Intersecting Spaces: Wi-Fi, public space and accessing the in-between

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ABSTRACT
The availability of wireless internet in an urban setting presents new possibilities for the ways in which inhabitants can interact with the city and its public spaces. Yet, the presence of Wi-Fi can be difficult to discern in an urban setting. It slips by largely unnoticed because of an apparent lack of physical infrastructure. This paper outlines the early stages of a PhD project in which emerging technologies have demanded innovative multiple approaches to the study of human activity at the intersection of the physical and digital. The ethnographic study highlights the path that led to a methodological breakthrough and development of an online tool for the collection and visualization of text and images posted to the social networking website, Twitter. It continues with a brief discussion of some initial challenges and early findings from participant observations which, in line with recent theoretical discourse, were necessarily conducted in both on and offline spaces, introducing Twitter as a supporting research tool. The experience suggests that experimenting with combined online and offline ethnographic methods in this way might open possibilities for new understandings of an urban public that exists in neither digital nor physical worlds - rather, somewhere in-between.

Keywords
Urban geography, social networking, ethnography, methodology, Twitter, Wi-Fi, wireless, public space.

INTRODUCTION

This research addresses the question of how we are beginning to know our cities and ourselves differently by virtue of Wi-Fi. Engaging directly with the materiality of the technology and its contemporary modes, this study is conducted through an analysis of the use of openly accessible Wi-Fi networks in urban public spaces. It uses photo-elicitation and visual methods along with participant-observation, to explore the possibilities presented by wireless technologies for new understandings and experiences of public space. By considering the everyday activities that take place in digital networks as well as on city streets, the study aims to provide a new lens through which we may conceptualize contemporary cities and the geographies of everyday life. Moving beyond utopian claims of what space might potentially become if the city were somehow blanketed in a 'ubiquitous', always-accessible digital layer; the research negotiates a complex *existing* urban tapestry that should be defined by its connections and disconnections, planned and unplanned encounters, at the intersection of the digital and physical. Certainly, the urban public does not exist solely in physical space, and undeniably exists beyond the digital realms of Facebook and Twitter, so it must lie somewhere in-between; *in streets and on screens* as Kurt Iveson (2007) puts it.

From the recent 'relational turn' (Jones, 2009) within the social sciences grew a need to (re)conceptualise terms like 'public space' as less restrained by physical boundaries and more complexly intertwined and changing digital spaces. The city and its public spaces are now characterized by their multiple, hybrid and contingent realities; comprised of bodies, networks, objects and flows of data. The result is a new urban public spatial realm that is neither physical nor digital, rather, an intricate and relational combination of the two. It is the question of how to access these *in-between* spaces that presents new academic challenges, especially with regard to appropriate research methodologies. The research introduced here might be considered a response to calls by/for geographers to move beyond simply reframing theoretical discussions in terms of 'practice' and 'performance' to embrace methodological pluralism and experimentation, teasing out "a certain amount of methodological naivety" (Latham, 2003: 2012).

This paper takes shape from the early stages of the author's PhD research and highlights the path that led to the development of an online tool for the collection and visualization of text and images posted to the increasingly popular social networking website, Twitter. It presents some initial challenges and findings from participant observations which, in line with recent theoretical discourse, were necessarily conducted in both on and offline realms. To accompany the established tradition of participant observation, there arose a need to develop a tool for not only observing and visualizing online data that is posted from free Wi-Fi in physical public spaces to social networks such as Twitter, but one that gives new meaning and significance to the notion of communal space. The result is a fascinating new perspective into everyday lives lived at the intersection of digital and physical spaces.

Wi-Fi and the invisible publics

The presence of Wi-Fi can be difficult discern in an urban setting. It can slip by largely unnoticed because of an apparent lack of physical infrastructure and a perception that it is most likely to be used from indoors at home, work or from other typically 'private' settings. Much of the existing research on public Wi-Fi is focused specifically on the social interactions that it facilitates and its effect on the sociality of co-present others (Hampton,

Livio, & Sessions, in press). Others have directed their attention towards thinking about Wi-Fi infrastructures (Adrian Mackenzie, 2005) and the opportunities it may present to municipalities (Francis, Nils, Thor Gunnar, & Rima, 2006).

In geography, Paul Torrens (2008) has begun to explore the geographical coverage of Wi-Fi taking on the considerably sized task of mapping and visualizing the Wi-Fi signals across an entire city, Salt Lake City, Utah. The results are presented as beautiful images that resemble a topographical map which show a 'cloud' of wireless data seamlessly floating atop the city's built form. Using just a laptop and a Wi-Fi capable mobile phone, Dan Hill (2008a, 2008b) used a similar technique, albeit on a smaller scale, to map the form of the wireless signal strength in an Australian public library. Although some evidence suggests that Wi-Fi might reinforce socio-spatial interaction (Schmidt & Townsend, 2003), very few, if any studies on Wi-Fi have considered the possibilities of changes to spatial behavior (Torrens, 2008) or conceptions of 'the public' and public space (Willis, 2008). What is clear, however, is that Wi-Fi does not conform to existing physical or architectural boundaries (Forlano, 2008).

Public spaces have traditionally been imagined as specific sites, where multiple meanings are ascribed, interpreted and adopted according to the physical setting, the built environment, and the interactions between people taking place in the space - the social context. For Willis (2007), technologies such as Wi-Fi contribute toward the intersecting of physical and digital spaces. Instead of thinking of space confined by physical boundaries, Willis (2007: 168) argues that public spaces now require a framework which conceptualizes them in terms of "articulated flows in networks of social encounters and situations". Using this conceptual model, an openly accessible public Wi-Fi access point presents a myriad of new possibilities of the ways in which social lives may be performed in (and beyond) physical public space. Without necessitating physical movement through space, free Wi-Fi affords access to new forms of information and existing social networks no longer separated by distance, only by a switch in a network connection (Willis, 2008).

The intersection of digital space and physical space facilitated by mobile and wireless technologies presents new possibilities and sets of relationships that would be difficult to understand and interpret under a more traditional framework for understanding public spaces (see Arendt, 1958; Lefebvre, 1991; Sennett, 1993; Zukin, 1995 etc.). These frameworks have considered the contested nature of space due to the multiple meanings ascribed to them and the competing interests of the public and private realms; however, they cannot sufficiently account for the new possibilities for social interaction and informational exchange facilitated by Wi-Fi and open access to an infinite number of online spaces.

Wi-Fi and the digital public

The research discussed here is intentionally not limited to the study of municipal Wi-Fi initiatives (Bar & Park, 2005; Middleton, 2007), cafe hotspots (Gupta, 2004; Hampton & Gupta, 2008) or wireless community networks (Forlano, 2006; Powell, 2008). Rather, it aims to explore more broadly how openly accessible Wi-Fi is being used in urban public space as a part of everyday life. Personal experience of searching for and using public Wi-Fi confirms that it is anything but pervasive, ubiquitous, "anytime, anywhere" (Forlano, 2008). I have frantically checked email from unsecured networks on the driveways of residential houses, used a public park's free Wi-Fi from the warmth of a neighboring café, and paced up and down a city street supposedly blanketed by city-wide access in an unsuccessful attempt to find any usable signal whatsoever.

In contrast to the impression that might be taken upon first glance of Torrens' (2008) omnipresent cloud of Wi-Fi signal which looms above Salt Lake City's streets, the majority of these networks are secured and inaccessible to the general public. Even in some European cities renowned for the ease in which one can find a public place to get online, finding and using open Wi-Fi as one might use other public amenities such as a restroom or water-fountain is seldom unproblematic. "Mobilities do not always simply move", Mackenzie (2006: 138) asserts, referring to the fixed nature of wireless networks that always require a physical location from which the signal is broadcast. On the one hand, Wi-Fi does not adhere to physical boundaries; unsecured private wireless networks can spill out into the streets (often inadvertently), and extend their range beyond the café or home from which they are broadcast into public space. On the other hand, Wi-Fi is very much constrained by the physical environment; it has difficulty passing through physical objects, concrete walls, hills, and even thick leafy trees as an expedition installing a meshed network in a Toronto public park recently taught me.

In light of the above, this research set out to explore new ways of visualizing the largely invisible spaces presented by open wireless networks in public space. Where Torrens (Torrens, 2008) used geographic information systems (GIS) to map an ominous cloud of Wi-Fi layered atop an entire city; this project could be considered an attempt at peering into the cloud's shadow, under the blanket layer of radio waves. By way of a fine-grained analysis of Wi-Fi use at an individual level, at street level, the research illuminates new ways of seeing and understanding social life as it exists beyond the bounded physical spaces of the city.

Understanding the complex geographies that emerge under the conditions presented by free Wi-Fi should not be limited to analyses of coffee shops, municipal networks, or public squares. While terms like 'ubiquitous' and 'pervasive' may evoke visions of an always on, digitally accessible urban environment; in reality, the city is comprised of messy communications and networks of digital and physical, connection and

disconnection. Each individual's navigation *in-between* these spaces represents an expression of social life as a unique performance in public space. Because 'public' can potentially be found in online realms as much as it can be found in physical space, it is important to consider the ways online spaces might reveal themselves in traditional material public space such as streets, parks, plazas, cafes. More importantly, this demands the question of what exactly might be the most appropriate research methodologies for understanding social and spatial interactions at the intersection of the physical and digital publics?

Challenges of observing digital spaces

In an early research proposal, the intention was to identify suitable participants for the study by observing users of Wi-Fi in public spaces in Toronto and New York City known for their popular and freely accessible networks. These spaces included parks and squares with free Wi-Fi access provided by councils and community wireless groups, as well as cafes, libraries and other less formal public spaces where unsecured Wi-Fi access can be inadvertently found. An initial goal was to explore notions of public space by way of participation and observation in these spaces in addition to in-depth interviews with Wi-Fi users present there. Additionally, participants in the study were invited to take photographs from their phone, laptop, digital camera or a mobile device of their choice and share them with the researcher at times they found themselves connected to (or searching for) an open or publicly accessible Wi-Fi network.

The act of taking a photograph was intended to help both researcher and participant find new ways to discuss and explore the experience of being online in public (or trying to unsuccessfully). In the same way the theory now considers urban space relational, and demands conceptions of fluidity, networks and flows; the photograph represents an engagement with subjective, unstable, changing spaces in a participant's everyday life. Of course, it cannot tell an entire story, but it can evoke new emotions and is useful for tracing a network of actors. Because the photograph was taken at the very moment a participant was connected to public Wi-Fi it allows a new view into the spaces that open Wi-Fi networks are being used from. The use of photography provided an alternate means of accessing spaces at the intersection of the digital and the physical that pure observation or interviews could not.

While the proposed method of approaching participants face-to-face from public spaces was not abandoned, it became clear that it required some significant modification. Although some participants were recruited and successful interviews and photo elicitation were accomplished as planned, I quickly began to realize that useful data could be captured directly from digital realms. Where observations in purely in physical space had failed to identify many Wi-Fi users, even at well-known high-traffic locations, subsequent analysis of network statistics told me that they *were* in fact there, just not clearly visible to a researcher set on identifying individual participants as people hunched over open laptop computers.

For example, during a typical three hour period observing the use of free Wi-Fi in Toronto's Yonge-Dundas Square, I might observe only two or three users sitting working at open laptops. However, access to the network statistics told a different story. The network control panel regularly informed me that twenty or more users were connected to the network, actively browsing the web, making VoIP calls, downloading and uploading data. Wi-Fi users were indeed present in the public spaces I had been lurking; on iPhones and laptops, Kindles and PSPs, it was my aged method of participant observation situated purely in physical space that was failing to identify users of technologies that are so finely engrained (almost to the point of invisibility) into our practices of urban everyday life.

Wi-Fi capable devices are no longer limited to easily identifiable laptops as they once were. It is no longer sufficient to assume that an open laptop in the proximity of a Wi-Fi network is the only means of identifying the presence of users. Recent studies confirm that public Wi-Fi networks are seeing a dramatic increase in users on handheld mobile devices (Meraki, 2009). Moreover, it turns out that mobile users *prefer* to use free Wi-Fi on their portable device, even when costly mobile data is an available alternative (Devicescape, 2009). Wi-Fi even further complicates attempts of physical observation as it is less constrained by physical boundaries. For example, users of a park's public network might connect to the network from outside the park in neighbouring cafes, on street-corners, in a cab or even passing through by bicycle. A user might log on for less than a minute, just long enough to post a blog comment, download an email or send a 'tweet'. On any given day spent observing, I realized that I was only able to visually identify a very small percentage of the people actually connecting to a network. A new approach was required.

Twitter as a digital public?

It became apparent from my field work and data analysis, that effective use of participant observation as a method for this study would require participation in both the physical and *digital* worlds I sought to understand. My understanding of the literature had already come to terms with the two as inseparable, relational, and under a process of constant reactivation; city spaces in an infinite state of becoming, as Thrift puts it, "[t]here is no last word" (2008: 114). While observing Wi-Fi use from parks, cafes and other physical public spaces remained central to the study, there was an obvious need to access more of the *in-between* spaces. As planned, I was observing the use of Wi-Fi, yet I was limited by what I could see in front of me in any given public space.

Daily, an abundance of useful data in the form of images and text is directly uploaded from physical public space; parks, cafes, libraries, streets, airports and bars etc. Unlike online news or blogs, made possible by the

presence of Wi-Fi and other mobile wireless internet technologies, visual content uploaded to social websites such as Facebook and Twitter is often posted to the web instantaneously, and in many cases, directly from public space. In particular, for many images that can be specifically identified as sent directly from Wi-Fi in public, the image and related text represent a fascinating moment where the user has engaged with a space that exists both digitally and physically.

At the same time the rest of the world was coming to terms with its burgeoning popularity, Twitter also became of particular interest to the research as an online space that might be suitable for observing a public. This move came naturally, as is it was already established as an indispensible information and communication tool in my own daily life. BBC reporter L.J. Rich likens Twitter's humble beginnings in to that of a "small town hall's informal message board – the community newsletter" where one might "pop in, read bite-sized voyeuristic nuggets of inconsequential information, gossip with friends, then pop out" (Rich, 2009). Conversely, Toronto Psychogeographer Shawn Micallef (2009) laments the service's drastic surge in popularity in early 2009 arguing this has resulted in unnecessary 'noise' caused by spam and people 'tweeting' meaningless updates like what they happen to be having for lunch. Even so, 'noise' aside, Micallef (2009) has persevered with Twitter and believes that frequent use the service and a carefully selected list of individuals worth 'following' allows him to get a good sense of what is going on in the city around him:

> *"Like Facebook, you choose who you follow — or, more accurately, listen to — as you get to curate your own Twitter experience. Many of the people I subscribe to are from Toronto, and throughout the day I get a sense of what's going on in the city, as if I'm hanging my head out the window, overhearing a slice of it."* (Micallef, 2009)

In January 2009, Micallef (2009) learned of a blackout in the west side of Toronto as tiny stories of the power cut appeared in real-time to his iPhone while he was wandering the trails of the Don Valley far away in the eastern reaches of the city. Humorously, he compares the sensation of listening to the city using the service to Obi-Wan Kenobi's statement first *Star Wars (1977)*, in the part where the Empire has destroyed Princess Leia's home planet. "I feel a great disturbance in the Force, as if millions of voices suddenly cried out in terror, and were suddenly silenced. I fear something terrible has happened" (Lucas, 1977).

My own perceptions of Twitter share much in common with Micallef's. Like more traditional understandings of urban publics, I can listen in to the events unfolding around me, choose which conversations to participate in, or simply sit back and passively consume information that interests me. It is not uncommon for Twitter's users to have heard about breaking news long before it is picked up by more traditional media outlets. News is spread by word of mouth and one can communicate with close friends and strangers alike. As an example, I began to follow certain Torontonians months before I physically set foot there, gradually moving myself to the new city; digitally first, then physically when I arrived at the Pearson International Airport two months later. Further, there are few technologies that can allow fans to communicate so freely and directly with celebrities and notable public figures like Twitter allows. Upon arrival in Toronto I was surprised to find that the city's mayor, David Miller, was a frequent user of the service and that it was possible for me to personally communicate with him in real-time.

Having an ear on Twitter is a lot like being outside in public in a traditional/physical sense. One could liken it to sitting watching life go by from a park bench. Certainly, it feels contrary to the familiar arguments of the use of mobile phones and iPods in public spaces where users are said to be closing themselves off from their surroundings into a personal private bubble (Bull, 2006). There is something about the sense of community and broader social interactions Twitter facilitates that just feels, at least in part, how a good public space should. There is something about the ability to pick up on what is happening around you, among strangers and close friends alike, which feels true to many established conceptualizations of publics and public spaces.

Although online social research has proliferated over the past few years (boyd, 2008), Twitter has been given little attention. As a tool for experimenting with online participatory techniques, it is ripe with possibilities. According to the PEW Internet and American Life Project, Twitter users are young (median age of 31), ethnically diverse, primarily urban dwellers who are more likely to connect wirelessly to the internet (Lenhart & Fox, 2009). Lenhart and Fox conclude:

> *"Twitter users engage with news and own technology at the same rates as other internet users, but the ways in which they use the technology – to communicate, gather and share information – reveals their affinity for mobile, untethered and social opportunities for interaction. Moreover, Twitter as an application allows for and enhances these opportunities, so it is not so surprising that users would engage in these kinds of activities and also be drawn to an online application that expands those opportunities".* (Lenhart & Fox, 2009: 5)

Open Wi-Fi hotspots scattered throughout our cities allow for pockets of unrestricted public access to digital spaces. These pockets of access to online realms from public space present new possibilities for serendipitous encounters, access to information, new and existing social networks through a simultaneous engagement in digital and physical worlds. It is possible for movements within physical city space to be dictated by these open points of digital access.

Increasingly it is commonplace for digital images to be posted directly to social websites such as Twitter from free/open Wi-Fi networks, even when paid mobile data services are an available alternative. Not only do social websites such as Twitter allow the researcher to search for relevant images and text, but they provide a relatively unintrusive means of initiating discussion with members of the public; an alternative to approaching participants often limited to face-to-face interaction in physical space. Sadly, at present, after being searchable on Twitter for only a few days, this rich data source then disappears from the researcher's gaze.

Conversations and Visualizations on Twitter

Because content posted to Twitter is largely done so by mobile and wireless devices, it can feel more instantaneous and 'of the moment' than other online content such as blogs. Rather than capturing pictures or thoughts to blog about or post to the web later, Twitter users are frequently sharing information and updates on their daily life in real-time. In a way, this allows the researcher to participate in life as it unfolds, much like a 'go-along' (Kusenbach, 2003) aims to do in more established ethnographic studies.

Photographs posted in this manner became of particular interest to the research. Although Twitter does not facilitate posting images directly to the website, dozens mobile phone applications and alternative third party websites such as TwitPic and Yfrog are popular and allow users the ability to post images from their laptops or mobile devices directly to their Twitter accounts. A problem encountered when viewing this data is that, in many cases, the images are displayed quite separately from the text, often on entirely different web-pages. Although Twitter does allow searches revealing 'tweets' that include links to images, because these images are uploaded via third party applications, in many cases they cannot be viewed alongside the text that accompanies them. Other problems with this method relate to capturing and storing the data in such a way that it can be retrieved and viewed at a later date.

Presently, Twitter only allows searches to go back week or two, or a few hundred results, before the information becomes unsearchable. There was a need for a research tool to capture the information as it was posted to the site. Twitter's search engine will provide an RSS feed for specific searches, so it was possible to monitor the desired images and text as they were archived to an RSS feed reader. However, for the purpose of organizing the data for later analysis, there was a clear need to take Twitter's application programming interface (API) and develop an application that could search Twitter for the desired information *and* save the data into an external database in real-time. Moreover, the application would be able to take any images that accompanied a 'tweet' posted from public Wi-Fi and display them alongside one another in a visually appealing manner. Essentially, a search of Twitter's posts would return a stream of images, rather than simply pages of text and associated hyperlinks.

Although still in the early stages of its development, Twitter's API was modified in such a way that searches for posts mentioning the use of Wi-Fi in public can be displayed in an attractive visual wall of information. Transformed from posts restricted to 140 characters of text, each image and its related 'tweet' began to present a unique view into everyday lives as they are being performed at the intersection of digital and physical publics.

In the context of the research, an experimental ethnography of sorts, the most important feature was the ability to respond because the images and text displayed have been posted to Twitter. Relevant search results can be quickly identified and incorporation of Twitter's reply function ensures they are easily responded to if necessary. Personal messages on Twitter do not demand the same attention as an email or direct message. Short replies asking about use of the Wi-Fi network they were using when the image was taken were nearly always greeted with a warm reply. Many discussions voluntarily left the limitations of Twitter's 140 characters and became full-blown, in depth email interviews/conversations.

CONCLUSIONS

When one attempts to theorize 'relational' space, public/private, digital/physical, "suddenly, what happens between" begins to matter most (van Loon, 2002: 90). Using traditional observational techniques, the research at first struggled to identify users of public Wi-Fi in an urban setting. It became clear that simply being on the lookout for people with open laptops is no longer a sufficient indicator for studies of the use of public Wi-Fi. Wi-Fi is increasingly used from handheld devices. The small, mobile nature of these phones and PDAs and great extent they are now used in public makes it difficult to assess which activities, online or offline, are taking place.

In this project, early attempts at field work highlighted the inadequacy of using physical observation as the sole method of data collection and analysis. Where observations in physical space are insufficient, largely due to the invisibility and embeddedness of activity using these devices in everyday urban life, Twitter became a useful tool for tracking down Wi-Fi users and observing their presence online. Not only were Twitter's users found to be regularly using Wi-Fi in public, but the ease of approaching them to interview online meant the research was no longer restricted to observations of Wi-Fi use in a handful of specific public places where its presence was already known. Rather, connections to Wi-Fi from public were sporadic, imaginative and unpredictable. Publicly accessible Wi-Fi was being used in the most unlikely of places and a response was now only a brief 140 character message away.

The images posted to Twitter from public space began to make visible the largely invisible publics taking place in our cities, but beyond the physical boundaries of the built

environment. For this project, Twitter quickly became an essential supporting research tool although the ways in which the service is used are rapidly evolving. At the very least, the research experience discussed in this paper suggests that experimenting with combined online and offline ethnographic methods in this or similar ways will open new possibilities and facilitate new understandings of an urban public that exists in neither digital nor physical worlds - rather, somewhere in-between.

REFERENCES

Arendt, H. (1958). *The Human Condition*. Chicago: University of Chicago Press.

Bar, F., & Park, N. (2005). *Municipal Wi-Fi Networks: The Goals, Practices, and Policy Implications of the US Case*. Paper presented at the First Transatlantic Telecom Industry Forum.

boyd, d. (2008). *Taken out of Context: American Teen Sociality in Networked Publics*. Unpublished PhD Dissertation, University of California - Berekeley, Berkeley.

Bull, M. (2006). Investigating the Culture of Mobile Listening: From Walkman to iPod. In K. a. B. Ohara, B. (Ed.), *Consuming Music Together: Social and Collaborative Aspects of Music Consumption Technologies* (pp. 131-149). Dordrecht: Springer.

Devicescape. (2009). Devicescape Wi-Fi Report: Original Research on Wi-Fi Usage and Trends. Quarter 1, 2009 Retrieved 5th November, 2009, from http://www.devicescape.com/assets/docs/ds-wfr-1Q-09.pdf

Forlano, L. (2006). Activist Infrastructures: The role of Community Wireless in Authenticating the City. *Journal, 2006*(1). Retrieved from http://www.eastbound.info/journal/2006-1/

Forlano, L. (2008). Anytime? Anywhere?: Reframing Debates Around Municipal Wireless Networking. *Journal, 4*(1). Retrieved from http://ci-journal.net/index.php/ciej/article/view/438/401

Francis, J. C., Nils, E., Thor Gunnar, E., & Rima, V. (2006). *Business opportunities of open broadband wireless access networks*. Paper presented at the Proceedings of the 2006 workshop on Broadband wireless access for ubiquitous networking.

Gupta, N. (2004). *Grande Wi-Fi: Understanding What Wi-Fi Users Are Doing in Coffee-Shops*. Unpublished Masters Thesis, Massachusetts Institute of Technology, Massachusetts.

Hampton, K., & Gupta, N. (2008). Community and social interaction in the wireless city: Wi-Fi use in public and semi-public spaces. *New Media & Society, 10*(6), 831-850.

Hampton, K., Livio, O., & Sessions, L. (in press). The Social Life of Wireless Urban Spaces: Internet Use, Social Networks, and the Public Realm. *Journal of Communication*.

Hill, D. (2008a). Post-occupancy evaluations of public Wi-Fi. Retrieved 1st November, 2009, 2009, from http://www.cityofsound.com/blog/2008/08/post-occupancy.html

Hill, D. (2008b). Wi-Fi Structures and People Shapes. *City of Sound* Retrieved 1st November, 2009, 2009, from http://www.cityofsound.com/blog/2008/11/wi-fi-structure.html

Iveson, K. (2007). *Publics and the City*. Malden: Blackwell.

Jones, M. (2009). Phase space: geography, relational thinking, and beyond. *Progress in Human Geography, 33*(4), 487-506.

Kusenbach, M. (2003). Street Phenomenology: The Go-Along as Ethnographic Research Tool. *Ethnography, 4*(3), 455-485.

Latham, A. (2003). Research, performance, and doing human geography: some reflections on the diary-photograph, diary-interview method. *Environment and Planning A, 35*(11), 1993-2017.

Lefebvre, H. (1991). *The Production of Space*. Oxford Blackwell.

Lenhart, A., & Fox, S. (2009). *Pew Internet Project Data Memo*. Washington, DC: Pew Internet and American Life Project.

Lucas, G. (Writer) (1977). Star Wars. United States: 20th Century Fox.

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

Mackenzie, A. (2006). From Cafe to Park Bench: Wi-Fi and the technological Overflows in the City. In M. Sheller, and Urry, J. (Ed.), *Mobile Technologies of the City*. Abingdon: Routledge.

Meraki. (2009). Meraki Wireless Census Reveals Bold Shifts in Type and Number of Wireless Devices in Use in North America. Retrieved October 5th, 2009, 2009, from http://meraki.com/press-releases/2009/08/18/meraki-wireless-census-reveals-bold-shifts-in-type-and-number-of-wireless-devices-in-use-in-north-america/

Micallef, S. (2009). Twitterramma. *Journal*. Retrieved from http://www.eyeweekly.com/blog/post/50084

Middleton, C. (2007). *A Framework for Investigating the Value of Public Wireless Networks*. Paper presented at the 35th research Conference on Communication, Information and Internet Policy.

Powell, A. (2008). WiFi Publics: Producing Community and Technology. *Information, Communication & Society, 11*(8), 20.

Rich, L. J. (2009). Don't be bitter as Twitter gets fitter. *Journal*. Retrieved from http://news.bbc.co.uk/2/hi/technology/7888115.stm

Schmidt, T., & Townsend, A. (2003). Why Wi-Fi Wants to be Free. *Communications of the Association for Computing Machinery (Publication of the ACM), 46*(5), 47-52.

Sennett, R. (1993). *The Fall of Public Man*. London: Faber and Faber.

Thrift, N. (2008). *Non-Representational Theory. Space, Politics, Affect*. Abingdon: Routledge.

Torrens, P. (2008). Wi-Fi Geographies. *Annals of the Association of American Geographers, 98*(1), 59-84.

van Loon, J. (2002). Social Spatialization and Everyday Life. *Space and Culture, 5*(2), 88-95.

Willis, K. (2007). Sensing Place - Mobile and Wireless Technologies in Urban Space. In L. a. M. Frers, L. (Ed.), *Encountering Urban Places: Visiual and Material Performances in the City*. Aldershot: Ashgate.

Willis, K. (2008). Places, Situations and Connections. In A. Aurigi & F. De Cindio (Eds.), *Augmented Urban Spaces: Articuating the Physical and Electronic City* (pp. 9-26). Aldershot: Ashgate.

Zukin, S. (1995). *The Cultures of Cities*. Cambridge: Blackwell.