Geoforum 43 (2012) 1266–1275

Contents lists available at SciVerse ScienceDirect

Geoforum

journal homepage: www.elsevier.com/locate/geoforum

# Location-based services, conspicuous mobility, and the location-aware future

Matthew W. Wilson

*Department of Geography, University of Kentucky, 1457 Patterson Office Tower, Lexington, KY 40506, United States*

ARTICLE INFO

*Article history:*
Received 21 July 2011
Received in revised form 21 March 2012
Available online 17 April 2012

*Keywords:*
Location-based services
Mobility
Critical GIS
Where 2.0
Technology
Urban

ABSTRACT

The production and consumption of geographic information is becoming a more mobile practice, with more corporate actors challenging the traditional stronghold of Esri- and government-based geospatial developments. What can be considered a geographic information system has expanded to include web-based technologies like Google Earth/Maps, as well as more recent developments of Microsoft's Bing Maps and the mobile version of ArcGIS available for the iPhone. In addition to these developments, a discursive shift toward 'location' is occurring across the Internet industry. Location has become the new buzzword for social-spatial strategies to target consumers. As reported in 2010, venture capitalists have, since 2009, invested $115 million into 'location start-ups' – software companies that provide location-based services to mobile computing consumers (Miller and Wortham, 2010). Applications like Foursquare, Loopt, Gowalla, and most recently, Facebook Places allow users to 'check-in' at restaurants, bars, gyms, retail outlets, and offices, thereby sharing their location within their social network. These developments enable consumers to (re)discover their proximities to products, while feeding a desire for making known one's everyday movements. Here, I discuss the development of location-based services as the proliferation of a peculiar form of geographic information: conspicuous mobility. Through discussion of a recent gathering of location-aware software professionals and through analysis of discourses that emerge over a battle between 'check in' companies, I sketch an area of study that explores the implications of these emerging geographic information 'systems', and new everyday cartographers.



## 1. Introduction

> Where *is* business: where people live, where they go, and where, when, and how they spend their money are now key factors in business success. From product development to distribution, marketing, and sales, location technologies help companies identify, understand, and serve their markets far more effectively than ever before. (O'Reilly Media Inc., 2011a, emphasis original)

The digitization of location has become a recent fix(ation) as dot-com corporations respond within the instabilities of global capitalism. As the quote above articulates, taken from the Where 2.0 conference home page for the 2011 meeting in Santa Clara, CA, the managing of digital spatial information has become more squarely a direct function of business. As a result, a number of conferences have been organized to promote different strategies for incorporating location-based services into business functions. The Where 2.0 conference, having completed its seventh year, is one of a handful of these gatherings in a growing, diversifying Internet-based location industry (other gatherings include the annual SXSW Interactive, GeoWeb, Web 2.0, and, increasingly, exhibitors at the annual meetings of the Association of American Geographers). This conference, where the majority of attendees represent start-up and veteran software companies, provides the site to examine the conditions through which spatial relations are presented by software.

Software technologies have provided a contemporary outlet for surpluses of capital. And while processes of urbanization have historically provided one such fix for the crises of capitalism (Brenner and Theodore, 2002; Harvey, 1986, 2010; Smith, 2002), software is perhaps an arguably more mutable investment. And as Internet industries persist through their boom and bust cycles, new forms of investment have emerged (Zook, 2005) – more recently around the development of web-based services, including those that are location-based. As reported by *The New York Times* in 2010, $115 million have been invested into 'location start-ups' since 2009 (Miller and Wortham, 2010). Indeed, 'location' as furthered by this renewed Internet industry has seemingly extended the influence of the 'social' as a driver of contemporary Internet innovations. As software architects and designers discover the importance of space to the intelligibility and profitability of online social networks, a renewed social network is drawn out of these spatial representations. 'Location' then is not eclipsing the importance of the 'social' in these digital relationships. However, the spatiality of social networking has become a discursive-material touchpoint for futurity, speculation, and investment.

*E-mail address:* matthew.w.wilson@uky.edu

0016-7185/$ - see front matter © 2012 Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.geoforum.2012.03.014

Location-based services (LBS) are a subset of web services meant to provide functions that are location-aware, where the use of such services is predicated on knowledge of where the services are engaged. LBS are oft-referenced with regard to mobile devices, although LBS are not necessarily only used on mobiles. Currently enjoying the speculative potential of their commercial viability, LBS are used for enhancing web search algorithms, for navigation and traffic information, for locating goods and services, as well as for locating other LBS users (or rather, their devices). And while geographers have investigated the various technical capabilities of location-based services (LBSs) and have discussed how these technologies challenge the role of expertise in the production of geospatial data (Elwood, 2008c; Goodchild, 2007; Haklay et al., 2008), what are less understood are the discursive and material circumstances that are productive of these LBS developments. This research serves to address this lack, to understand the various discourses that outline the emerging work of location-based software. To do so, I discuss one particular LBS development – that of the check-in service – popularized by the company Foursquare. By first situating the development of LBS in the early-2000s, I draw upon the popular media descriptions of the emergence of LBS and, more specifically, of Foursquare. I then discuss the ways in which Foursquare positioned its LBS work at a major development conference: Where 2.0. Here, I unpack a broader critique of the LBS ethic: that location *is* business. I close with perhaps more questions than answers, to further define a research agenda that pays attention to the development of these technologies of mobility, to place these developments within a research program of critical GIS, and to consider the implications for space and radical action. This is a call to widen the possibilities for location-based services, beyond game mechanics and capital accrual.

## 2. Technology, mobility, space

Recent scholarship on new geographic technologies has increasingly focused on the use of mobile consumer electronics to capture data about movement. Indeed, the recording and visualizing of time–space geographies has particularly enjoyed a resurgence: an Economic and Social Research Council seminar series devoted to "tracking the rhythms of daily life" (Pain and Smith, 2008), a National Center for Geographic Information and Analysis workshop on "spatio-temporal constraints on social networks" (Goodchild and Carley, 2010), and nearly 60 sessions of the 2011 AAG meetings devoted to "space–time integration in Geography and GIScience". Specific notions of mobility, and thereby space, are being produced and promoted through new technological apparatuses. The tendency, of course, is to treat space and time as separate entities, and not as integrated aspects of lived experience. Indeed, the digitization of location actually furthers the thinking of space and time as distinct modes of inquiry. What are the conditions that enable this technocultural moment of recording/visualizing/analyzing mobility in this way? How might these developments, largely in the GISciences, be situated within a broader focus on mobility, specifically the social-cultural geographies of mobility?

While the critical GIS literature has pushed the GISciences to consider the emerging implications for new forms of geospatial data production, variously called neogeography or volunteered geographic information (Elwood, 2008b, 2009; Elwood and Leszczynski, 2011; Graham, 2010; Haklay et al., 2008), there remain important questions as to the changing role of the discipline in the proliferation of these geographic technologies, the social–cultural moments of meaning-making that are produced by interactions with these tools, the commercialization of these technologies and the spatial practices driven by these business models. Critical GIS has explored the production of scientific knowledge and database ontologies (Schuurman, 2006, 2008) as well as interactions with local governments (Harvey, 2003, 2005) and community organizations (Elwood, 2004, 2006, 2008a; Ghose, 2001). This scholarship draws upon a range of conceptualizations, including science studies (Chrisman, 2005; Ghose, 2007; Harvey and Chrisman, 1998; Poore and Chrisman, 2006; Wilson, 2011a,b) and feminist theory (Kwan, 2002; McLafferty, 2002, 2005; Pavlovskaya, 2002, 2006), critical and participatory planning (Elwood and Leitner, 1998; Leitner et al., 2000; Talen, 2000), and critical cartography (Crampton, 2001, 2010a,b; Harley, 1989; Pickles, 2004; Wood, 1992).

And yet, while the critical GIS literature demonstrates how to speak to the practices surrounding geospatial technology more generally, what is not apparent is how geospatial technologies, like LBS, are emerging as objects of development. Critical studies of geospatial technologies have largely been silent on the recent proliferation of LBS. Furthermore, the use of geospatial technologies to understand mobility tends to limit the notion of mobility to the mere measurement and representation of movement. Here, I suggest that LBS have a social–cultural geography that impacts spatiality, and further, that LBS call attention to the ways in which mobilities are made as data objects, to both represent actually existing mobilities and future, speculative mobilities.

LBS are not merely about location, in this sense, and can be read as technologies of mobility. To explicate this suggestion, I ground my argument in the ways in which the recent social–cultural geographic literature emphasizes a concept of mobility that is not simply reducible to movement (Sheller and Urry, 2006). As Cresswell (2010, 19–20) writes, mobility is "the entanglement of movement, representation, and practice". Physical movement, Cresswell continues, is the "raw material" of mobility. Beyond this notion, however, representations of mobility abound: as both freeing and dominating, a source of terror and adventure, as modernizing and antiquating. Mobility is thus about the meanings of movement (or the absence of movement) (Cresswell, 2011). As a practice, mobility is bodied, both human and more-than-human. Its enactment as mobilities, is to always involve a plurality of mobility, of "being mobile-with" (Adey, 2010, 18). Furthermore, mobilities are a way of making sense of our engagement with others, with "how we address the world" (Adey, 2010, 19). They are experienced through diverse affective registers, of waiting (Bissell, 2007) and the sensed vibrations of movement (Bissell, 2010), of being stranded and immobile (Birtchnell and Büscher, 2011) and feeling uncertain (Barton, 2011), and of pleasure (Hagman, 2010).

In this sense, mobilities demand a recognition of the spatiality of our worlded interactions, despite the ways in which space and time are "tamed", to use Massey (2005, 7), by some methods for measuring movement. Indeed, the spatiality of the world is constituted through a multiplicity of arrangements of material and immaterial objects: animate and inanimate, organic and inorganic, mobile and immobile. Mobilities researchers are increasingly incorporating nonhuman objects as central to an understanding of contemporary mobilities, for instance, in the use of mobile phones while traveling (Berry and Hamilton, 2010) or in the use of mobile music devices (Beer, 2010). Such attention to objects, as perhaps prior to the possibility of mobility, furthers the work of geographies which are "dense, flowing, particular, sensate, and radically actual", as Dewsbury (2000, 491) writes. This conceptualization has deep implications for understanding spatiality, drawing out the tensions in social-cultural theorizations of space as potentiality and space as inert fixity.

Objects, if they are to be enrolled as the potentiality of action, require greater consideration in mobilities research, particularly coded objects. The rise of information technology marks a further enabling of the turning of space into time, while also producing more complex relationships of mobility between the here and there. For instance, in their work on the code/spaces of air travel, Budd and Adey (2009) document the embodiment of software

simulations and the importance of the interplay between the physical and the digital. These geographies of information technology emphasize the ways in which technology is imbricated in everyday life, even as technologies both enact and are symbols of change, progress, and futurity (Dodge and Kitchin, 2005a,b, 2007, 2009; Kitchin and Dodge, 2011; Kinsley, 2010; Wilson, 2009, 2011b).

Information technology objects not only produce representations of our everyday spatiality, but actually produce our spatiality – both enabling and disabling our physical, imaginative, and discursive practice. Put differently, coded objects both enable our movement and figure our mobilities: the potentiality of action. How do these objects of mobility emerge? How do their formative conditions impact both the actual and the possible? I proceed by first articulating what it means to take such information technology objects seriously. I then briefly trace the recent development of 'location-based services' and describe the conspicuousness of contemporary technologies of mobility.

## 3. Following conferences-in-action

Conference registration sites often set the tone for the multiple assemblages that make possible such gatherings: the digital kiosks, the name badge printers, the attendees staring into mobile phones, sending and receiving instant messages to meet up with other attendees. Conferences are constituted and sustained through such interactions. In these particular code/spaces, I consider the implications for beginning the interrogations of technological developments, such as LBS, here, where imagined devices, software, interactions, and profits are made material. Technology conferences are both spaces of production and spacings, a taking-place (following Anderson and Harris, 2010). To follow these conferences is to recognize their importance to the proliferation of information technologies. Conferences-in-action is therefore my take on "science-in-action" (Latour, 1987), to insist on these space-times as worthy of careful attention. Within the O'Reilly Where 2.0 conference space, narratives about the movements and behaviors of users are weaved through narratives that herald the technological accomplishments of location tracking and web services that utilize these traces to produce new behaviors and renewed profits. The conference is thus the site in which discursive and material, code objects take shape and congeal. Here, developers meet with entrepreneurs, investors, and major dot-com corporations. Hope is evoked throughout the conference halls, with the possibility of an angel investor, a buyout offer, or a new staff acquisition. Some ideas are traded openly, while others are held close to chests with a great deal of speculative fanfare.

By following the Where 2.0 conference in 2010 and 2011, I observe the emergence of a specific discourse of mobility – a notion that I argue pushes at the edges of current mobilities research. In my reading, mobilities are produced as socio-economic data objects that reveal to users as well as to application developers the habits and, through algorithmic inference, the actual desires of consumers. These data create speculation about future movements and trends, generating buzz where none may currently exist. The possibility that social behaviors can be adapted through LBS presents new insight into how these mobilities enact renewed relationships to the world. In other words, it is the discursive materiality (Butler, 1993) of mobility that is activated during such conference space-times.

In what follows, I draw on the field notes of my attendance at and participation in these conferences. After registering at the 2010 Where 2.0 conference held at the San Jose Marriott, I was given an 'ecofriendly', recyclable tote bag, containing advertisements for new LBS startups, as well as a sample copy of *LBx Journal*, a trade magazine for LBS-development. The company Veriplace, one of the sponsors for the conference, included a Hammond Pocket Road Atlas, a curious addition given the hyper-digital focus of this gathering. Outside the entrance to the kick-off session, as numerous conference-goers assembled, I introduced myself to Helen Field[1], a researcher with the United States Geological Survey. We began to chat about the difference between other conferences we've attended and the entrepreneurial ethic of this conference. As the doors to the room swung open, and music began to emanate from an attractively decorated stage, Helen remarked, "Government is slow. Here, change happens all the time!" Indeed, change seems central to the strategic marketing of new technologies – new data transfer standards, new privacy controls, new interfaces – planned obsolescence as creative destruction. Change is infectious; and, as anyone who works within large bureaucracies knows, change is (sometimes) coveted.

As the conference continued, both formal sessions and informal gatherings in hallways and lobbies shape the object of mobility that I articulate in the next sections. Such critical studies of technology demand an approach that is neither deterministic nor relativistic, neither resolutely material nor immaterial. Technologies matter and have matter; they produce and are produced. And as objects of human affect, they both constitute and trace the limit of humanism itself (Turkle, 2007). To understand the complex relationships formed with objects, then, one approach is to promote our interactions with objects as subjects of study. For the purposes of this research, the conference produces a specific object of mobility – conspicuous mobility – that percolates throughout talk of information technology devices and software.

Haraway inspires a liveliness in the study of such technoscientific objects. To situate knowledges is to recognize this liveliness (Haraway, 1991, 1997; Whatmore, 2006; Wilson, 2009). Indeed, science and technology studies draws our attention to technoscientific objects, as well as other more-than-human objects, actions, and discourses (Latour, 2005; Jons, 2006; Wilson et al., 2011). Following objects requires not only recognition, but, particularly for Haraway, also engagement and interaction. I have previously distilled four strategies from Haraway's scholarship toward the following of objects: witnessing, situating, diffracting, and acquiring (Wilson, 2009). Each necessitates a hybridity of being and knowing, of a responsibility to objects and their messy implications. This posture of inquiry requires a recognition of how we relate to the objects of study themselves. To diffract and to acquire is to participate in the volatility of objects, in their capacity for change, and to be available to accept that our selves change in the process of this engagement. And while there are distinct material objects worthy of study at these conferences (such as new satellites and tracking devices and new software that monitors spatial interactions), this research looks to examine objects barely materialized, as *discursive* objects that emerge throughout the ballrooms and corridors of technology conferences.[2]

Therefore, I document the discourses around LBS that emerge at a prominent development conference in Silicon Valley, held in 2010 and 2011. A specific discursive object of mobility was expressed in hundreds of LBS devices and applications (most of which were web-enabled). During this research, I joined a particular LBS called Foursquare and participated over the course of a year, volunteering my location and enrolling my friends in the practice of broadcasting and acting on personal, locational information. In addition to these activities, I examined the prevalence

[1] Pseudonym.

[2] Indeed, as one reviewer points out, these discursive objects also move through other settings, institutions, and geographies. Certainly, the object of conspicuous mobility studied here as emergent through technology conferences is reinforced within the academy, particularly in GIScience but also as a new cultural geography focuses on mobility as an object of study. Furthermore, the U.S. Department of State's interest in these tools which trace mobilities is indicative of the broader trajectory of this discursive object (Pollack, 2010).

and growth of location-based services in popular media (as revealed by a LexisNexis search for 'location-based services', 1998 through early 2011). What emerges is a particular narrative that interweaves government regulation, capitalist growth and speculation, designs for socio-behavioral change, and re-imaginings of urban interaction. In the next section, I trace the emergence of LBS to provide a backdrop for the contemporary development of these geographic technologies, and the conferences, like Where 2.0, that support them.

## 4. Situating location-based services

> "Headphones connected to the iPhone, iPhone connected to the Internet, connected to the Google, connected to the government." (M.I.A., 2010)

M.I.A., a hip-hop/electronica recording artist, has often linked her music to social-political activism. In her 2010 album, *Maya*, M.I.A. draws attention to the pervasiveness of digital information technology. In the refrain quoted above, she connects individuals using smartphones to the interests of corporations and the state. Indeed, the use of mobile devices to engage in social and spatial media is deeply connected to corporate interests and draws upon the governmental technologies of the state. In what follows, I extend the critical histories of global positioning systems, by examining the recent history of LBS development, to explore the conditions through which mobile locational technologies emerge.

Key to the development of location-based services is the ability to coordinate a global location. The global positioning system is perhaps more popularly known through consumer products, but, like many tools of geography, has its origins with the state and the military (Smith, 1992). Developed by the US Department of Defense, the global positioning system is a constellation of satellites that broadcasts time signals which are interpreted by GPS receivers. These receivers, which can be quite small (size of a postage stamp) and embedded in many devices, compare these time signals to measure the distance traveled by various signals, and thereby fix a location (Harvey, 2008). The increase in positional accuracy offered by GPS enabled the "neutralization of cartographic representation", as Escolar (2003, 50) writes of modernized mapping practices, latest in a long-line of such advancements (McHaffie, 2002).

The development of these technologies is situated within the 'space race' and the increased competition between the United States and the USSR. In their analysis of advertisements of geographic technologies, Roberts and Schein (1995) demonstrate how the representational spaces of these advertisements depict the world as a data source. As a political economy of GIS and GPS, they argue for a recognition of the connections between the rise of US militarism, American corporations, and these discourses around the rise of digital global information. In this sense, GPS allowed "technology-enabled representations of global space", representations which furthered the practices of "cold war militarism and the rise of the American multinational" (187). GPS provides a global perspective, both essential to a US military hegemony and consistent with the needs of a US-born global capitalism.

Location-based services inherit this tradition of state-commerce assemblage. While European wireless carriers were beginning to market a diversity of mobile applications using LBS, carriers in the US were presented with a federal mandate by the Federal Communications Commission (FCC), that provides the backdrop for the rollout of LBS infrastructure. Cellular providers in the US were required to ensure that all mobile telephones had Enhanced 911 capability by 2001 (a deadline which was later extended to 2005). E911 services would allow emergency responders to access the geospatial location of individuals placing calls using cellular telephones. By requiring cellular devices to be compliant, the state effectively motivated the industry to find ways to capitalize on the infrastructural overhead of such requirements.

This system requirement would prove to be a lucrative opportunity for private industry. Beginning in the late 1990s, journalists began to speculate as to how this mandate would create opportunities for investment and profit as is forecasted in Table 1 (McGinity, 1999; Swartz, 2000; Thomas, 2002). Cellular providers were faced with a need for compliance and a seemingly expansive opportunity for revenue. A late-2000 report in *Wireless Review* articulates this tension:

> Regardless of the questions that surround location-based services, they will arrive with plenty of thunder. Right now, though, service providers stand at a crossroads. Vendors beckon for providers to get in the game, yet caution may dictate the focus on implementing an E-911 solution before delivering location-based services. Eventually, though, providers will offer services that are not just based on who their customers are, but where they are. (Rockhold, 2000)

Privacy, positional accuracy standards, and interactivity became topics of concern (Young, 2000). The sharing of locational information with an emergency responder was seen to be quite different than the sharing of the location of a user with a wireless carrier. The sense was, at least in 2000, that people were using phones primarily for voice calls, and not to share details about their location (which was seen to be private information). Device-makers Ericsson, Motorola and Nokia created the Location Interoperability Forum to move providers forward in discussion about LBS (later consolidated with the Wireless Application Protocol forum into the Open Mobile Alliance). The concern was around creating open locational standards that could be used across the growing industry.

Therefore, as LBS developers, carriers were finding ways to fold in and capture state regulations as opportunities for capitalist expansion. Of course, these kinds of state interventions in geographical technologies have a lengthy history. Location-based services no doubt benefited from federal regulations for Enhanced 911 capabilities in the US; in some cases, the costs of infrastructure development were deferred by financial incentives (by reducing federal licensing fees for cellular providers) (Petrova and Wang, 2011; Seeman et al., 2007). As location-based mobile systems came online, new applications for their use proliferated, directed both at individual consumers and at enterprise-level geospatial problems. It is one such aspect of LBS development for consumers – the check-in service – that generated a sense of urgency through the Where 2.0 conference, with concerns about how to more effortlessly collect the mobility preferences of users/consumers, but also about how to capitalize on information about their mobilities.

## 5. Conspicuous mobility

The media attention toward location-based services for emergency management and public safety in the late 1990s was eventually eclipsed by the use of LBS for business. At present, with the emergence of 'hyperlocal' business strategies encapsulated by dot-coms like Groupon, LivingSocial, and Tippr, locationally-aware mobile devices assist customers in finding 'deals' on goods and services. These 'daily-deal' LBS notify users of discounts and specials nearest to their neighborhoods. As a result, the digitization of location has become discursively significant as an important economic driver of offline industries. In their description of the Where 2.0 conference for 2011, the organizers enroll 'location' as a potential fix for our current economic crisis.

> As location-aware technologies progress and spread across the globe, the decisions are getting tougher to call. What can

**Table 1**
Potential LBS applications.

| What can location-based services do? (from Thomas, 2002) |
|---|
| * Tracking employees, without having to invest in expensive global positioning systems |
| * Giving employees information, such as directions or, by linking with [Customer Relations Management] systems, the location of the best customers |
| * Telling consumers the nearest outlets of interest, such as bars or hotels. This can be utilised as a branding tool by third parties, such as brewers |
| * "Buddy finders" could be used by parents to track their children |

> businesses do to stay ahead of the changes? Or simply stay afloat in these difficult economic times? Which technologies are the most efficient and flexible for creating location-aware apps? What does location data tell us about our customers and how do we use those insights to make money? (O'Reilly Media Inc., 2011b)

Here, location is citational in that it performs, through iteration, a focused attention to the specificities of *where*: of being aware of location, to respond to change, to predict, to learn about customers, and to profit.

I argue that the rising attention to 'location', through the development of location-based services, draws out a particular concept of mobility – conspicuous mobility – that serves to restructure urban experiences as transactions. The capturing and accrual of locational traces not only provides social media companies (and their corporate and state partners) with unprecedented data about consumers (and their potential to consume), but also furthers the ability of social media to intervene in mobilities, to change the habits of users. In my formulation, the making-known of one's location is part of the making conspicuous of one's mobility. A single reporting event of a location from a mobile device is less significant. However, the accrual of multiple locational traces weaves a narrative about the specifics of one's presence in space – enabling users to broadcast that curated narrative of the places they frequent, the neighborhoods they travel within, and the kinds of consumptive activities they afford. In this section, I unpack popular media accounts of the rise of LBS and the Where 2.0 conference, in three subsections, with an emphasis on location-based web search, the check-in service of Foursquare, and the speculative ways in which check-ins might change consumer behavior.

### 5.1. Mobile searching: places and people

Before LBS were to be used to directly drive consumers to businesses, locational information was enrolled to augment search engines. The commercial use of location-based services began as a contextually-relevant search, with European LBS being used to find bars, restaurants, and car services. A magazine article in 2001 reports on this use:

> In general, the most popular European location-based services revolve around weekend night life. Sullivan said that there is an almost hysterical correspondence between time and types of location-based services. He said it starts off with pub finders at the beginning of the evening. Then restaurant searches start hitting the system. About 10 p.m., it goes back to nightclubs or branded searches, where customers want to find someplace specific. Sullivan added that late in the evening, the most popular service is always taxis. (Rockhold, 2001)

LBS also were used to find other mobile-device users. By late 2001, some cellular users in the UK had access to an LBS called FriendFinder, which would allow individuals to use SMS to return the location of their friends (Norris, 2003). Available in the US by 2002, AT&T customers could utilize a similar service called Find Friends, which would allow those 'friends' to RSVP at nearby restaurants, bars, and coffeeshops. These technologies relied upon the location of the mobile device to serve information to the user, to find places, services, and other users. Many of these software technologies were developed by the wireless carriers themselves, tying their success to the operating system and specific device hardware.

Mobile consumer technology made significant advances since the early 2000s as carriers no longer developed in-house LBS directly on their handsets, and instead supported or developed operating systems that would allow third-party applications built by other companies. And as mobile-device hardware and software became more sophisticated – 'smart' – so did consumer desire for locational technology. In 2005, the announcement of Google Earth allowed desktop computer users to 'spin' a 3D model of the Earth, and 'fly in' to their location (Kho, 2010). The 'digital Earth' was realized, beckoning new types of technocultural interactions (White, 2006). Coupled with the release of mapping application program interfaces (APIs), consumers could produce map mashups centered around *their* locations (Crampton, 2009; Grayson, 2006; Miller, 2006). Numerous applications for mobile devices were developed to take advantage of LBS allowing users to access Internet-based content in new ways, personalized by the user's location (see Table 2).

However, alongside desktop mapping products and locationally-dependent sorting of Internet-based content, new mobile LBS were founded and launched, with initial players like Dopplr.com, Qype.com, Loopt.com, and Brightkite.com, which allowed individual users to broadcast their locations to friends (Arthur, 2008). I suggest further attention to this technocultural moment of LBS development, where users are clearly pushing out their location to the Internet, where it can then be viewed by members of their social network as well as utilised by social media companies and their partners.

### 5.2. From location-based search to 'checking in'

LBS, on the backs of a federal mandate for emergency services, are no longer just about using location-based search to assist consumers to locate businesses. Instead, LBS have been employed to enroll users in an elaborate advertising and marketing scheme. Standing in the hallway of the Where 2.0 conference, I watch as vendors discuss how to reach potential customers by integrating LBS in an explicit hyperlocal strategy. On the main stage, an individual named Dennis Crowley with a laid-back, counter-cultural appearance (a 'hipster') greets the audience of the nearly 800 attendees. He launches into a discussion of the smartphone application his team has developed – Foursquare – named after the popular, outdoor primary school game. Crowley's discussion of Foursquare, available for iOS and Android OS devices as well as SMS-enabled mobile devices, provides an appropriate site to witness this shift toward the use of LBS to drive consumers to consume – beyond just assisting them to arrive on location. But much of conferences-in-action is spent with laptops open. While Crowley retraces the previous year of Foursquare development, Twitter tweets submitted by conference attendees in the room and remote viewers annotate and extend his presentation. Foursquare, it seems, is slipping into the symbolic: a discursive object that represents the optimism – indeed, the very culture – of LBS sentiment at the conference.

**Table 2**
LBS applications.

| 10 Applications that make the most of location (from Biba, 2009) |
|---|
| 1 Drive fast, avoid the cops (locations of known speed traps): Trapster |
| 2 Sleep easy, we'll wake you (missing your stop on public transit): iNap |
| 3 Play tag, with strangers: JOYity |
| 4 Call a cab, the easy way (location-aware cab services): Cab4Me |
| 5 Scan a barcode, find a deal (local deals): ShopSavy |
| 6 See the world, through Google's eyes: Google Earth |
| 7 Train your phone to know its place (location-aware phone ringer settings): Locale |
| 8 Look Up! Be a stellar student (what stars are above): GoSkyWatch |
| 9 Dark Alley? Call for help (location-aware alarm system): SafetyNet |
| 10 Go here when you gotta go (location-aware facility finding): SitOrSquat |

In March 2009 at South By Southwest (SXSW), Crowley and Naveen Selvadurai launched Foursquare, a location-based service that allows individuals to 'check in' to locations, thereby notifying their social network of their whereabouts. Previous to this launch, Crowley had created Dodgeball, which was a similar service that relied upon SMS messages (Wortham, 2009). Crowley sold Dodgeball to Google in 2005, which Google then shutdown and re-announced as Google Latitude in 2009, an LBS that displays an individual's location to those in their social network.

Foursquare depicts the check-in process on their website, articulating a specific form of locational reporting that makes conspicuous one's mobility. The application, designed for use on a cellphone but also available on a computer browser, connects the user to their contacts from their phone's address book, their Twitter account, or Facebook account. The user checks in at specific locations stored within the Foursquare network. Users may also volunteer data about locations not already in the network. The application also encourages the user to add suggestions, 'tips' about the venues they frequent – which serve as recommendations, not only for the user's social network, but also for other users that check in at that location. Foursquare enables the user to make use of the application as a way to get suggestions for activities, such that the more a user uses Foursquare, the more the user will get out of the experience, as the application builds and analyses data about the user's activities, often comparing them to other users in their social network. In this use case, users examine places that are 'trending' nearby, augmenting their specific interactions in the urban. By being presented with the consumptive landscape, Foursquare users may connect with other users in their social network, or may examine the makeup of potential venues – gender, age, race are not made explicit in the codings, but avatars signal the bodied aspects of nearby places.

Foursquare uses game-mechanics to further entice users to 'check in' and report their location. This reward system gives users points for checking into places never checked into before, as well as points for returning to 'favorites'. Those who check in the most are granted a 'mayorship'. Places within Foursquare have mayors, and users compete to become mayor of a place – granted only if their handheld device is located at that place (Metz, 2009). At some businesses, checking in with Foursquare provides access to special deals and discounts (Pattison, 2010). In lieu of financial incentives for checking-in, users also compete with people in their social network to gain points and remain 'leaders' for the week. Users are given digital badges that are displayed on their user profiles (and are announced through linked accounts on Facebook and Twitter). A range of badges are offered, including Crunked, Player Please!, School Night, Socialite, Slut, Gym Rat, JetSetter, Hangover, etc., each of which are awarded to users for actions like checking into multiple bars and clubs in one evening, for doing so on a 'school night', for hitting the gym regularly, and checking into multiple airports.

Crowley continues his Where 2.0 presentation by discussing the ways in which Foursquare is more than a social media startup and how it serves as a new business model for LBS. The process of 'checking-in' is seen as a boon for businesses attempting to draw upon social networks, and represents an opportunity for Foursquare to monetize their LBS. The company received early interest from major media and product brands: Bravo TV, Starbucks, MTV, and PepsiCo (Patel, 2010; Vuong, 2010; Weinkrantz, 2010; Corcoran, 2010). At SXSW Interactive 2010 in Austin, Texas, Foursquare and Gowalla (a 'rival' check-in service) competed to capture the most users and check-ins. More broadly, this competition served as a media stunt, demonstrating the opportunity of LBS to affect consumer behavior (Pollack, 2010; Siegel, 2010). And while Foursquare drew in Ashton Kutcher (social media investor and Hollywoodite), Gowalla and their founder Josh Williams, used their local advantage of being based in Austin. Still the SXSW event solidified the 'check-in' as potentially the next-hot-thing following Twitter (Hickman, 2010).

> Back at South by Southwest, Foursquare is operating guerilla-style, its employees roaming the convention centre handing out T-shirts and temporary tattoos. Gowalla has sponsored a taco truck a couple blocks west of the convention centre, offering the "Gowalla taco", featuring steak, guacamole, bacon and queso fresco in a corn tortilla. Parked a few feet away is a Mini Cooper bearing the company logo and packed with T-shirts. (Pollack, 2010)

Seemingly overnight, the business opportunity for LBS, and more specifically, 'checking-in', was concretized (Brady, 2010; Hesseldahl, 2010; Pollack, 2010; Shields, 2010).

### 5.3. Checking in and changing behavior

Foursquare and other 'check-in' LBS are in the business of making mobility a conspicuous practice of mobile technology users. Among those who avidly use social networking technologies like Facebook, 'checking-in' is perhaps an obvious extension of the volunteering of one's personal information. However, it is important to recognize this as not only a constitutive re-casting of privacy, but, more insidiously, as a re-figuring of everyday mobility as a consumptive activity. Check-in services like Foursquare roll-out new 'opportunities' for users to address the world in renewed physical and digital ways.

Returning to Crowley's presentation at the Where 2.0 conference in 2010, I use my iPhone to sign into Foursquare so that I may 'check in' to the conference venue. Crowley reports that Foursquare has 750,000 users; in late April Foursquare would cross the 1 million mark. By the end of 2010, despite or perhaps because of the competition of Facebook Places, announced in August (Swartz, 2010; Heater, 2010), Foursquare had 6 million users with over 380 million worldwide check-ins. At the end of 2011, Foursquare reports 10 million users.

Crowley is careful not to limit the impact of Foursquare to the commercial; this is no doubt important to his countercultural appeal. For him, it's about connecting people to place. And yet, monetizing this activity is an obvious consequence (if not the precise business model). As users check in, this activity is published to their social network. When Crowley (2010) checks in, he continues, "that's a little mini-ad that goes out to 10,000 different people". Foursquare actively pursues businesses to promote through Foursquare; Crowley notes that their business affiliates see sales increase by 30%. Foursquare, for all its novelty, has built a platform enrolling users to market and advertise goods and services as they make their mobility a conspicuous activity.

However, in Crowley's (2010) words, Foursquare was enabling people to live "different and more interesting" lives, and, the company was fundamentally interested in how to "use software to change behavior". By granting people 'badges' and 'mayorships' in return for their check-ins, Foursquare rewards people "for doing a little bit of nothing". Crowley suggests that by offering the Gym Rat badge, people worked out more often. Crowley continues, "by using game mechanics, people feel that they are more interesting, that they are leading more interesting lives". While Foursquare is in the business of changing user behavior, Crowley gives the crowd a series of humorous stories about user behavior, as if these shifts in a person's everyday mobilities were just an aftereffect of the evolution of LBS. He quips; a typical user of Foursquare, upon being notified that another user has taken away their mayorship of a favorite venue, jumps out of bed and heads directly to that venue to check in and reclaim their mayorship. Foursquare mayorships are changing behaviors, as reported by one user:

> Last year, in his early days of using Foursquare, Mr. Ilagan noticed there was a nearby user named Elizabeth H. who was mayor of almost every venue near his home on Fifth Street in South Philadelphia. He figured that Elizabeth H. must have been cheating, possibly checking in from her car, so he took a screen shot of her Foursquare profile, which included a photo of her face, and posted it on Twitter, accusing her of deception. Since then, Mr. Ilagan has managed to eke out his own mayorships. He also happens to date Ms. Harcharek, the sometime-mayor of the Benjamin Franklin Bridge. (Oliver, 2010)

Crowley admits the pathology of these behaviors, that it is "kind of crazy, but crazy in a good and interesting way" (and potentially lucrative way). Foursquare was reported in early 2011 to be worth $95 million (Beer, 2011).

Herein lies the social and economic power of LBS, that volunteering information about one's location is not only about making visible one's location, but is about making conspicuous one's mobility: one's movement, significance of that movement, and the potentiality (both economic and social) that is present in the iterativeness of 'checking-in'. As Crowley leaves the stage, he leaves a Twitter trail in his wake. The Where 2.0 conference goers, myself included, are pushed toward speculative imaginations: the possibility of gaining access to the conspicuous mobilities of monied consumers and what it means to have devices and objects that are increasingly location-aware.

## 6. Discussion: the location-aware future?

> Simply put, location changes everything. This one input – our coordinates – has the potential to change all the outputs. Where we shop, who we talk to, what we read, what we search for, where we go – they all change once we merge location and the Web. (Honon, 2009)
>
> We need games to help us relax into that [knowledge of everyone's location] and how to deal with that. By playing, we learn about our social obligation. They're social rehearsal for a location-aware future. (Justin Hall, iPhone game developer quoted in Pollack, 2010).

Following the opening session of Where 2.0 2010, I pick through my tote, and remove the glossy *LBx Journal.* This complementary magazine, with their tagline, 'Location in the Language of Business', began in 2009 as a publication for discussing new developments in mobile geographic technologies that enable consumers to (re)discover their proximities to products. While the production and consumption of goods and services has always been about space, and now location, LBS are about producing and consuming material forms of spatial contextualization. I argue that these practices, for all their potentiality for 'different and interesting' living, actually enact a narrowing of spatial interaction. And, further, these mobile geographic technologies constrain the space of open, radical mobilities, here discussed both in terms of the political economies of investment in LBS-developments and in the experiences and behavioral adaptability of such LBS use.

Therefore, I continue to ask what role might geographic information technologies serve in the creation of or resistance to these new urban geographies? Of course, more traditional technologies – like cartography (Crampton, 2010a; Edney, 1997) – have long enabled the state to expand and redefine its role to the territory it occupies. And, furthermore, the use of GIS constitutes new relationships between citizens and their neighborhoods (Elwood, 2006; Wilson, 2011a), while highlighting the power of mapping technologies to reshape urban governance more generally (Ramsey, 2008; Ghose, 2007). GIS and the rise of digital data have enabled unprecedented modeling power to actualize visions for new geographies and new profits.

These kinds of LBS technologies also impact individuals' perceptions of the lived, built environment. Cognition and the GISciences have long emphasized the role of the map in spatial interaction, both as a kind of psychogeography (Wood, 2010; Harmon, 2004) and as the behavioral study of spatial cognition (Golledge and Stimson, 1997). Recent work in more-than-representational geographies have also unpacked the relationships between the familiar spaces of everyday mobilities and the "overarching visual mapping of unfamiliar environments" (Patterson, 2011). Enrolling this post-phenomenological theorization, the use of an LBS like Foursquare to consult where to check in is necessarily influenced by the proprioceptional, or the bodied sensations of being in-place or in-movement, that enables the visioning of and the behaviorial reaction to the prospect of a new location (Anderson, 2006; Massumi, 2002). Put more simply, 'checking-in' has the potential to become habit, and as such, folds in our sensuous experiences of being a body that moves and identifies through that movement.

Furthermore, technologies like location-based services enable, demand, and reward consumptive mobilities. As such, LBS are anticipatory technologies (Kinsley, 2010; Anderson, 2010). The turning of movement into a game creates new possibilities for investment – and competition – as companies scramble to occupy the online gameboard. Players are increasingly individuated to amass points and bargains, to compete against other players as they 'volunteer' information about their movement to others, and more importantly, to corporations that are eager to market new goods and services as new urban challenges: 'Unlock this badge by checking in with a friend!' Taken further, these kinds of game experiences shape the capacities of users to navigate space. The habits of 'checking-in' constitute the mechanisms that can be configured to produce new events, new potentialities for interaction, to follow Ash's (2010, 2012) studies of the spatialities of videogames. For Ash (2012, 31), the "structuring of bodily habit and perception" in videogames is the reorganization of the capacity to respond. Similarly, it is the technicity of the 'check-in' that enables such an interiorization of one's being in time and space as well as the ability to "make things happen" (Kitchin and Dodge, 2011, 42; compare Stiegler, 2010).

The role of the state in LBS continues in important ways, namely through the commercialization of services made possible through a maintained geolocational infrastructure, and the unrolling of Enhanced 911 cell phone requirements. These technologies, since the switching off of 'selective availability', have propelled the unfettered inclusion of locational-positioning systems into technologies of everyday life – from cars to cellphones. However, the GISciences largely remain blinded by the involvement/investment of the state along these lines: increased investment in the study/development of geospatial cyberinfrastructure, increased attention

by the Army Research Office to the study of volunteered geographic information, as well as Defense Advanced Research Projects Agency (DARPA) competitions around the use of locational crowdsourcing. How will the GIS & Society tradition adjust to these new relationships? What is the role of an invigorated critical GIS – in the context of a public that is more aware of the ways LBS are central to everyday urban life?

The discourse surrounding the 'location-aware future' presents significant challenges for GIScience – as this is a future that is increasingly shaped by corporate actors. Here, I argue that the location-aware future is an imagination furthered by the privatization of mobilities as data objects. The use of LBS to broadcast one's location to a social network that increasingly includes corporations further muddies the relationship between being public and being private. The technology encourages and rewards publicity to your private contacts and private industry. Check-in services like Foursquare enable users to constitute their consumptive identity. Their mobilities are purposely conspicuous. As these movements are made conspicuous, other individual mobilities are certainly concealed (particularly those positioned by difference) – fixed, as if by snapshot, to the assumed stillness of their positionality. Mobility and immobility are thus structured around an economy of presence. Those with check-in capabilities leave a trace of their mobility, and affect those connected others to react in complementary ways. Movement through urban space-time are captured and distilled into categorical habits. Spatiality is thereby tamed (Massey 2005).

The growth of these LBS practices is not only recording the prevalence of consumption in everyday urban life, but is enacting the conditions through which the aggressive reiteration of these habits becomes normal, even expected of individuals. In other words, mobility in urban space is assumed to be consumptive and a practice meant to be made conspicuous, to be shared with others. Furthermore, it is the purview of check-in services like Foursquare to make this kind of hyper-informed, conspicuous mobility part of the everyday experience of urban dwellers. These claims to the mundane should spark the attention of critical geographers. Recognizing that the potentiality of change in the proximate future is simultaneously timed and spaced, critical geographies have rightly laid claim to the proximate as a political site/moment. Within these sites/moments, the mere possibility for inter-relation and inter-action is a powerful affect. However, knowledge about proximity in the location-aware future has become a commodity; it has been captured. The reification of such knowledge is enacted through the social-economic transactions associated with the rise of 'location' in technoscience. Covertly then, this 'local knowledge' apparatus may disguise itself as participatory data collection, as crowdsourced citizen science, and as neogeography. Indeed, its knowledge is locally situated, and therefore prized by the participatory movement. The knowledge effects, however, of these LBS developments should give critical geographers pause – as the inculcation of new habits refigure interaction in urban space-times.

## 7. Conclusions

> Mobile is local. ... The entire context for everything that I do is me, my person, my location. These are tasks that get consummated in a very short period of time and nearby. They're often on foot, which means that the spatial accuracy should become super important. ... When you're down there on the street, ... it raises the bar for accuracy and location. (Agüera and Arcas, 2010)

Blaise Agüera y Arcas, a software architect at Microsoft, leads development of Bing Maps drawing upon previous experience building Photosynth (a technology that stitches web-based photos together into multidimensional and navigable digital spaces). While at Where 2.0 in 2010, Agüera and Arcas was careful to articulate Microsoft's relationship to the growing use of LBS: Microsoft acts primarily as a connector among the locational information vehicles constituted by Foursquare, Gowalla, Twitter, and other emerging location-based services. Microsoft is therefore one corporate partner that seeks to make use of the data created by LBS to augment the services they provide to their users. These locational-information ecologies have restructured web-based search (Zook and Graham, 2007) and are, as I have argued here, also restructuring everyday mobilities augmented by mobile LBS.

In the above quote, Agüera and Arcas equates mobile with local. For him and those at the Where 2.0 conference, attention to mobile application development is all about building 'solutions' for the local – to place people in space-time. This kind of emphasis on the local, by fixing space into discrete places, further reinforces for Blaise that this activity is all about "me, my person, my location". This of course does not preclude the possibilities for interactivity; however, the potential for these interactions are limited to a largely transactional imagination. For instance, LBS proponents imagine (and drive toward) the following use case: We both 'check in' at the local coffeeshop. You've left a 'tip' in Foursquare that informs me of drink specials. I 'respond' by noting that I have followed your advice. Perhaps I affix a picture to my 'check-in', allowing future users and customers to make a more informed decision regarding their morning coffee.

These transactional interactions rub against more relational understandings of spatiality. Massey resists these compartmentalized and individuated notions of space. She writes (2005, 125), "You can't hold places still." And while the user ethic of Gowalla and Foursquare is to have 'interesting and different' experiences, the actual practice of checking-in produces a narrowing of urban space-time experience. Massey (2005) continues,

> We do not feel the disruptions of space, the coming upon difference. On the road map you won't drive off the edge of your known world. In space as I want to imagine it, you just might. (111)

For Massey and much of contemporary social–cultural critical human geography, space is constituted through relationality; interaction does not presuppose space *per se*, but space is productive of and produced by interaction. The possibility of driving off the edge and to do so with others as a "social activity" establishes a notion of mobility that necessarily exceeds the mundane work of the 'check-in' (Adey, 2010, 23). Furthermore, in Dewsbury's (2000) articulation of performativity, it is the possibility for "experimentation" and "joyful encounters" that a relational spatiality enables (493). However, as transactions, LBS attempt to render spatiality a rigid series of engagements that are fully anticipated and controllable. These attempts are perhaps largely not realized (especially given the relative lack of uptake of 'check-in' activities globally), and yet they disturb how we might make sense of place, of taking place, and the possibilities for encounter.

Read another way, it is this kind of control and anticipation that make LBS a different iteration of urban surveillance. The check-in service produces a knowledge of the self that is shared – and only fully available – to the owner of the LBS system and their various corporate and state partners. Check-in applications provide this new urban analytic where individuals 'volunteer' their location in return for a complex of information tailored to their specific spatial–temporal and social-political-economic contexts. This information is used to channel users toward particular social–political–economic objectives, to anticipate and control movement (providing data rich for speculation). Furthermore, it is not a sur-

prise that an office at the US State Department made contact with Dennis Crowley at SXSW in 2010 to talk about Foursquare (Pollack, 2010). LBS make available information about urban movements, as a power-knowledge that multiplies the disciplinary possibilities of the state. In the location-aware future, the conspicuousness of our mobilities should inform both the study of the differentiated mobilities of urban dwellers and our resistances to such surveillant calculations.

## Acknowledgments

This manuscript was fostered in various forms by the enthusiastic audiences of the 2011 AAG meetings in Seattle, the 2011 RGS-IBG meetings in London, and the NCGIA workshop in 2010 at Santa Barbara. I also thank those who provided feedback, including: Sam Kinsley, Ryan Cooper, Bryan Preston, and three anonymous referees.

## References

Adey, P., 2010. Mobility. Routledge, London, New York.
Agüera, Arcas, B., 2010. The Map as an Information Ecology, at Where 2.0 2010. O'Reilly Media Inc., San Jose, CA.
Anderson, B., 2006. Becoming and being hopeful: towards a theory of affect. Environment and Planning D: Society and Space 24, 733–752.
Anderson, B., 2010. Preemption, precaution, preparedness: anticipatory action and future geographies. Progress in Human Geography 34 (6), 777–798.
Anderson, B., Harrison, P. (Eds.), 2010. Taking-Place : Non-Representational Theories and Geography. Ashgate, Farnham, Surrey, England, Burlington, VT, pp. xi, 378p.
Arthur, C., 2008. Location, Location, Location... That is the Key to Top 100 Websites, The Guardian, final ed. Guardian Newspapers Limited, London, p. 12.
Ash, J., 2010. Architectures of affect: anticipating and manipulating the event in processes of videogame design and testing. Environment and Planning D: Society and Space 28, 653–671.
Ash, J., 2012. Technology, technicity and emerging practices of temporal sensitivity in videogames. Environment and Planning A 44, 187–203.
Barton, D., 2011. People and technologies as resources in times of uncertainty. Mobilities 6 (1), 57–65.
Beer, D., 2010. Mobile music. Coded Objects and Everyday Spaces. Mobilities 5 (4), 469–484.
Beer, J., 2011. The New Dot-Com Boom, Canadian Business, pp. 28–34.
Berry, M., Hamilton, M., 2010. Changing urban spaces: mobile phones on trains. Mobilities 5 (1), 111–129.
Biba, E., 2009. Inside the GPS Revolution: 10 Applications That Make the Most of Location. Wired Magazine.
Birtchnell, T., Büscher, M., 2011. Stranded: an eruption of disruption. Mobilities 6 (1), 1–9.
Bissell, D., 2007. Animating suspension: waiting for mobilities. Mobilities 2, 277–298.
Bissell, D., 2010. Vibrating materialities: mobility-body-technology relations. Area 42 (4), 479–486.
Brady, D., 2010. Social Media's New Matra: Location, Location, Location, Business Week, Bloomberg, LP, pp. 34–36.
Brenner, N., Theodore, N., 2002. Cities and the geographies of "actually existing neoliberalism". Antipode 34 (3), 349–379.
Budd, L., Adey, P., 2009. The software-simulated airworld: anticipatory code and affective aeromobilities. Environment and Planning A 41, 1366–1385.
Butler, J., 1993. Bodies that Matter: On the Discursive Limits of "Sex". Routledge, New York.
Chrisman, N.R., 2005. Full circle: more than just social implications of GIS. Cartographica 40 (4), 23–35.
Corcoran, C.T., 2010. Brands use Foursquare, Women's Wear Daily, 136 ed., p. 8.
Crampton, J.W., 2001. Maps as social constructions: power, communication and visualization. Progress in Human Geography 25 (2), 235–252.
Crampton, J.W., 2009. Cartography: maps 2.0. Progress in Human Geography 33 (1), 91–100.
Crampton, J.W., 2010a. Cartographic calculations of territory. Progress in Human Geography 34 (5).
Crampton, J.W., 2010b. Mapping: A Critical Introduction to Cartography and GIS. Wiley-Blackwell, Malden, Mass.
Cresswell, T., 2010. Towards a politics of mobility. Environment and Planning D: Society and Space 28, 17–31.
Cresswell, T., 2011. Mobilities I: catching Up. Progress in Human Geography 35 (4), 550–558.
Crowley, D., 2010. Adventures in Mobile Social 2.0: Twelve Months of Foursquare, at Where 2.0 2010. O'Reilly Media Inc., Santa Clara, CA.
Dewsbury, J.-D., 2000. Performativity and the event: enacting a philosophy of difference. Environment and Planning D: Society and Space 18, 473–496.
Dodge, M., Kitchin, R., 2005a. Code and the transduction of space. Annals of the Association of American Geographers 95 (1), 162–180.
Dodge, M., Kitchin, R., 2005b. Codes of life: identification codes and the machine-readable world. Environment and Planning D: Society and Space 23, 851–881.
Dodge, M., Kitchin, R., 2007. 'Outlines of a world coming into existence': pervasive computing and the ethics of forgetting. Environment and Planning B: Planning and Design 34, 431–445.
Dodge, M., Kitchin, R., 2009. Software, objects, and home space. Environment and Planning A 41, 1344–1365.
Edney, M., 1997. Surveying and mapping. Mapping an Empire: The Geographical Construction of British India 1765–1843, 77–118.
Elwood, S.A., 2004. Partnerships and participation: reconfiguring urban governance in different state contexts. Urban Geography 25 (8), 755–770.
Elwood, S.A., 2006. Beyond cooptation or resistance. Urban spatial politics, community organizations, and GIS-based spatial narratives. Annals of the Association of American Geographers 96 (2), 323–341.
Elwood, S.A., 2008a. Grassroots groups as stakeholders in spatial data infrastructures: challenges and opportunities for local data development and sharing. International Journal of Geographical Information Science 22 (1), 71–90.
Elwood, S.A., 2008b. Volunteered geographic information: future research directions motivated by critical, participatory, and feminist GIS. GeoJournal 72, 173–183.
Elwood, S.A., 2008c. Volunteered geographic information: key questions, concepts and methods to guide emerging research and practice. GeoJournal 72, 133–135.
Elwood, S.A., 2009. Geographic information science. New geovisualization technologies – emerging questions and linkages with GIScience research. Progress in Human Geography 33 (2), 256–263.
Elwood, S.A., Leitner, H., 1998. GIS and community-based planning: exploring the diversity of neighborhood perspectives and needs. Cartography and Geographic Information Systems 25 (2), 77.
Elwood, S.A., Leszczynski, A., 2011. Privacy, reconsidered: new representations, data practices, and the geoweb. Geoforum 42, 6–15.
Escolar, M., 2003. Exploration, cartography and the modernization of state power. In: Brenner, N., Jessop, B., Jones, M., MacLeod, G. (Eds.), State/Space. A Reader. Blackwell, Malden, MA, pp. 29–52.
Ghose, R., 2001. Use of information technology for community empowerment: transforming geographic information systems into community information systems. Transactions in GIS 5 (2), 141–163.
Ghose, R., 2007. Politics of scale and networks of association in PPGIS. Environment and Planning A 39 (8), 1961–1980.
Golledge, R.G., Stimson, R.J., 1997. Spatial Behavior: A Geographic Perspective. Guilford Press, New York.
Goodchild, M.F., 2007. Citizens as sensors: the world of volunteered geography. GeoJournal 69, 211–221.
Goodchild, M.F., Carley, K.M., 2010. Spatio-temporal constraints on social networks. National Center for Geographic Information and Analysis, Santa Barbara, CA. 13–14 December. <http://www.ncgia.ucsb.edu/projects/spatio-temporal/>.
Graham, M., 2010. Neogeography and the palimpsests of place. web 2.0 and the construction of a virtual Earth. Tijdschrift voor Economische en Sociale Geografie 101 (4), 422–436.
Grayson, I., 2006. We know where you live. The Australian, IT Broadsheet ed., Nationwide News Pty Limited, p. 1.
Hagman, O., 2010. Driving pleasure: a key concept in swedish car culture. Mobilities 5 (1), 25–39.
Haklay, M., Singleton, A., Parker, C., 2008. Web mapping 2.0: the neogeography of the GeoWeb. Geography Compass 2 (6), 2011–2039.
Haraway, D.J., 1991. Simians, Cyborgs, and Women : The Reinvention of Nature. Routledge, New York.
Haraway, D.J., 1997. Modest_Witness@Second_Millennium. FemaleMan©_Meets_OncoMouse™: Feminism and Technoscience. Routledge, New York.
Harley, J.B., 1989. Deconstructing the map. Cartographica 26, 1–20.
Harmon, K.A., 2004. You are Here: Personal Geographies and Other Maps of the Imagination, first ed. Princeton Architectural Press, New York.
Harvey, D., 1986. The Place of Urban Politics in the Geography of Capitalist Uneven Development. The Urbanization of Capital, Johns Hopkins, Baltimore, pp. 125–164.
Harvey, D., 2010. The Enigma of Capital: and the Crises of Capitalism. Oxford University Press, Oxford, New York.
Harvey, F., 2003. Developing geographic information infrastructures for local government: the role of trust. The Canadian Geographer 47 (1), 28–36.
Harvey, F., 2005. Reconfiguring administrative geographies in the United States. ACME: An International E-Journal for Critical Geographies 4 (1), 57–79.
Harvey, F., 2008. A Primer of GIS: Fundamental Geographic and Cartographic Concepts. Guilford Press, New York.
Harvey, F., Chrisman, N.R., 1998. Boundary objects and the social construction of GIS technology. Environment and Planning A 30, 1683–1694.
Heater, B., 2010. Foursquare Sees Record Signups in Wake of Facebook Places. PC Magazine.
Hesseldahl, A., 2010. Foursquare Tries Broadening its Appeal. Business Week, Bloomberg, LP, p. 2.
Hickman, L., 2010. How I Became a Foursquare Cyberstalker: Move over Twitter, There's a New Social Networking Tool Everyone's Talking About. The Guardian, final ed., London, p. 4.
Honon, M., 2009. I Am Here: One Man's Experiment with the Location-Aware Lifestyle. Wired Magazine.

Jons, H., 2006. Dynamic hybrids and the geographies of technoscience. Discussing conceptual resources beyond the human/non-human binary. Social and Cultural Geography 7 (4), 559–580.
Kho, N.D., 2010. Location, Location, (Geospatial) Location, Information Today. Information Today, Inc., Medford, NJ.
Kitchin, R., Dodge, M., 2011. Code/Space: Software and Everyday Life. MIT Press, Cambridge, Mass.
Kinsley, S., 2010. Representing 'things to come': feeling the visions of future technologies. Environment and Planning A 42, 2771–2790.
Kwan, M.-P., 2002. Feminist visualization: re-envisioning GIS as a method in feminist geographic research. Annals of the Association of American Geographers 92 (4), 645–661.
Latour, B., 1987. Science in Action: How to Follow Scientists and Engineers Through Society. Harvard University Press, Cambridge, Mass.
Latour, B., 2005. Reassembling the Social: An Introduction to Actor-Network-Theory. Oxford University Press, Oxford, New York.
Leitner, H., Elwood, S.A., Sheppard, E., McMaster, S., McMaster, R.B., 2000. Modes of GIS provision and their appropriateness for neighborhood organizations: examples from minneapolis and St. Paul Minnesota. URISA Journal 12 (4), 43–56.
Massey, D., 2005. For Space. SAGE, London (Thousand Oaks, Calif).
Massumi, B., 2002. Parables for the Virtual: Movement, Affect, Sensation. Duke University Press, Durham, NC.
McGinity, M., 1999. Service Providers Sleuthing out e-911 Solutions Find the Trail Leads to Lucrative New Services: Tracking Profits, tele.com. CMP Media, Inc.
McHaffie, P.H., 2002. Towards the automated map factory: early automation at the US geological survey. Cartography and Geographic Information Science 29 (3), 193–206.
McLafferty, S.L., 2002. Mapping Women's worlds: knowledge, power and the bounds of GIS. Gender, Place and Culture 9 (3), 263–269.
McLafferty, S.L., 2005. Women and GIS: geospatial technologies and feminist geographies. Cartographica 40 (4), 37–45.
Metz, R., 2009. Friends Go Online at Foursquare to Meet Offline. San Jose Mercury News, San Jose, CA.
M.I.A., 2010. The Message, MAYA.
Miller, Christopher C., 2006. A beast in the field: the Google maps Mashup as GIS/2. Cartographica 41 (3), 187–199.
Miller, Claire.C., Wortham, J., 2010. Technology Aside, Most People Still Decline to be Located. The New York Times, New York.
Norris, A., 2003. Online: Mobile Matters: Hide and Seek, The Guardian. Guardian Newspapers Limited, London, p. 7.
Oliver, S.S., 2010. Who Elected Me Mayor? I Did. The New York Times, New York, NY.
O'Reilly Media Inc., 2011a. Where 2.0 2011 – O'Reilly Conferences, April 19–21, 2011, Santa Clara, CA. O'Reilly Media Inc.
O'Reilly Media Inc., 2011b. About: Where 2.0 2011 – O'Reilly Conferences, April 19–21, 2011, Santa Clara, CA. O'Reilly Media Inc.
Pain, R., Smith, S., 2008. Tracking the Rhythms of Daily Life, Economic and Social Research Council seminar of the Time-Space and Life Course seminar Series, London, UK. 26 August.
Patel, K., 2010. As Foursquare Moves Beyond Hipsters, Big Brands Check in, Advertising Age. Crain Communications Inc., p. 8.
Patterson, M., 2011. More-than visual approaches to architecture. Vision, touch, technique. Social and Cultural Geography 12 (3), 263–281.
Pattison, K., 2010. Geolocation Services: Find a Smartphone, Find a Customer. The New York Times, New York, NY.
Pavlovskaya, M., 2002. Mapping urban change and changing GIS: other views of economic restructuring. Gender, Place and Culture 9 (3), 281–289.
Pavlovskaya, M., 2006. Theorizing with GIS: a tool for critical geographies? Environment and Planning A 38, 2003–2020.
Petrova, K., Wang, B., 2011. Location-based services deployment and demand: a roadmap model. Electronic Commerce Research 11, 5–29.
Pickles, J., 2004. A History of Spaces: Cartographic Reason, Mapping, and the Geo-Coded World. Routledge, New York.
Pollack, N., 2010. Behind Foursquare and Gowalla: The Great Check-in Battle. Wired Magazine.
Poore, B.S., Chrisman, N.R., 2006. Order from noise: towards a social theory of geographic information. Annals of the Association of American Geographers 96 (3), 508–523.
Ramsey, K., 2008. A call for agonism: GIS and the politics of collaboration. Environment and Planning A 40, 2346–2363.
Roberts, S., Schein, R.H., 1995. Earth shattering: global imagery and GIS. In: Pickles, J. (Ed.), Ground Truth: The Social Implications of Geographic Information Systems. Guilford, New York, pp. 171–195.
Rockhold, J., 2000. Where It's At, Wireless Review.
Rockhold, J., 2001. Anywhere but Here, Wireless Review. Primedia Business Magazines & Media Inc.
Schuurman, N., 2006. Formalization matters: critical GIS and ontology research. Annals of the Association of American Geographers 96 (4), 726–739.
Schuurman, N., 2008. Database ethnographies: using social science methodologies to enhance data analysis and interpretation. Geography Compass 2 (5), 1529–1548.
Seeman, E.D., O'Hara, M.T., Holloway, J., Forst, A., 2007. The impact of government intervention on technology adoption and diffusion: the example of wireless location technology. Electronic Government 4 (1), 1–19.
Sheller, M., Urry, J., 2006. The new mobilities paradigm. Environment and Planning A 38, 207–226.
Shields, R., 2010. Can Foursquare and Gowalla put mobile ads on the map?, New Media Age, pp. 1–2.
Siegel, R., 2010. In: Block, M., Siegel, R. (Eds.), Tech Innovations at SxSW. All Things Considered, USA.
Smith, N., 1992. History and philosophy of geography: real wars, theory wars. Progress in Human Geography 16, 257–271.
Smith, N., 2002. New globalism, new urbanism: gentrification as global urban strategy. Antipode, 427–450.
Stiegler, B., 2010. Taking Care of Youth and the Generations. Stanford University Press, Stanford, Calif.
Swartz, J., 2010. Facebook Dives into Location-Based Services, USA Today, Final ed., p. 1B.
Swartz, N., 2000. Great Location Expectations, Wireless Review. Primedia Business Magazines & Media Inc.
Talen, E., 2000. Bottom-up GIS – a new tool for individual and group expression in participatory planning. Journal of the American Planning Association 66 (3), 279–294.
Thomas, D., 2002. Knowing their Place. Computer Weekly, Reed Business Information, UK.
Turkle, S., 2007. Evocative Objects : Things we Think With. MIT Press, Cambridge, Mass., pp. ix, 385p.
Vuong, A., 2010. Foursquare Fans Check Out Where Others Checking in, The Denver Post, Final ed, Denver, CO., pp. K-01.
Weinkrantz, A., 2010. 'Checking in' Helps Businesses, San Antonio Express-News, State & Metro ed.. San Antonio Express-News, San Antonio, TX, p. 1C.
Whatmore, S., 2006. Materialist returns: practising cultural geography in and for a more-than-human world. Cultural Geographies 13, 600–609.
White, M., 2006. The Body and the Screen : Theories of Internet Spectatorship. MIT Press, Cambridge, Mass.
Wilson, M.W., 2009. Cyborg geographies: towards hybrid epistemologies. Gender, Place and Culture 16 (5), 499–516.
Wilson, M.W., 2011a. Data matters: legitimacy, coding, and qualifications-of-life. Environment and Planning D: Society and Space, 29.
Wilson, M.W., 2011b. 'Training the eye': formation of the geocoding subject. Social and Cultural Geography 12 (4), 357–376.
Wilson, M.W., Hickey, M., Craine, J., Fawcett, L., Oberhauser, A., Roe, E., Warkentin, T., 2011. Cyborg spaces and monstrous places: critical geographic engagements with harawayian theory. Aether: The Journal of Media Geography 8 (A), 42–67.
Wood, D., 1992. The Power of Maps. Guilford Press, New York.
Wood, D., 2010. Everything Sings: Maps for a Narrative Atlas. Siglio, Los Angeles.
Wortham, J., 2009. Face-to-Face Socializing Starts with a Mobile Post, Late ed. The New York Times, New York, p. 1.
Young, D., 2000. Location-Based Services: Not Ready for Prime Time, Wireless Review. Primedia Business Magazines & Media Inc.
Zook, M.A., 2005. The Geography of the Internet Industry : Venture Capital, Dot-Coms, and Local Knowledge. Blackwell Pub., Malden, MA.
Zook, M.A., Graham, M., 2007. The creative reconstruction of the Internet: google and the privatization of cyberspace and DigiPlace. Geoforum 38, 1322–1343.