necessary to build the additional circuitry onto a second board (see Fig. 8.1). This Arduino-driven back-end was implemented in such a way that it could be connected to both and LED testing display as well as the ink-based displays. To create prototypes of these permanent displays I set pieces of white cloth into a frame and sewed the resistance wire-wrapped ink pellets to the reverse side (see Fig. 8.10). Stretching the cloth taught required that the pieces be cut slightly larger than the actual display sized defined by the standard Oyster Card wallet. However, the actual area

Figure 8.10: Unactivated SeeShell displays (left), close-up of ink pellets (right)

utilized for these displays remains within the original specification, it is merely bordered by additional white space. This prototype was implemented in order to explore the visual, aesthetic nature of the artifact. Given this motivation, these displays were not fabricated within a plastic enclosure because achieving an optimized form factor was not the primary concern.

As mentioned in the previous section, the second display concept which I presented attempted to approach journeys from a holistic and rhythmic perspective. Because I felt this display had the most potential to address the experiential aspects of mobility in the Underground, I created three prototypes which implemented this design concept. To explore the visual range of this interface I gathered the real-world journey information of three women who share a flat in the south of London. The data spanned a two week period and all start and end stations of the journeys taken during this time were recorded. Each SeeShell was docked with a computer and the journey data was entered into the text-based interface in order to activate each display. Using this real data allows us to get a rich, visual sense of what lived patterns of mobility might emerge through SeeShell. The results of the activation of the SeeShells are strikingly different (see: Figure 11). This exploration is not intended to be an evaluation, rather the prototype was built and used in such a way that SeeShell be situated as a point of departure for a discussion about what these types of artifacts might allow us to see.

Briefly, then, I would like to discuss what each of these displays revealed and reflected. Let us first consider central image in Figure 8.11, the SeeShell based on Jin-Mae's journeys. Typically moving on a long commute between home and work, Jin-Mae has a fairly regular travel pattern. When she does go out into the city for social activities, Jin-Mae tends to visit only a particular area of town which created a steady green band on her SeeShell. Because the Underground stations between which she commutes between are outside of Zone 1 only her socially motivated journeys register. Yet this has the

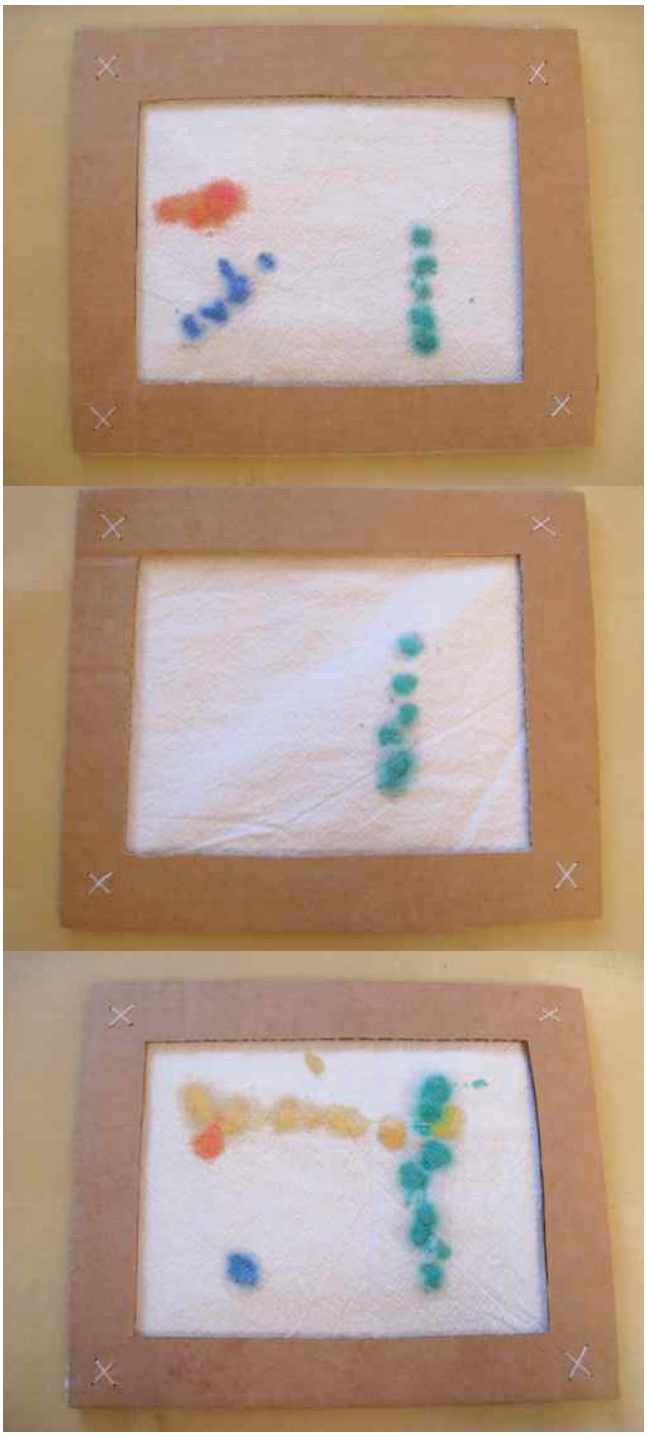

Figure 8.11: Ariel, Jin-Mae and Kylie's SeeShell patterns

effect of creating a very directed and focused pattern. Jin-Mae, upon sending her journey data, told me "I am sorry that my travels are pretty simple, but that's my life!" Indeed one can see by her SeeShell that a very minimalist pattern begins to emerge.

Looking at the top SeeShell shown in the figure, based on Ariel's travels, we see quite a different aesthetic. Unlike Jin-Mae, Ariel often works from home. While she occasionally visits the university she is attending, most often she uses the Tube to travel to social engagements. On her SeeShell we can see a pattern of decreasing frequency across the lines of ink. This, however, gives the impression of three lines struggling to converge, and could be seen to represent the three areas of her life, the domestic, the scholastic and the social, are all present, albeit in differing strengths. That is not to suggest that this display *must* be interpreted in such a way, but rather to demonstrate that an intimate understanding of one's own journeys *can* be seen to emerge from the interface.

The final SeeShell was generated from the journeys of Kylie. She mainly divides her time between her own flat, her boyfriend's flat in North London, and her two places of work. Here you can see strong bands of color indicating heavy travel to two different areas, as well as isolated deviations from this pattern. Kylie, in comparison to her housemates, appears to have very rich movement in two modes which are punctuated by a bit of variety. Her SeeShell appears at once to be the most dynamic and intense.

Exploring the embodied aesthetic of SeeShell based on real-world travel patterns allows SeeShell to act as a tool giving us cause to reflect on the journeys we take. While it is clear that there is a connection between the display and my travels, it is not an explicit one. And yet we are able to see distinctive patterns emerging even among three people who share a home. This allows us to see the potential of a simple interface like SeeShell to act as an opportunity for inquiry into not only our own rhythms, but those of the people around us as well.

8.4: SeeShell & The Inspirations for Design

Now that I have explored not only the concept, but also the potential, of SeeShell, I can expound on the ways in which this work draws from, and brings a new perspective to, the design inspirations presented in Chapter 6. This section then will bring this dissertation to complete the answer to my final research question: *What principles can we create for a reformulated ubiquitous computing view of mobility and technology?* Here, then, I will further articulate the actionable nature of these principles by demonstrating the ways in which they guided and influenced the design of a system in a very different way than the work presented in the previous chapter.

Designing for Engagement was, similarly to *undersound*, a very influential principle. However, the way in which it was borne out was quite different. SeeShell was inspired by the way riders were often observed holding the Oyster Cards in their hands, fanning themselves with them, playing with them, and using their engaging qualities as physical artifacts in themselves. Unlike *undersound*, which created a new channel of interaction through an existing technology on a very large scale, SeeShell moderately augments the physical aspects of an artifact on a very personal level.

SeeShell addresses *Designing for the Expert Journey* by allowing riders to craft the look of their SeeShells by moving in different ways, or by actively removing their Oyster Cards from inside it. One can imagine travelers creating their own unique looking SeeShells by changing the way they move through the city. This design, then, looks at the personal and creative aspects of expert journeys whereas *undersound* address the collective and interactional sides facets of the principle.

Also somewhat differently, SeeShell is enmeshed into an *Ecology of Objects*, albeit a somewhat different one. With this design I attempted to actively speak to the existing ecology that Oyster is an integral part of. There is a complex system in place surrounding Oyster as a technology (e.g., readers, kiosks, internet), as a designed artifact (e.g., aesthetically-pleasing holders, wallets, purses, pockets) and as an artifact (e.g., something you can fit in your jeans, clench in your teeth). While *undersound* was positioned with respect to the engaging objects (e.g. mobile phones, newspapers, iPods) found in the Underground, SeeShell is targeted towards an integral sub-system of the Tube. With this design I call attention to the complexities of these ecologies by amplifying one, often more hidden, aspect, which is the data produced and stored by the system. Here I am giving visibility to something often almost invisible, the journeys which passengers enact, and trying to rethink the balances within this ecology.

Additionally, SeeShell approaches *Designing for the Flow* from an alternate angle. This design looks specifically at the history of personal journeys unfolding over time. Whereas *undersound* attempted to address the vastness of collective patterns, SeeShell looks deeply at the individual flows we each experience through time. The display acts as a historical snapshot when one SeeShell is replaced with another. As users collect these slices of the past and reflect on them as a narrative, they open a window onto a broader picture of the patterns of their travel unfolding. SeeShell, then, examines the dynamic nature of the personal flows which contribute to a pulsing collective.

Finally, though SeeShell does not explicitly address the concept of *Designing for the Buzz*, we can, nevertheless, imagine how it might figure in to this concept. SeeShell, though a personal artifact, is an object which many passengers could potentially have. This common point could provide an occasion for a range of social interaction. Though SeeShell is somewhat private object, like any Oyster Card holder it often comes out into public view, giving other riders the chance to take note of their fellow passenger's wallet. This artifact then, could create a window of opportunity into the buzz, spurring on other passengers' imaginings based on their shared understanding of the device.

By examining not only the ways in which SeeShell approaches the inspirations for design presented in Chapter 6, but also how SeeShell's interpretation of these principles differs from that of *undersound*. What we begin to see that a design space is opened and identified. Not only do SeeShell and *undersound* address the *same* set of design principles but they do so in complexly interwoven way. A single design could not accomplish the work of these two taken together precisely because they explore the space by different means. In answering *What principles can we create for a reformulated ubiquitous computing view of mobility and technology?*, I have demonstrated that one can, in fact, create a set of actionable principles that do not give rise to a single design, but rather, carve out a space for design which waits to be further explored.

9: Conclusion

This dissertation has focused its inquiry on the topic of urban mobility, and, now, in this final section I would like to reflect on this framing and take a step back to examine the way in which the various pieces of this dissertation work in concert with one another to address a concern which is more than merely a sum of its parts. Crucial to this discussion is the phrasing, and conceptualization, of the topic of my dissertation. I chose to describe "urban mobility" as my focus, rather than, for instance, "urban spaces," "mobile technology" or "city dwellers," precisely because the site of my research lies at the intersection between people, the places which they move (or don't move) through, and the technologies which the bring, use, find, and leave in these places. Rather than approaching the use of technology in cities through a single lens by focusing on only one of these components, this basic framing compels us to address the interdependencies of this living, complex system. This more holistic approach leads to a conception of the movement of city dwellers as a continuous flow rather than a series of discrete moments and provides motivation to examine the broader socio-cultural context in which technologies are used. Though "mobile computing" has become and increasingly important site for research activity, the question of what "mobility" actually is remains relatively under-explored. This dissertation, then, seeks to provide a deeper understanding of the relationship between people's mobilities, the sites in which they are enacted and the technologies which support them.

In keeping with the bipartite nature of the topic, the product of this dissertation is likewise somewhat of a hybrid. While ubiquitous computing has traditionally taken a linear approach moving through ethnography (often more accurately described as requirements gathering), to design, to prototyping, and finally evaluation [Dourish, 2006] this dissertation serves, in part, as an active reconsideration of the relationship

between these “phases.” While methodological considerations have not been the explicit focus of this dissertation, they will inevitably be raised by any overarching discussion of the constituent parts of this work, precisely the focus of this chapter. While it is not the intent of my research to single-handedly close the gap between ethnography and design, this work does serve to represent a living effort – on the part of single person who works in collaboration with ethnographers and designers, and believes herself to be something of a hybrid of the two – to explore what a more open dialogue between design and ethnography might look like in practice. Thus far, this dissertation has presented two interrelated pieces of ethnography and design that bear equal weight and are intended to be understood in concert with one another. It is here, then, in the final chapter of this dissertation, where I will turn directly towards an examination of this dialogue in an attempt to further reveal the ways in which the various pieces of my research serve to reinforce and reinterpret one another, ultimately closing the circle of ethnography and design, allowing us to reflect more broadly on the potential future directions for this work.

In this chapter, I will first discuss the ways in which the theoretical foundation presented in Chapter 5 served to influence the analysis of the Aesthetic Journeys study. Then, I will go forward and reflect on the ways in which the design presented in Chapter 7 was influenced by not only the design principles presented in Chapter 6, but by findings of the ethnographic work itself. Finally, I will explicate the ways in which the work presented in Chapters 7 and 8, when taken together, begins to define a new space for not only design, but future ethnographic work as well.

9.1: Avenues of Exploration and Aesthetic Journeys

The analysis of the cultural geography literature presented in Chapter 5 gave rise to several novel avenues for exploration within ubiquitous computing. Likewise, both the conception and analysis of the Aesthetic Journeys study were driven by the goal to explore new directions within ubiquitous computing. Here, then, I will address the ways in which the Aesthetic Journeys study served to make progress in these new directions for ubiquitous computing and reflect on how to address the avenues which this dissertation has not explored in great detail.

While the proposed directions for ubiquitous computing presented in Chapter 5 were discussed individually, when approached through the lens provided by the design principles from Chapter 6, their interrelation can be made more clear; this is specifically true for the first three avenues for exploration which I identified previously and will briefly recount again here. First, I highlighted the ways in which some ubiquitous computing work has extended the notion of voyeurism and creativity which the cultural geography literature motivates, and suggested that this poses an opportunity to continue to manifest this theme within the design of new technologies for urban mobility. Secondly, I emphasized the fact that there is a lack of design work within ubiquitous computing which attempts to address the idea that mobility can serve to bridge the public and private realms. Finally, in explicating the ways in which ubiquitous computing extends the work of cultural geography by demonstrating that recent technologies have brought to light the potential of alterity to create connections rather than merely foster hostility, I suggested that a worthwhile avenue of further research for both disciplines would be to attempt to more deeply understand the various ways in which people conceive of alterity and to create technologies which take these practices into account. In Chapter 5, these concerns appeared to be separable, however, by approaching them through the lens of design, their relationship becomes more apparent. The concept of *Designing for the Buzz* spans across this range of potential

future approaches. As a design principle it urges us to craft technologies which are flexible enough to move fluidly between these conceptions of mobility, creating a continuum rather than a discrete set of unrelated trajectories for research. *Designing for the Buzz* urges us to craft interfaces which are capable of addressing the range of urban social experiences. One way, then, of making headway in the three areas highlighted above is to approach them simultaneously, cuing off the way in which participants in the Aesthetic Journey conceived of their own mobility [special note to Paul: maybe I need to have more about how they were explored individually as well? But I think that was already clear in chapters 7 and 8].

While this dissertation has addressed the aforementioned avenues for exploration in detail, the fourth, which I will review in short, remained relatively out of focus. In Chapter 5 we saw that ubiquitous computing takes an active approach towards supporting the ways in which urban mobility can contribute to the creation of community in a variety of ways, on several scales, and through many forms of media. However, there is a notable lack of work focused on approaching mobility as a lived tension between groups. This suggests that there is a need within ubiquitous computing to recognize the other side of this duality, exploring how technology can not only create communities but also separate them, acknowledging that these two things are fundamentally interwoven. The guideline of *Designing for the Flow* helps to capture this idea of the tensions but reminds us that these tensions are not fixed, but rather in a constant state of flux and negotiation. Reflecting on this inspiration for design points towards a further area of research which might focus on an attempt to design for the movements and interplays of these tensions, rather than solely at the lower level of the individuals who experience them. In other words, one might tackle the problems of negotiating inter-community tensions by addressing them as a dynamic collective, rather than a series of discrete social conflicts to be dealt with in isolation.

Finally, by highlighting the different methodological approaches for the study of urban mobility of both cultural geography and ubiquitous computing in Chapter 5, I attempted to draw attention to a fifth avenue for further exploration. I proposed that it would be potentially beneficial for future ethnographic studies regarding the role of technology in aesthetic experiences of mobility to be conducted on a scale like those presented among the ubiquitous computing work, but with a cultural and thematic depth like those studies originating from cultural geography. It is this final avenue which this dissertation has attempted to carry out with diligence. In answering Sheller & Urry's call for new forms of mobile ethnography to be created and employed it became apparent that this decision not only affected the ethnographic research itself, but also the design principles which it gave rise to. The concepts of *Designing for the Expert Journey, Ecologies of Objects, and Engagement* would have gone unformulated had the scale of the work been too broad or the depth of the inquiry too shallow. The Aesthetic Journeys study produced design principles which addressed urban experiences on the same scope as it was conducted. Though this point might seem self-evident, it motivates a direction for future research to be conducted in such a way that the reach and range of the ethnographic and design work of a particular project are brought more closely in line with one another in order to be more mutually beneficial.

By reflecting on the ways in which the future avenues for exploration presented in Chapter 5 were addressed or recontextualized by the inspirations for design from Chapter 6 we can see that the work of this dissertation is not linear. Rather, by employing a multifaceted approach to the relationship between urban mobility and technology, different aspects of this relationship are brought to light. Further, these findings suggest further directions for research relevant across disciplinary boundaries. However, in order to more precisely explicate the ways in which the individual parts of

this dissertation actually form a cohesive, mutually-influential, whole, in the coming section I will examine the foundations of the design choices presented in Chapter 7.

9.2: What undersound Could Have Been

Here, using *undersound* as an exemplar of the alternative approach to design which this dissertation presents, I will reflect on the way in which both the process of, and the rationale for, the design of *undersound* represents an alternative to the prevailing ubiquitous computing approach. Within this section I will expound upon not only what the design of *undersound* is, but also what it could have been, and why I chose a certain direction for the design over others. Specifically, I will explore the ways in which the Aesthetic Journeys study, and the principles which it gave rise to, shaped my design decisions.

Looking to the beginning of the design process of *undersound*, it is crucial to highlight that we drew not only from the principles proposed at the end of Chapter 6, but also utilized specific findings from the Aesthetic Journey study directly. Because that study was motivated by a concern of understanding the experiential, and not merely functional, aspects of journeying through the London Underground, the design process began with a very different sort of focus. By rooting *undersound* in our actual observations of a specific city and by utilizing the inspirations for design drawn from an aesthetically-oriented ethnographic study, the overall technique of this design process is an example of an alternative approach towards the creation of new urban technologies.

In order to render this discussion more concrete, let us look to a series of three illustrative design choices to examine how these decisions reflect the position of this

dissertation as a whole and how *undersound* stands in contrast with other systems (actual and possible). Our first choice was to eschew a top-down musical journey planner in favor of large-scale displays which represent the bottom-up movement of music through the system. We could have chosen to design a feature into *undersound* which would allow users to plan their journeys based on their music preferences. However, we explicitly shied away from any top-down style way-finding utilities. While *undersound* could have emerged as a next-generation way- and content-finding application, a sort of route-planning Yelp for music, we instead choose to build a system which explicitly did not tackle navigation, and we did so for two reasons. First, during the Aesthetic Journeys study I spoke to many "expert" riders and our discussions often touched on Transport for London's Journey Planner, as mentioned in Chapter 6. These passengers felt that the tool often fell short in their eyes. It was seen to miss the mark in different ways by different people. Some found that it was meant for the unseasoned, giving less complicated routes which actually would be slower, obscuring "hidden" connections, or forgoing particularly beautiful routes because they were less efficient. From a design perspective, these remarks led us to strive to build a system which could support a multiplicity of styles of journeying, rather than attempting to uncover and assert one "best" way ourselves. Consequently, *undersound* features no route-planning capabilities, as it was clear to the designers that we would not be able to explicitly improve on our riders' talents for crafting the journeys which they found most satisfying. Instead, we chose to build an application that would support discovery and to build upon our riders' ability and desire to do this on their own. Secondly, by looking to the principle of *Designing for the Expert Journey*, our decision was shaped on a higher level. From our observations we were aware that it would be incredibly challenging in the least to tackle the issue of navigation in any form, and so we made the decision to not approach this theme. However, the principle spurred us on to consider how we might actively take an alternative direction. This led us to consider how feeding back the information regarding the journeys of the music in the system, in the form of the large-

scale displays, might act as a novel channel for expert riders to reshape their journeys in new ways. This inspiration for design, then, pushed us from avoiding the idea creating yet another top-down route planning utility, to considering how expert riders might benefit from approaching navigation in an inspirational, rather then prescriptive, bottom-up, way.

The second design choice I would like to call attention to is the use of the mobile phone as a platform for a new application which was done explicitly instead of building a stand-alone device. This design decision is a very simple, yet very important one. As mentioned in the previous section, one of the reasons why we chose to design a mobile phone application was due to our understanding of the large role which the phone played in the already existing ecology of artifacts present in the Tube. While we were motivated to respect and explore the potential of tapping into this ecology, the root of our motivation for using the mobile phone was much more basic. It stemmed from the sheer, and surprising, number of riders we saw using their mobile phones in the Tube despite the complete lack of signal coverage. This observation was overwhelmingly powerful to me; though passengers kept themselves engaged through a variety of media, despite the fact that the functionality of the device was in a sense crippled due to the lack of coverage, it was a testament to me of the potential of the mobile phone as a platform for an application developed for the Tube. Because wide penetration is crucial to the success of *undersound*, we choose to use our first-hand observations of the intended area of deployment to strengthen the potential of use for our application. Though from an outside perspective the mobile phone was sometimes seen as a difficult choice – how would we support the seemingly endless variety of operating systems running on the phones? – it was clear to ourselves as designers that creating a new device, try to distribute it massive quantities, and competing with the mobile phone would lead directly to failure. Had we not seen the mobile phone being used in such great numbers, our implementation plan for *undersound* might have been radically

different; we might have concluded that a new technological intervention would be well received. This design decision, then, highlights the importance of immersive fieldwork being used in concert with the inspirations for design. The principle of *Designing for Ecologies* does not covey the complex relationships at work within an *Ecology of Objects*, but rather merely highlights its existence in order to spur further investigation.

undersound stands in contrast to other urban music applications like tunA [Bassoli et al., 2006] or Sonic City [Gaye et al., 2003] whose designers elected to assemble and distribute stand-alone hardware to their users for testing. Instead of relying on technologies already owned by users, it is of course a reasonable decision to configure systems which can then be deployed to users in order to simplify and streamline the implementation and testing processes. Indeed it is common in ubiquitous computing to have the aim of building a demo-able system quickly in order to hold user trials and receive feedback. Rapid prototyping can have very useful results, however, it is the position of this dissertation to highlight the importance of considering the consequences of this as our sole course. If we build systems intended for city-wide use but rely on technologies not already found in that urban area, we pose to ourselves the problem of never succeeding in a reasonable deployment. By trading the long-term goal of a realistic deployment that meshes with the existing patterns of our users, we often aim instead for the quick turn-around cycle of an idealistic deployment. Though it has become popular, often through necessity, to approach design for the developing world through a very pragmatic lens, relying only on currently available technology, ubiquitous computing as a whole is in a sense behind the times as the community builds new prototypes of technologies which essentially already exist in the real word. Why create a stand-alone device which locates your friends who are nearby when you can buy an iPhone and download Brightkite, Loopt or Whrrl? I seek, then, in this dissertation to highlight the importance of maintaining real-world relevance within our field. While it is important to continue cutting edge research that no doubt often requires new device

prototypes to be built, perhaps it is important for us to recognize that years ago it was not possible to achieve a deployment of novel interfaces on top of an existing technological infrastructure because there was no such infrastructure in existence. However, ubiquitous computing is in danger of being eclipsed by the world around itself as it fails to embrace the fact that the future which we were predicting and shaping is already here. Now if we persist in resisting this tide, we will become forever insular, re-designing and re-creating the novel interfaces already out in the world and subscribed to by millions of users. The incredibly simple choice, then, of utilizing the mobile phone as a design platform, demonstrates how the creation of *undersound* reflects the importance of situating any new design firmly within the context in which it is meant to be used.

The final design choice I would like to discuss is the way in which the metadata that drives *undersound* is gathered and presented. In ubiquitous computing we often find ourselves asking what data is available through the use of my system to present to the users and how can I analyze that data to evaluate my design? This data-centric view pushes us to see the world as bits of information we can capture and highlight. Yet at the same time, this conception obscures the fact that technology is deeply enrolled in the creation of meaning and it decouples the users from the "data" which they are creating. This dissertation attempts to demonstrate that a move away from a functional exploration of the world – what data can we collect and feed back to the users? – opens up the possibility to address the experiential aspects of city life—what meanings can users create through the system and how best do we support that? Accordingly, the Aesthetic Journeys study allowed us to see that passengers were adept at crafting a variety of journeys with respect to a multitude of factors. This, in turn, affected the design process of *undersound*, leading us focus on what meaningful interactions users might have with the system and to collect and present information about only these sorts of interactions. Rather than designing our application to collect as much metadata

as possible and then sifting through it to find areas of potential significance, we chose to focus from the outset on a more bounded, more relevant, set of metadata to support a tighter coupling between the input and output of the system. Here the users are more able to be aware of how their actions affect the system—they can see clearly, through both the mobile phone application and the large displays, that, to put it simply, what they put in comes back out. This was done in order to respect and foster a sense of control for the users. Everything which they put into the system is theirs, and so it is all returned to the users. Or, more accurately, the users actions shape and define the *undersound* network in such a way that their actions *are* the system. We do not collect abstract data and present it to the users, but rather *undersound* acts as a tool for them to simultaneously mold and reflect on their interactions, and the actions of others, through active use of the system.

Through this discussion, then, we can see that the principles which I presented in Chapter 6 can lead to the creation of a new sort of design which serves to reinforce, and rely on, the expansion of the relationship between mobility and technology for ubiquitous computing. From this work we can see that a focus on the experiential aspects of urban life creates the foundation for a different design process and outcome. By explicating the ways in which the design decisions were shaped by both the ethnography and by its resulting principles, we can clearly see that *undersound* represents a viable and alternative approach towards mobility and technology. Yet *undersound* does not represent the *only* alternative, and in the next section I will reflect on the ways in which *undersound* and SeeShell together begin to define a new design space.

9.3: Defining a Space for Design and Beyond

Here, I will explicate the ways in which the work presented in Chapters 7 and 8, when taken together, begins to define a new space for not only design, but future ethnographic work as well. At the highest level we can observe that the design principles formulated in Chapter 6 gave rise to two very different designs. This dissertation then, has not attempted to narrow its range of focus to a singular achievement. Instead of presenting a lone interface, I have attempted to demonstrate that a space for design emerges from this work, supported in the very least by the existence of two very different examples of such.

More importantly, though, is the fact that *undersound* and SeeShell are not two different designs which draw from different principles in a set, rather they both address, to varying degrees, all of the principles simultaneously. Further, they do not approach the principles in the same way; the designs, then, stand both in tension and cooperation with each other. For example, both *undersound* and SeeShell attempt to *Design for the Expert Journey*, yet they do so by very different means. *undersound* opens the opportunity for riders to alter their journeys based on the flow of music and other passengers through the system. Their movements, in turn, contribute to the ways in which the large public displays will look. Individual choices are influenced by, and constitute when taken together, the collective actions of all *undersound* users. SeeShell, on the other hand, works to support export journeys in an inverse way. *undersound* spurs users to alter their patterns in order to obtain something (e.g., different music, personal interactions) through the application; however, SeeShell itself changes in response to users movements and creates a unique display based on individual choices. *undersound*, therefore, focuses on both the collecting and collective aspects of expert journeys; while SeeShell explores the more generative and individual sides of expert journeys. What is significant here is that these designs are fundamentally separate in that not one design could do the work of both. This is due to the fact that deliberate

design choices were made, choices which were inherently binary. *undersound* is a mobile phone application which allows users to share content whereas SeeShell is a tangible artifact that relies on the data of a single rider. A design can either be an application or an artifact, connected or stand-alone, but it can never be both. The design guideline is then addressed in a very different ways by these two interfaces specifically because certain choices were made. The inspirations for design derived from the ethnographic research serve to carve out a space for design, but a single design is only capable of addressing certain aspects of that space. That is precisely why we can discuss the opportunities that the guidelines present as a space, because no one design can encompass the varied, and sometimes conflicting, nuances at hand. This, then, leads to the conclusion that more designs, beyond which have been presented in this dissertation, could draw upon these same principles and indicates that there is room for future explorations.

Yet, it is not only a new design space which has been identified; new opportunities for ethnographic work result from engaging in this design process. For example, while *undersound* responds to the design principles it also raises questions about the ways in which emerging musicians distribute their music, how artists communicate with their fans, and the role of music in the city of London itself. This points towards a worthwhile future project – undertaking a further ethnographic study examining the aforementioned concerns. The findings from such a study could then be utilized to deepen and refine the design of *undersound* to better respond to the wide range of practices that the system attempts to address.

The future avenues for exploration described a wide range of broad topics to further explore. While the ethnographic research deepened this range and brought rich empirical insight about the aesthetic aspects of the relationship between urban mobility and technology. And finally, the design work served to explore the space defined by the

principles derived from the ethnographic studies. Yet through reflection on the designs we begin to see the boundaries of the space in which they were created, spurring on the need for future ethnographic inquiries and, indeed, possibility the need for more higher level inquiry such as the work presented in Chapter 5. In this dissertation, then, cross-disciplinary literature analysis, ethnography and design inform and push one another, expanding and deepening in a cyclic fashion. The reason why this all becomes possible is the interrelation between all of the aspects of this dissertation. Exploring a design space that is described by ethnographic research which, in turn, is underpinned by and analytical framework, creates a tight coherence which allows a researcher to use the findings in one area to reflect on and develop another. This suggests, then, that continuing the work presented in this dissertation will lead not only to new designs, but also to new design and ethnographic spaces.

9.4: Final Thoughts

The interrelated pieces of this work serve to answer the research questions set forth at the beginning of this dissertation. The juxtaposition of ubiquitous computing literature with research from cultural geography provided a response to the question: *What relationship between mobility and technology is posited by ubiquitous computing and what is left out of that relationship?* I demonstrated that ubiquitous computing tends to conceive of mobility as a source of problems which technology can be used to overcome, whereas the research from the Orange County bus study along with the examination of cultural geography literature suggested that an exploration of the less functional and more aesthetic aspects of mobility would be worthwhile. This answer provided an inroad to my second research question: *How can we expand (through conceptual resources) the relationship between mobility and technology in useful ways?* By utilizing the insights garnered from the cultural geography literature I identified a

series of further avenues for exploration with ubiquitous computing. These directions helped create a framework from within which an ethnographic study directed towards the aesthetic aspects of urban mobility was conducted. The Aesthetic Journeys study gave rise to a series of actionable inspirations for future design work. These principles, in turn, stood in answer to my final research question: *What principles can we create for a reformulated ubiquitous computing view of mobility and technology?* The design work presented in response to these principles acted to validate their utility and to highlight the opportunity for both future design and ethnographic work, which further explores this reformulated view of mobility and technology, to be conducted.

The work of this dissertation, however, is not without limitations. Reflecting on the way in which I attempted to answer these research questions allows us to see future avenues for further research. First, in order to conduct a deep exploration of the aesthetic aspects of urban journeys, the ethnographic studies which I carried out were expressly specific in nature. This, however, raises the question of how these deeply situated findings might reflect the experience of mobility in other cities. Secondly, though I explored the inspirations for design presented in this dissertation through my own work, it has not yet been seen how other designers might interpret these principles. We might ask, then, how these deeply situated principles might give rise to design in very different contexts. Finally, as the conceptual designs presented in this thesis were used as tools of reflection, rather than products to be evaluated, it is important to note that they have not yet been placed into the hands of users for long-term engagements. It would be worthwhile, then, to study how the use of such experientially-oriented designs might change over time.

In the introduction to this dissertation I positioned my work as a single voice contributing to the ongoing dialogue of the relationship between ethnography and design for ubiquitous computing. I have attempted, through my research, to foster a

cyclic relationship between the empirical and technical facets of my discipline. By acknowledging the mutually supportive nature of the relationship between ethnography and design, I attempted to highlight both the opportunities and challenges presented when one deeply engages with a highly specific facet of urban life. My dissertation recognizes both the potential and the problems which arise when the design of new technologies for use in everyday life is not done in a vacuum. My research was not conducted in a lab precisely because the users which I studied do not live in idealized, simplified environments. Engaging from the outset with the complexity of urban mobility, by studying it up close, and by designing with real-world constraints in mind, I have, of course, demonstrated that this sort of design is not without its challenges. However, I have attempted to show that addressing and accounting for the complexities of everyday experience can give rise to equally nuanced designs. While the work presented within this dissertation might not address all urban settings, nor all of the inhabitants of a given city, it expressly avoids trying to do so. By reveling in the intriguing depth of the urban experience I have attempted to craft designs of comparable particularity, designs which will inevitably resonate deeply with some users more than others. But it is this celebration of variation and diversity which this dissertation seeks to spread. Rather than crafting interfaces that simply help us move from A to B, we can choose to delight in the depth of urban experiences which ubiquitous computing is only just beginning to explore.

References

Abowd, G., Atkeson, C., Hong, J., Long, S., Kooper, R. and Pinkerton, M. 1997. Cyberguide: A Mobile Context-Aware Tour Guide. ACM Wireless Networks 3, 421-433.

Agre, P. 2001. Changing Places: Contexts of Awareness in Computing. Human-Computer Interaction 16(2-4), 177-192.

Allen, J. 2000. On Georg Simmel: Proximity, Distance and Movement. In Crang, M. and Thrift, N. (eds.), Thinking Space (Critical Geographies). Routledge.

Augé, M. 2002. In the Metro. University of Minnesota Press.

Axup, J., Viller, S., MacColl, I. and Cooper, R. 2006. Lo-Fi Matchmaking: A Study of Social Pairing for Backpackers. Proc. of Conf. Ubiquitous Computing UbiComp'06 (Orange County, CA), 351-368.

Barkhuus, L., Chalmers, M., Tennent, P., Hall, M., Bell, M., Sherwood, S. and Brown, B. 2005. Picking Pockets on the Lawn: The Development of Tactics and Strategies in a Mobile Game. Proc. of Conf. Ubiquitous Computing UbiComp'05 (Tokyo, Japan), 358-374.

Barkhuus, L. and Dourish, P. 2004. Everyday Encounters with Ubiquitous Computing in a Campus Environment. Proc. of Conf. Ubiquitous Computing UbiComp'04 (Nottingham, UK), 232-249.

Bassoli, A., Brewer, J., Martin, K., Dourish, P. and Mainwaring, S. 2007. Underground Aesthetics: Rethinking Urban Computing. IEEE Pervasive Computing 6(3), 39-45.

Bassoli, A., Moore, J. and Agamanolis, S. 2006. tunA: Socialising Music Sharing on the Move. In O'Hara, K. and Brown, B. (eds.), Consuming Music Together: Social and Collaborative Aspects of Music Consumption Technologies. Springer.

Beckmann, J. 2001. Automobility—A Social Problem and Theoretical Concept. Environment and Planning D: Society and Space 19, 593-607.

Bell, M., Chalmers, M., Barkhuus, L., Hall, M., Sherwood, S., Tennent, P., Brown, B., Rowland, D. and Benford, S. 2006. Interweaving Mobile Games with Everyday Life. Proc. of Conf. Human Factors in Computing Systems CHI'06 (Montréal, Canada), 417-426.

Bellotti, V. and Bly, S. 1996. Walking Away from the Desktop Computer: Distributed Collaboration and Mobility in a Product Design Team. Proc. of Conf. Computer-Supported Cooperative Work CSCW'96 (Cambridge, MA), 209-218.

Benford, S., Crabtree, A., Flintham, M., Drozd, A., Anastasi, R., Paxton, M., Tandavanitj, N., Adams, M. and Row-Farr, J. 2006. Can You See Me Now? ACM Trans. Computer-Human Interaction TOCHI 13(1), 100-133.

Benford, S., Flintham, M., Drozd, A., Anastasi, R., Rowland, D., Tandavanitj, N., Adams, M., Row-Farr, J., Oldroyd, A. and Sutton, J. 2004. Uncle Roy All Around You: Implicating the City in a Location-Based Performance. Proc. of Conf. Advanced Computer Entertainment ACE'04 (Singapore).

Benjamin, W. 2002. The Arcades Project. Tiedemann, R. (ed.), Eiland, H. and McLaughlin, K. (trans.), Belknap Press.

Bertelsen, O. and Neilsen, C. 1999. Dynamics in Wastewater Treatment: A Framework for Understanding Formal Constructs in Complex Technical Settings. Proc. of European Conf. Computer-Supported Cooperative Work ECSCW'99 (Copenhagen, Denmark), 277-290.

Bourriaud, N. 1998. Relational Aesthetics. Les Presse Du Reel.

Brown, B. and Chalmers, M. 2003. Tourism and Mobile Technology. Proc. of European Conf. Computer-Supported Cooperative Work ECSCW'03 (Helsinki, Finland), 335-354.

Brown, B., Chalmers, M., Bell, M., Hall, M., MacColl, I. and Rudman, P. 2005. Sharing the Square: Collaborative Leisure in the City Streets. Proc. of European Conf. Computer-Supported Cooperative Work ECSCW'05 (Paris, France), 427-447.

Bruno, G. 1992. Streetwalking around Plato's Cave. October 60, 110-129.

Buck-Morss, S. 1986. The Flaneur, the Sandwichman and the Whore: The Politics of Loitering. New German Critique 39, 99-140.

Bull, M. 2000. Sounding Out the City. Berg Publishers.

Burrell, J., Gay, G., Kubo, K. and Farina, N. 2002. Context-Aware Computing: A Test Case. Proc. of Conf. Ubiquitous Computing UbiComp'02 (Gothenburg, Sweden), 1-15.

de Certeau, M. 2002. The Practice of Everyday Life. University of California Press.

Cheverst, K., Davies, N., Mitchell, K. and Friday, A. 2000. Experiences of Developing and Deploying a Context-Aware Tourist Guide: The GUIDE Project. Proc. of Conf. Mobile Computing and Networking MOBICOM'00 (Boston, MA), 20-31.

Chipchase, J., Persson, P., Piippo, P. and Yamamoto, T. 2005. Mobile Essentials: Field Study and Concepting. Proc. of Conf. Designing for User Experience DUX'05 (San Francisco, CA), 57.

Cohen, S. 1995. Sounding out the City: Music and the Sensuous Production of Place. Transactions of the Institute of British Geographers 20(4), 434-446.

Crabtree, A., Benford, S., Greenhalgh, C., Tennent, P., Chalmers, M., and Brown, B. 2006. Supporting Ethnographic Studies of Ubiquitous Computing in the Wild. Proc. of Conf. Designing interactive Systems DIS '06 (University Park, PA), 60-69.

Crang, M. and Travlou, P. 2001. The City and Topologies of Memory. Environment and Planning D: Society and Space 19, 161-177.

Cresswell, T. 1999. Embodiment, Power and the Politics of Mobility: The Case of Female Tramps and Hobos. Transactions of the Institute of British Geographers 24(2), 175-192.

Curry, M. 2005. Toward a Geography of a World Without Maps: Lessons from Ptolemy and Postal Codes. Annals of the Association of American Geographers 95(3), 680-691.

Dodge, M. and Kitchin, R. 2004. Flying Through Code/Space: The Real Virtuality of Air Travel. Environment and Planning A 36, 195-211.

Dourish, P. 2006. Implications for Design. Proc. of Conf. Human Factors in Computing Systems CHI'06 (Montréal, Canada), 541-550.

Duruz, J. 2005. Eating at the Borders: Culinary Journeys. Environment and Planning D: Society and Space 23, 51-69.

Farish, M. 2005. Cities in Shade: Urban Geography and the Uses of Noir. Environment and Planning D: Society and Space 23, 95-118.

Ferguson, J. 2005. Seeing Like an Oil Company: Space, Security, and Global Capital in Neoliberal Africa. American Anthropologist 107(3), 377–382.

Fortunati, L. 2002. Italy: Stereotypes, True and False. In Katz, J. and Aakhus, M. (eds.), Perpetual Contact: Mobile Communication, Private Talk, Public Performance. Cambridge University Press.

Garrioch, D. 2003. Sounds of the City: The Soundscape of Early Modern European Towns. Urban History 30(1), 5-25.

Gaye, L., Mazé, R. and Holmquist, L. 2003. Sonic City: The Urban Environment as a Musical Interface. Proc. of Conf. New interfaces For Musical Expression NIME'03 (Montréal, Canada), 109-115.

Gety Study Group. 1998. Lovegety Perfect Manual. Hiten Publishing.

Goss, J. 1995. "We Know Who You Are and We Know Where You Live": The Instrumental Rationality of Geodemographic Systems. Economic Geography 71(2), 171-198.

Graham, S. 2005. Software-sorted Geographies. Progress in Human Geography 29(5), 562–580.

Graham, S. and Marvin, S. 2001. Splintering Urbanism: Networked Infrastructures, Technological Mobilities and the Urban Condition. Routledge.

Griswold, W., Shanahan, P., Brown, S., Boyer, R., Ratto, M., Shapiro, R. and Truong, T. 2004.
ActiveCampus – Experiments in Community-Oriented Ubiquitous Computing. IEEE Computer 37(10), 73-81.

Grengs, J. 2004. The Abandoned Social Goals of Public Transit in the Neoliberal City of the USA. City 9(1), 51-66.

Guano, E. 2006. Fair Ladies: The Place of Women Antique Dealers in a Post-Industrial Italian City. Gender, Place and Culture 13(2), 105-122.

Hayden, D. 1997. The Power of Place: Urban Landscapes as Public History. MIT Press.

Heath, C. and Luff, P. 1992. Collaboration and Control: Crisis Management and Multimedia Technology in London Underground Line Control Rooms. Journal of Computer Supported Cooperative Work 1(1), 24-48.

Hubbard, P. and Lilley, K. 2004. Pacemaking the Modern City: The Urban Politics of Speed and Slowness. Environment and Planning D: Society and Space 22, 273-294.

Hutchins, E. 1995. Cognition in the Wild. MIT Press.

Hutchinson, S. 2000. Waiting for the Bus. Social Text 18(2), 107-120.

Isaacs, E., Walendowski, A. and Ranganathan, D. 2002. Hubbub: A Sound-Enhanced Mobile Instant Messenger that Supports Awareness and Opportunistic Interactions. Proc. of Conf. Human Factors in Computing Systems CHI'02 (Minneapolis, MN), 179-186.

Ito, M. and Okabe, D. 2005. Intimate Connections: Contextualizing Japanese Youth and Mobile Messaging. In Harper, R., Palen, L. and Taylor, A. (eds.), The Inside Text: Social, Cultural and Design Perspectives on SMS. Springer

Ito, M., Okabe, D. and Anderson, K. 2009. Portable Objects in Three Global Cities: The Personalization of Urban Places. In Ling, R. and Campbell, S. (eds.), The Reconstruction of Space & Time: Mobile Communication Practices. Transaction Publishers.

Jacobs, J. 1961. The Death and Life of Great American Cities. Random House.

Jarvis, H. 2005. Moving to London Time: Household Co-ordination and the Infrastructure of Everyday Life. Time & Society 14(1), 133-154.

Jarvis, H., Pratt, A. and Wu, P. 2001. The Secret Life of Cities: The Social Reproduction of Everyday Life. Pearson Education.

Juhlin, O. and Weilenmann, A. 2001. Decentralizing the Control Room: Mobile Work and Institutional Order. Proc. of European Conf. Computer-Supported Cooperative Work ECSCW'01 (Bonn, Germany), 379-398.

Jungnickel, K. 2004. Ordinary Technology: A Methodological Study of Urban Mobility through a London Routmaster Bus. Proc. of UbiComp in the Urban Frontier Workshop at Conf. Ubiquitous Computing UbiComp'04 (Nottingham, UK), 27-28.

Kling, R., Olin, S. and Poster, M. (eds.) 1991. Posturban California: The Transformation of Orange County Since World War II. University of California Press.

Lamming, M., Eldridge, M., Flynn, M., Jones, C. and Pendlebury, D. 2000. Satchel: Providing Access to Any Document, Any Time, Anywhere. ACM Trans. Computer-Human Interaction TOCHI 7(3), 322-352.

Laurel, B. (ed.) 2003. Design Research: Methods and Perspectives. MIT Press.

Laurier, E. 2001. Why People Say Where They Are During Mobile Phone Calls. Environment and Planning D: Society and Space 19, 485-504.

Lefebvre, H. 1991. The Production of Space. Blackwell.

Lemon, A. 2000. Talking Transit and Spectating Transition: The Moscow Metro. In Berdahl, D., Bunzl, M. and Lampland, M. (eds.), Altering States: Ethnographies of Transition in Eastern Europe and the Former Soviet Union. University of Michigan Press.

Levine, J., Vinson, A. and Wood, D. Subway Behavior. 1973. In Birenbaum, A. and Sagarin, E. (eds.), People in Places: The Sociology of the Familiar. Praeger Publishers.

Lilley, K. 2004. Mapping Cosmopolis: Moral Topographies of the Medieval City. Environment and Planning D: Society and Space 22, 681-698.

Lofland, L. 1973. A World of Strangers: Order and Action in Urban Public Space. Basic Books.

Low, S. 1996. Spatializing Culture: The Social Production and Social Construction of Public Space in Costa Rica. American Ethnologist 23(4), 861-879.

Lynch, K. 1960. The Image of the City. MIT Press.

Mackenzie, A. 2005. Untangling the Unwired: Wi-Fi and the Cultural Inversion of Infrastructure. Space and Culture 8(3), 269-285.

Maines, D. 1977. Tactile Relationships in the Subway as Affected by Racial, Sexual, and Crowded Seating Situations. Environmental Psychology and Nonverbal Behavior 2(2), 100-108.

Maines, D. 1992. Theorizing Movement in an Urban Transportation System by Use of the Constant Comparative Method in Field Research. The Social Science Journal 29(3), 283-292.

Mainwaring, S., Anderson, K. and Chang, M. 2005. Living for the Global City: Mobile Kits, Urban Interfaces, and Ubicomp. Proc. of Conf. Ubiquitous Computing UbiComp'05 (Tokyo, Japan), 269-286.

Marcus, G. 1995. Ethnography in/of the World System: The Emergence of Multi-Sited Ethnography. Annual Review of Anthropology 24, 95-117.

Maspero, F. 1994. Roissy Express. Verso.

Massey, D. 1993. Power-geometry and a Progressive Sense of Place. In Bird, J., Curtis, B., Putnam, T., Robertson, G. and Tickner, L. (eds.), Mapping the Futures: Local Cultures, Global Change. Routledge.

Munn, N. 1996. Excluded Spaces: The Figure in the Australian Aboriginal Landscape. Critical Inquiry 22(3), 446-465.

del Negro, G. 2004. The Passeggiata and Popular Culture in an Italian Town: Folklore and the Performance of Modernity. McGill-Queen's University Press.

Nilsson, M. and Hertzum, M. 2005. Negotiated Rhythms of Mobile Work: Time, Place, and Work Schedules. Proc. of Conf. Supporting Group Work GROUP'05 (Sanibel Island, Florida), 148-157.

O'Hara, K., Perry, M. and Lewis, S. 2003. Social Coordination around a Situated Display Appliance. Proc. of Conf. Human Factors in Computing Systems CHI'03 (Ft. Lauderdale, FL), 65-72.

Okabe, D. and Ito, M. 2005. Keitai in Public Transportation. In Ito, M., Okabe, D. and Matsude, M. (eds.), Personal, Portable, Pedestrian: Mobile Phones in Japanese Life. MIT Press.

Paulos, E. and Goodman, E. 2004. The Familiar Stranger: Anxiety, Comfort, and Play in Public Places. Proc. of Conf. Human Factors in Computing Systems CHI'04 (Vienna, Austria), 223-230.

Paulos, E. and Jenkins, T. 2005. Urban Probes: Encountering Our Emerging Urban Atmospheres. Proc. of Conf. Human Factors in Computing Systems CHI'05 (Portland, OR), 341-350.

Perry, M., O'Hara, K., Sellen, A., Brown, B. and Harper, R. 2001. Dealing with Mobility: Understanding Access Anytime, Anywhere. . ACM Trans. Computer-Human Interaction TOCHI 8(4), 323-347.

Pitkin, D. 1993. Italian Urbanscape: Intersection of Private and Public. In Rotenberg, R. and McDonogh, G. (eds.), The Cultural Meaning of Urban Space. Bergin & Garvey.

Politis, G. 1996. Moving to Produce: Nukak Mobility and Settlement Patterns in Amazonia. World Archaeology 27(3), 492-511.

Pound, E. 2003. Poems and Translations. Library of America.

Robertson, S. 2007. Visions of Urban Mobility: the Westway, London, England. Cultural Geographies 14, 74-91.

Rodman, M. 1993. Beyond Built Form and Culture in the Anthropological Study of Residential Community Spaces. In Rotenberg, R. and McDonogh, G. (eds.), The Cultural Meaning of Urban Space. Bergin & Garvey.

Russell, D. and Gossweiler, R. 2001. On the Design of Personal & Communal Large Information Scale Appliances. Proc. of Conf. Ubiquitous Computing UbiComp'01 (Atlanta, Georgia, USA), 354-361.

Ryman, G. 1998. 253. St. Martin's Griffin.

Schaeffer, K. and Sclar, E. 2003. The Automobile Era: A Cultural Analysis. In Root, A. (ed.), Delivering Sustainable Transport: A Social Science Perspective. Pergamon.

Scott, J. 1999. Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed. Yale University Press.

Sheller, M. 2004. Mobile Publics: Beyond the Network Perspective. Environment and Planning D: Society and Space 22, 39-52.

Sheller, M. and Urry, J. 2006. The New Mobilities Paradigm. Environment and Planning A 38, 207-226.

Snow, D. and Anderson, L. 1987. Identity Work among the Homeless: The Verbal Construction and Avowal of Personal Identities. American Journal of Sociology 92(6), 1336-1371.

Stevens, Q. 2006. The Shape of Urban Experience: A Reevaluation of Lynch's Five Elements. Environment and Planning B: Planning and Design 33, 803-823.

Suzuki, P. 1976. Germans and Turks At Germany's Railroad Stations: Interethnic Tensions in the Pursuit of Walking and Loitering. Journal of Contemporary Ethnography 4(4), 387-412.

Swerdlow, M. 1998. Underground Woman: My Four Years as a New York City Subway Conductor. Temple University Press.

Tanenbaum, S. 1995. Underground Harmonies: Music and Politics in the Subways of New York. Cornell University Press.

Thrift, N. and French, S. 2002. The Automatic Production of Space. Transactions of the Institute of British Geographers 27(3), 309–335.

Urry, J. 2004. Connections. Environment and Planning D: Society and Space 22, 27–37.

Verran, H. 1998. Re-imagining Land Ownership in Australia. Postcolonial Studies 1(2), 237–254.

Vertesi, J. 2008. Mind the Gap: The London Underground Map and Users' Representations of Urban Space. Social Studies of Science, 38(1), 7–33.

Williams, A. 2006. Trust and Driving in Bangkok Traffic. Proc. of Betwixt: Technology and Transitional Spaces Workshop (Irvine, CA).

Willis, P. 2003. Ethnography of Motor-Bike Boys. In Root, A. (ed.), Delivering Sustainable Transport: A Social Science Perspective. Pergamon.

Zimmerman, J., Forlizzi, J. and Evenson, S. 2007. Research Through Design as a Method for Interaction Design Research in HCI. Proc. of Conf. Human Factors in Computing Systems CHI'07 (San Jose, CA), 493–502.

43: http://the43.blogspot.com/

Arts Council England:
http://www.artscouncil.org.uk/pressnews/press_detail.php?browse=recent&id=833

APTA: http://www.apta.com/

Arduino: http://www.arduino.cc/en/Main/ArduinoBoardDiecimila/

Bad Oyster: http://www.badoyster.co.uk/wallets.htm

Boing Boing: http://www.boingboing.net/

Cast Off: http://www.castoff.info/

Claritas: http://www.claritas.com/

Creative Commons: http://creativecommons.org/

GPS Drawing: http://www.gpsdrawing.com/

Hole-In-Space: http://www.ecafe.com/getty/HIS/

London Underground Tube Diary: http://london-underground.blogspot.com/

Londonist: http://londonist.com/

Networked_Performance: http://transition.turbulence.org/blog/

OCTA: http://www.octa.net/

Office for National Statistics: http://neighbourhood.statistics.gov.uk/dissemination/

OpenStreetMap: http://wiki.openstreetmap.org/index.php

Oyster Watch: http://www.flickr.com/photos/anniemole/2740568998/

Smoke: http://home.btconnect.com/smoke/

TFL Art: http://www.tfl.gov.uk/tfl/corporate/projectsandschemes/artmusicdesign/pfa/

TFL Oyster Facts:
http://www.tfl.gov.uk/assets/downloads/corporate/Oyster_Fact_Sheet_Feb_2008.pdf

TFL Oyster Pamphlet: http://www.tfl.gov.uk/assets/downloads/tickets/get-the-most-out-of-oyster.pdf

Thin Cities: http://thincities.tfl.gov.uk/oyster-wallets.php

Tube Challenge: http://en.wikipedia.org/wiki/Tube_Challenge/

Tube Gossip: http://www.themanwhofellasleep.com/gossip.html

US Census Bureau: http://quickfacts.census.gov/qfd/states/06/06059.html

We Make Money Not Art: http://www.we-make-money-not-art.com/