CHAPTER 7

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NEW DIGITAL GEOGRAPHIES: INFORMATION, COMMUNICATION, AND PLACE

Abstract This chapter provides an overview of contemporary trends relevant to the development of geographies based on new digital technologies such as the Internet and mobile phones. Visions of utopian and ubiquitous information superhighways and placeless commerce are clearly passé, yet privileged individuals and places are ever more embedded in these new digital geographies while private and state entities are increasingly embedding these digital geographies in all of us. First is a discussion of the centrality of geographical metaphors to the way in which we imagine and visualize the new digital geographies. Then the example of the commercial Internet (e-commerce) is used to demonstrate the continued central role of place in new digital geography both in terms of where activities cluster and how they vary over space. The transformation of digital connections from fixed (i.e., wired) to untethered (i.e., wireless) connections is explored as to its significance in the way we interact with information and the built environment. Finally is an examination of the troubling issue of the long data shadows cast by all individuals as they negotiate their own digital geographies vis-à-vis larger state and private entities.

Keywords Technology, telecommunications, social users of technology, e-commerce, mobile phones, privacy

1. INTRODUCTION

Digital communications technologies are creating complex arrays of new geographies through which we view, interact, and connect to the world. It is now possible to view live shots of the Eiffel tower, chat with a colleague in South Africa, or read a local newspaper from the comfort of your home, from an Internet café in Chiang Mai, Thailand, or via mobile phone in Helsinki. While this capability provides an image (heavily promoted by the advertising of telecommunications companies) of uniform and utopian connectivity, the reality of new digital geographies is much more complex. The cost of these technologies, the

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ease, availability, reliability, and portability of their use, and even the functions to which they are turned vary across time and space. Images of famous landmarks may be easily available while vernacular landscapes are bypassed. Certain parts of South Africa and Thailand (especially privileged spaces such as cities and tourist destinations) are well wired while their hinterlands remain cut off, and parts of the "developed" world such as Appalachia are struggling to maintain meaningful digital connections. Even the space (private, public, or publicly private) and means of connection (wired PC or wireless phone) vary according to local availability and personal preference.

These new digital geographies (both social and economic) are by no means technologically determined. Rather, the way in which places and people become "wired" (or remain "unwired") still depends upon historically layered patterns of financial constraint and cultural and social variation. The geographic and technological evolution of this digital infrastructure can therefore be understood as a process of social construction of new (and often personal) digital geographies. These new geographies are both immensely empowering (for the people and places able to construct and consume them) and potentially overpowering as institutional and state forces are able to better harness information with growing personal and spatial specificity.

At the heart of new digital geographies is the ability to represent text, sound, still, and moving images in digital formats which can then be transmitted across common networks. This potentiality of shared transmission and consumption via some digital receiver, be it a wired PC or a wireless phone, is central to the geographical impact of information and communication technologies (ICTs). The exemplar of this interoperability is the Internet, which pioneered digital packet switching between disparate hardware and software systems via a standardized set of protocols (Abbate 1999). Although in existence for decades, mainstream Western society adopted the Internet during the 1990s, often with unrealistic expectations that the technology would simply substitute for geography in social and economic relations. Utopian visions of a "digital and spaceless society" abounded, and thousands of so called dot-com firms sprang up overnight intent on changing the structure of the economy. Ironically, although the rhetoric often proclaimed an end of geography, ICTs were and continue to be routinely imagined and understood through geographic metaphors.

Metaphors of information superhighways and wired cities are useful in imagining a world in which data is created, shared, accessed, and cross-checked in historically unprecedented volumes. While primarily employed to emphasize the exponential growth of "digital geographies," metaphors were also central in understanding the unevenness of these new landscapes. Some countries, particularly relatively small ones such as Singapore or Finland, emerged as

so-called "cyberstates," while others such as Estonia, Qatar, and Slovenia are making considerable progress to this same goal although often with radically different forms. Larger and wealthy countries such as the U.S. with developed high technology industries were also able to quickly expand their presence in digital geographies, albeit with significant digital divides. At the same time, much of the developing world was limited to a few "digital islands" located in capital cities and/or expatriate populations. Clearly a ubiquitous and uniform global digital geography is more rhetoric than reality (Warf 2001).

Moreover, even in the densest parts of these new digital geographies, ICTs are accessed, adapted, and appropriated differently depending on individual and societal imagination, culture, and history. This is particularly pronounced within the economic sphere, as legacies of earlier, firm technological and cultural structures create forms of electronic or mobile commerce (e-commerce or m-commerce) that vary considerably between places. While dot-com companies envisioned a single predetermined global digital geography, evidence suggests that there are multiple digital geographies interconnected but situated in places that are instrumental in shaping any interaction. The introduction of mobile connections further amplifies the dynamic complexities of contemporary digital geographies. These technologies enable an entirely new type of interaction, whether through peer-to-peer communications or new uses of the built environment, melding access to information and instant worldwide communications in portable and personal packages. We are becoming unique and powerful digital individuals within multiple digital societies.

Yet even as people are using information in new ways and places, it is being distributed and made available in greater quantity and with unprecedented details. An ever growing number of personalized records are collected, and at times disseminated in the databases and customer management systems of businesses, organizations, and government agencies that service modern living, thereby connecting the world via a complex and ever-changing array of digitized transactions of ever more personal records. The Orwellian notion of "Big Brother" is now distributed and multiple but is indeed watching, and the implications can be simultaneously reassuring (monitoring individual health) and terrifying (tracking what is being read and with whom it is being discussed).

This chapter provides an overview of various contemporary trends of significant relevance in developing a theoretical framework for digital geographies. First, we discuss the centrality of geographical metaphors to the way in which we imagine and visualize the new digital geographies. We then use the example of the commercial Internet (e-commerce) to demonstrate the continued central role of place in new digital geography both in terms of

where activities cluster, and also in how they vary over space. We explore the transformation of digital connections from fixed (i.e., wired) to untethered (i.e., wireless) connections, which has significance in the way we interact with information and the built environment. Finally, we examine the troubling issue of the long data shadows cast by every individual as they negotiate their own digital geographies vis-à-vis larger state and private entities.

2. IMAGINING DIGITAL GEOGRAPHIES

In both popular and academic discussions of digital communication technologies and their possible socioeconomic implications, a large panoply of metaphors has been coined with a premise on geographic place, such as superhighways, teleports, server farms, homepages, and so on (Adams 1997). Likewise, the transactions and data exchanges at the heart of the so-called Network Society (Castells 1996), are also frequently imagined and envisioned in terms of "spaces"—hyperspace, dataspace, netspace and, of course, cyberspace (Dodge and Kitchin 2001; Thrift 1996). The result, according to Graham (1998), is digital geographies that are made tangible and knowable through familiar territorial analogy.

Although useful for imaging new social spaces, the metaphors and geographic analogies used are rarely neutral; rather they are active, ideological constructs often deployed purposefully to hide the underlying realities. The implication at the heart of many of these visions of digital geographies (particularly prevalent during the dot-com boom) is that "something new, different, and (usually) better is happening" (Woolgar 2002, 3), the rhetoric often supporting a deterministic and utopian viewpoint, with new spaces creating opportunities for free-market exploitation. There are few studies, however, that explicitly aim at "getting behind" these spatial metaphors, to begin describing how digital communication technologies actually do their "work" at the level of individual, everyday performances of space (notable exceptions include Adams 2000; Kwan 2002a; Valentine et al. 2002). Such "invisibility" of analysis of communication within the geography discipline (Hillis 1998) in part derives from the fact that, unlike transportation networks, much of the telecommunications and network infrastructures supporting cyberspace are small in scale and often remain hidden from the public view, such as the case for fiber-optic cables that carry many gigabytes of information, anonymous servers rooms, and secure, windowless buildings, with cables buried under roads and running through walls and under floors (Hayes 1997). Such invisibility may in part have led to the erroneous assumption that cyberspace is somehow immaterial, aspatial, and nongeographic. "The net cannot float free of conventional geography" (Hayes 1997, 214), however,

even though most users of the Internet may be oblivious about practicalities of "where" and "how" data flows to successfully send e-mail.

> Current technology requires information to be served from somewhere and delivered to somewhere. Heisenberg's uncertainty principle not withstanding, at geographic scales a bit always has an associated location in real geographic space." (Goodchild 1997, 383-84)

The "where" and "how" of the physical embeddedness of data networks is important, first, because of their highly uneven geographical distribution and the consequent sociospatial implications in terms of access and inequalities. Second, it is important because of the increasing concern for the physical vulnerability of cyber infrastructure to terrorist attack, with damage to nodal points potentially causing major economic and social impacts for technologically dependent nations. Cartographic visualization provides one useful way to envision and begin to analyze the "where" and "how" of these digital geographies.

3. VISUALIZING DIGITAL GEOGRAPHIES

Efforts have already been made to map the material, economic, and social geographies of cyberspace (Dodge and Kitchin 2001). They range from those with a relatively basic cartographic design, such as the geographic layout of cable infrastructures from the very local scale of city streets up to global scale interconnections (as shown in **Figure 7-1**), to more sophisticated representations. Cheswick and Burch created a visualization of the structure of the core of the Internet using a graph representation (**Figure 7-2**). The "map" shows the Internet's topology as of December 11, 2000, representing over 75,000 network nodes, color coded according to the ISP, seeking to highlight who "owns" the largest sections of Internet. The choice of mapping through abstract graphs also prompts one to think about the types of visual representations, locational grids, and projections that are most effective to map new digital geographies. For geographers, it raises fundamental questions about how far Euclidean geography is useful or relevant to the analysis of these digital spaces.

One key aspect that is missing from most current work on mapping network infrastructures, including Cheswick and Burch's, is information on the nature of traffic flows and for what people are actually using the networks (see Kellerman 2003). Yet mapping can reveal the nature of information archives and social interaction by exposing their latent spatial structures (see Skupin's 2002 work on AAG abstracts). Online interaction is currently dominated by visual interfaces, rather than aural, tactile, or olfactory interfaces, which suggests that cartographic approaches are particularly apposite for

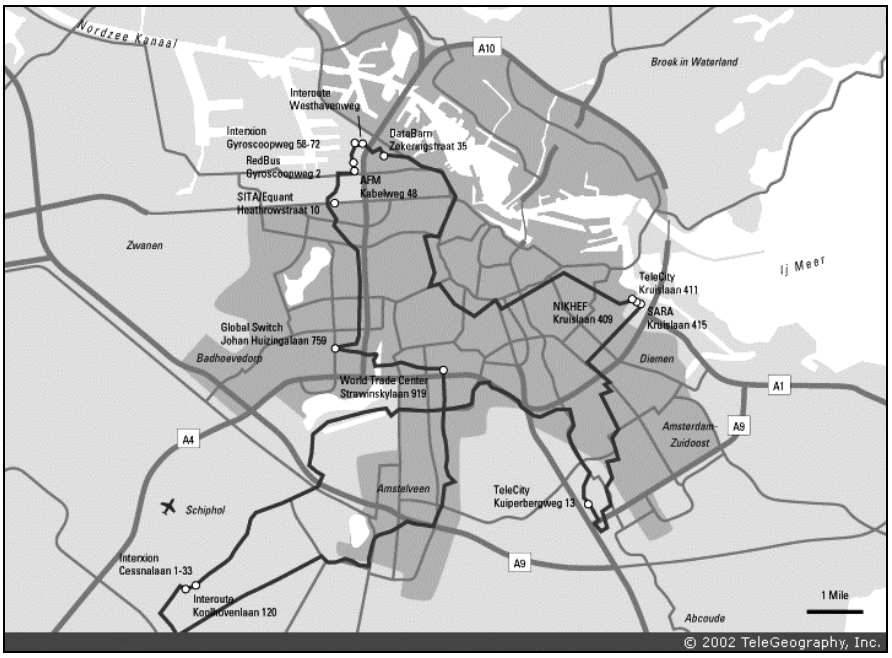

Figure 7-1. An example of how cartography can be used to envision infrastructure of digital geographies. This map shows Interoute's fibre network ring around the city of Amsterdam. (Source: TeleGeography's Metropolitan Area Networks Report 2003, http://www.telegeography.com.)

representing information spaces and providing novel tools for their navigation (Dodge and Kitchin 2001). Many of the most interesting cyberspace mapping efforts produce nongeographic visualizations of information structures using innovative processes of spatialization (Couclelis 1998).

Spatialization can be considered a subset of information visualization and information retrieval, and is defined by Fabrikant (2000, 67) as the processes of visualization that "rely on the use of spatial metaphors to represent data that are not necessarily spatial." The aim of spatialization is to render large amounts of abstract data into a more comprehensible and compact visual form by generating meaningful synthetic spatial structure (e.g., distance based on lexical similarity) and applying cartographic-like representations, for example by borrowing design concepts from terrain and thematic mapping. Innovative developments in spatialization, information visualization, and geovisualization are altering the nature of the map. Within geography, digital

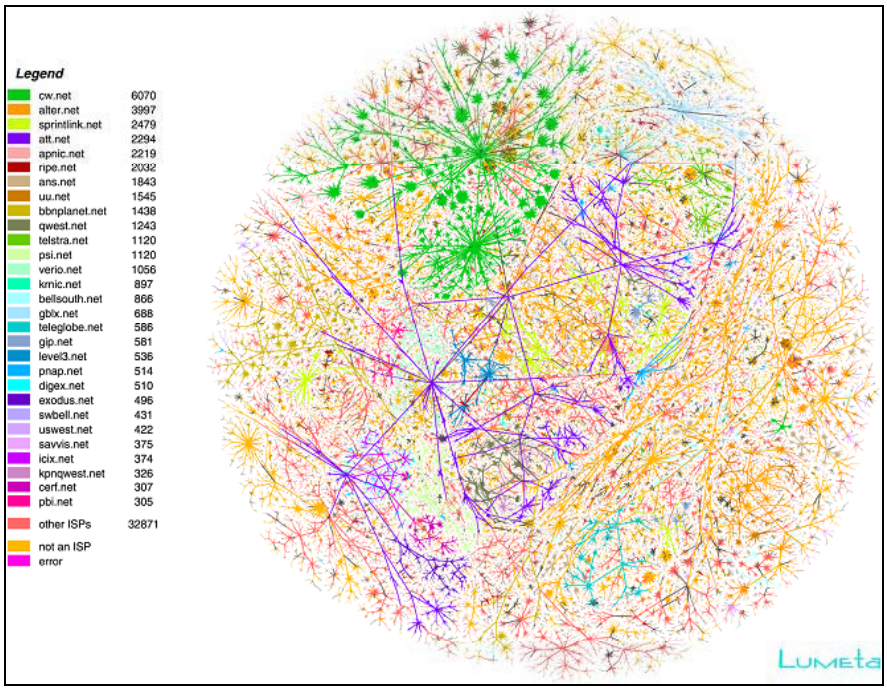

Figure 7-2. A graph visualisation of the topology of network connections of the core of the Internet, December 11 2000. (Source: Bill Cheswick, http://www.lumeta.com)

maps have increasingly become more tools for exploring data than static representations for communicating results. Looking forward, developments in digital communications technologies are likely to accelerate this as maps become interactive and transitory, generated "on-the-fly" to meet particular needs (e.g., web mapping services, in-car navigation, and on-demand mapping to mobile devices). As maps become "intelligent" to some degree (i.e., aware of the location context of the user), we will see mobile maps that provide an individually tailored view of the world centered around the person's location and themed to match their interests. But as new modes of individualized and context aware mapping are developed at fine scales and in real time, there will be corresponding ethical and privacy implications to grapple with. These new issues will involve politics just as in other forms of cartography, and therefore their partiality and subjectivity should be taken into consideration (Dodge and Kitchin 2000; Harpold 1999).

4. COMMERCIALIZING DIGITAL GEOGRAPHIES

Arguably, one of the most powerful visions about the new digital geography of the Internet was that distance would compress to nothing and physical location would become irrelevant. The initial public offering (IPO) of Netscape Communications in August 1995, through the market downturn in April 2000, marked a boom in dot-com companies that strove to change the way businesses and consumers conducted transactions. The dot-com boom was a historically unprecedented effort to define and commercialize what hitherto had been a fiercely noncommercial digital space and ushered in an extraordinary moment in the economy.

The vision of this new commercial digital geography was so compelling that the closing years of the twentieth century saw a tremendous expansion of risk capital, media attention, and stock market growth based on dot-com companies (Zook 2002). The subsequent bursting of the dot-com bubble in April 2000 and rapid retreat from Internet companies (see Kaplan 2002 and Cassidy 2002) has resulted in a marked decrease in rhetoric on the ability of the Internet and e-commerce to transform the economy. Subsequent evidence has shown that "spacelessness" was increasingly a mere product of imagination as the twentieth century came to a close. Moreover, even at the height of the boom, dot-com firms were overwhelmingly concentrated in major metropolitan and technology centers (such as the San Francisco Bay area and New York City), belying the very rhetoric they espoused (Zook 2000).

Despite this decline in visibility, e-commerce nevertheless persists and affects the way all companies conduct business, albeit with significant variation across sectors and business structures. For every spectacular dot-com flame-out, there are examples of companies using the web in new and innovative ways. This trend, however, does not mark a return to the economic system of the pre-Internet era but is simply the next step in emerging commercial digital geographies. These companies often have no formal risk capital, employ small numbers of people, and receive little in the way of media attention. One of the best known examples of this phenomenon is the listings site called Craigslist (www.craigslist.org). Founded by Craig Newmark in 1995 as an e-mail listing service, this no-frills website leverages what the Internet does best, i.e., aggregating relevant information from scattered sources (such as individuals) in an easily accessible format. In the case of Craigslist, it catalogs subjects such as apartment listings, garage sales, and job listings for a local area. It is this simplicity and the low cost of use that makes Craigslist such a success and a marked contrast to the dot-com hoopla of the 1990s. It will not turn its employees into overnight millionaires but it does have the potential of growing steadily while providing sufficient revenues and profits to continue. In fact, it

is because Craigslist was not conceived as a big moneymaker that it still exists. Ironically, precisely because Craiglist did not go all out to capture a market or build a community of users, it has been able to become an important node in emerging visions of the commercial Internet.

Commercial digital geographies also manifest themselves differently across space and cultures. The way in which consumers adopt e-commerce varies greatly between societies, and such variations are directly and indirectly linked with construction of space in each society (Aoyama 2001a, b, 2003). The causes behind such variations are cultural (e.g., "keyboard allergy" or the lack of familiarity with using the standard Western keyboard for typing and entry), institutional and regulatory (i.e., structures of retail/wholesale sectors, consumer behavior), and spatial (urban form and settlement patterns). Consumer behavior is governed by convenience, familiarity, and social habits, which in turn are shaped by the historical evolution of retail trade. Hence, even societies with similar income and education levels vary in the manner and the speed of technological adoption. For example, e-commerce developments in Japan and Germany have each shown unique historical trajectories and have followed their own distinctive paths.

The notable aspects of the evolution of e-commerce in Japan include (1) the lack of widespread and historical use of long-distance, nonstore retailing, (2) the early adoption of e-commerce by neighborhood convenience stores, and (3) the widespread popularity of Internet-abled mobile telephones. The lack of popularity for nonstore retailing in Japan is attributed to its densely populated urban structure (which gave advantages to ubiquitous storefront retailers), low reputation (proliferation of fraudulent nonstore merchants), tight regulations (as a response to fraudulent merchants), and strategic blunder on the part of retailers who, in the interest of protecting and increasing profitability, did not implement generous return/exchange policies (Aoyama 2001b).

The adoption of e-commerce in Japan was initially associated with an innovative strategy of neighborhood convenience stores. Japan's convenience store franchises, such as Seven Eleven Japan, used their ubiquity and preexisting information network infrastructure (used for point-of-sale inventory reduction) to bring e-commerce into their storefronts by setting up dedicated terminals that sold game software, concert tickets, and travel packages. While the U.S.'s e-commerce sector innovated by bringing virtual storefront to every home, Japan's e-commerce sector attempted to achieve ubiquity first by bringing e-commerce to every storefront. This strategy was later superceded by the emerging Internet-abled mobile telephone, which then brought portable virtual storefronts to every consumer.

In contrast, long-distance retailing was an accepted, legitimate, and established medium of consumption in Germany for over a century before e-

commerce emerged. German nonstore retailers established an early reputation for convenience, quality, and affordability, some with well-known brands that were sold exclusively via their nonstore operations. Two World Wars caused significant disruption of consumer activities, where nonstore retailers served important purposes during the time storefront retailing was being restored. E-commerce merchants benefited from this well-established practice of nonstore retailing and accumulated significant business know-how. Germany today is the largest e-commerce market in Europe, and is the home of two of the top 10 mail order businesses in the world. Furthermore, eight out of the top 10 German e-commerce websites are operated by longstanding catalog houses. This is in stark contrast to Japan's e-commerce market, where top websites are dominated by new, exclusively e-tailer merchants, with the exception of two that are run by traditional mail order firms.

Germany's retail sector has been governed by Europe's most stringent set of regulations, and they played a major role in shaping competition between storefront and nonstore retailers, the predecessors of e-commerce merchants. Regulations that controlled store closing hours, competition, and spatial planning severely restricted the use of marketing and locational strategies of storefront retailers, thereby giving opportunities for nonstore retailers to grow. In-store impromptu discounts and sales were against the law, and spatial planning policy practically eliminated opportunities for storefront retailers to use strategies such as those used by Wal-Mart in the U.S. (locating on the edge of town to reduce property cost), or those by Seven Eleven Japan (locating a small urban store near public transportation to capture commuters). Thus, not only did nonstore retailers have lower operating costs than storefront counterparts, storefront retailers could not exercise many of the conventional retail strategies to out-compete nonstore retailers.

E-commerce also reaches beyond the realm of mainstream consumption to underground and "gray" economies with decidedly geographic implications. Today, the transfer of digital products and services such as online gambling and pornography is a sizeable business generating significant revenue. These activities have been shown to often locate outside the centers of the mainstream Internet activities in more hospitable regulatory and labor regimes such as the Caribbean and Eastern Europe (Wilson 2003; Zook 2003). The technology of Internet does not itself determine the structure and role of these participating places but offers new possibilities for participation, interaction and exploitation based on existing historical and cultural attributes.

Thus, as the case of electronic commerce demonstrates, the form and function of new digital geographies varies significantly across sector, place, and culture. Moreover, any changes engendered by the use of digital

communications technologies generally take much longer than technological visionaries hope. For example, David (1990) shows how a pivotal technological innovation, the electrical motor, first introduced in the 1880s, took well over four decades before altering the face of industry and fundamentally changing the production process, e.g., from compact vertical to low-rise manufacturing factories. Likewise, the new digital geographies that are emerging based on the commercial use of the Internet are still in the state of dynamic flux—not the least because the technology that supports these activities is also continuing to evolve, as the shift towards wireless digital communications illustrates.

5. UNTETHERING DIGITAL GEOGRAPHIES

Although the dot-com boom and bust largely revolved around technologies associated with wired PCs (particularly in the U.S. context), wireless technologies (and the visions and metaphors associated with them) are emerging as an increasingly important component of digital geographies.. Geographic research had only just begun to recognize the existence of this new digital infrastructure despite the fact that mobile subscribers had *always* outnumbered Internet users.

5.1. Wireless Technology, Local Variation

While mobile phone use enjoys worldwide popularity, it does so for a variety of reasons. In countries with relatively undeveloped telecommunications infrastructures, it represents an opportunity to "leap-frog" over older landline technology in an efficient and economical manner and, in many places, is fast replacing wired versions of telephony. Users in wealthier countries are often attracted to the advanced data features, i.e., e-mail, photos, and web access, that are increasingly common in mobile phones. Of course, the precise combination of factors varies with the place, while industry and regulatory issues shape the type of technology available.

The proliferation of the wireless web in Japan is an informative example of how a particular sociospatial condition which allocates premiums on space, portability, and ease of use, results in a specific digital geography. The popularity of Internet-abled mobile telephones in Japan is the result of combined technological and marketing schemes designed to provide an affordable and user-friendly alternative, to those who did not have the money, space, and computer literacy to handle PC-based Internet access (Aoyama 2003). NTT DoCoMo put together a project group in early 1997 to develop the first Internet-abled mobile telephone service with deliberately limited contents to avoid direct competition from PC-based Internet access (Matsunaga

2000; Natsuno 2001). The team conceived the service to function much like that of a hotel concierge or Japan's convenience stores, providing a limited yet essential array of services or products with instant access.

One can further speculate several society-specific factors that contributed to a wide acceptance of wireless web in Japan: market positioning, portability, urban spatial structure, and socially embedded user friendliness. Japan's sociospatial conditions accord high premiums for portability and space-saving equipment, thereby creating a market for a service that provides portability of access. Portability enabled through wireless web not only reduces cost and time of communications, it also expands the timing and location of communications, and enriches it through transfer of increasingly complex multimedia features (Sanwa Research Institute 2001). Portability is particularly attractive to residents in large metropolitan areas where commutes are long and public transit is used heavily for travel, creating idle time. Over half of the commuters in Tokyo Prefecture use public transit to get to work, with an average commuting time of 56 minutes for the greater Metropolitan area (Ministry of Construction 2000; Japan Statistics Bureau 2002).

The popularity of Internet-abled mobile telephones as a medium of communication, particularly among the young, is not unique to Japan, however. The wireless web, although to a slightly lesser extent, has been actively adopted in Western European markets. The explanation is likely to lie in the success of implementing common compatible technical standards (GSM/TDMA), while the U.S. market is fractured between incompatible analog protocols. Another explanation may be technological leapfrogging, which tends to occur in the technological backwater areas. Unlike the U.S. market, where mass home-ownership of Internet-abled PCs was achieved early, many Japanese and Western European households lagged behind, which resulted in the absence of significant competition against wireless web adoption.

In Germany, where mobile telephone ownership is actually higher than Japan, usage (especially among the young) exploded with the introduction of prepaid cards (Koenig et al. 2003). Much like the case of Japan, the early adopters in Germany were teenagers, and today three-quarters of those aged between 12 and 19 have a mobile telephone. The killer applications (the uses of a new technology that drives its adoption) are similar across Japan and Germany, and include downloading ring-tones or display logos, SMS greetings (text messages), and simple games. Particularly for the youth, wireless web is simultaneously a critical means of freedom as well as a means of ensuring connection and mobility in an increasingly geographically and socially dispersed world (Goban-Klaz 2002).

5.2. Changing Patterns of Mobility and Social Interaction

The widespread use of wireless technologies by teenagers illustrates the way in which digital technologies are allowing people to interact with information and the built environment in new ways. In the late 1990s, observers noted changes in the mobility patterns of teens in countries around the world that exhibited high levels of mobile phone ownership. Rather than meeting at landmarks in public locations like plazas or street corners, youths tended to loosely coordinate movements and meetings through constant communications via mobile phone (Townsend 2000). Repeatedly and independently in various cities, this pattern of coordinated mobility was understood via the metaphor of flocking.

The flock-like behavior of teens using mobile phones was neither unique nor representative of a limited phenomenon. This behavior was merely the most visible manifestation of a widespread new type of emergent behavior in the untethered digital geographies, the microcoordination of daily activities. Put simply, the mobile phone permitted a much freer flow of information within social and professional networks. Operating at a highly decentralized level, these untethered networks carried the viral-like flow of information first observed in e-mail usage on the Internet into streets, cafes, offices, and homes. In these intimate, everyday locales, untethered digital networks became far more essential and intricately interwoven into human society than any wired network ever was.

By the first decade of the 21st century, mobile communications technology had led to the creation of a massively hypercoordinated urban civilization in the world's cities. These flows had remarkably destabilizing impacts on existing social and economic structures. Employed by smart mobs, these new patterns of communication were successfully used in massive ad hoc antiestablishment political demonstrations and actions from Manila to Manhattan (Rheingold 2002).

While changes in the social networks of these untethered digital geographies are now well documented, there was little research to help geographers and urban planners understand the complex impacts on the physical forms of the city. The urban environment generates an enormous amount of information that needed to be anticipated, reacted to, and incorporated into everyday decisionmaking. Information about constantly changing traffic, weather, and economic conditions could be better transmitted through mobile phones and other wireless digital media. Traditionally, cities had functioned on a daily cycle of information flow with mass media like newspapers, third spaces like bars and cafes, and family conversations at the dinner table as the primary means of information exchange. With ubiquitous

untethered communications, this old cycle was dramatically speeded up. As the information cycle sped up, there was a corresponding increase in the rate of urban metabolism–the pace at which urban economic and social life consumed information and materiel–and the potential number of places where interaction could occur. In effect, instead of the synchronous daily rhythm of the industrial city coordinated by standardized time and place, untethered communications were leading to a city coordinated on the fly in real time.

Untethered communications also provided more flexibility in travel, supported higher levels of mobility among certain classes and places, and helped increase the pace of all types of transactions, from making a business deal to making a date. With the ability to rapidly get information to and from the people who mattered most in any decision, the efficiency and flexibility of entities (from the corporation to the family) to deal with changing conditions was greatly enhanced. From this perspective, the use of systems such as mobile telephony can be seen as a parallel globalization process, whereby individuals may achieve the same flexible manipulation of space and time locally as corporations have globally for many decades. In short, untethered digital geographies are allowing individuals more freedom and control of the process of constructing new (and often highly personal) geographies of how and where they create and consume information. While this freedom and control is by no means equally available (relatively wealthy and urban populations are at a distinct advantage), and it does not dissolve other social divisions of gender, age and race, it does suggest the potentially liberating aspects of these new and diffusing geographies.

6. PANOPTIC DIGITAL GEOGRAPHIES

The individual empowerment afforded by the untethering of digital technologies, however, is accompanied by an increased ability of businesses, governments and other institutions to create panoptic geographies of people's lives, with important implications for individual privacy. Digital technologies create many new types of records that entangle the daily life of each person into a dense web of threads, across time and space, and easily give rise to Orwellian visions. These threads are created through routine daily electronic transactions (e.g., automatic bill payment or mobile phone calls) and interactions (e.g., companies setting cookies to track individual surfing patterns through the web). Each single item of transaction-generated information is accumulated, byte by byte, to form an ever more panoptic picture of a person's life. People are also increasingly leaving digital tracks in noncommercial arenas as more and more personal interactions are undertaken via computer-mediated communication. E-mail logs and web surfing histories can be just as revealing

of a person's daily behavior patterns and lifestyle as their bank statement, medical records, and tax returns.

7. DIGITAL GEOGRAPHIES OF THE SELF: DATA SHADOWS AND TRACKING

The result is that we have all become "digital individuals" (Curry 1997) and are represented by a parallel "data shadow." The data shadow is partial and ever changing, it represents us in transactions where we are not bodily present (e.g., authorizing an online purchase) and also identifies us to strangers (e.g., the shop assistant). We produce our own data shadow, but do not have full control over what it contains or how it is used to represent us. It has become a valuable, tradeable commodity, as evidenced by the growth of credit reference agencies, lifestyle profiling, and geodemographics systems (Goss 1995). A data shadow is inevitable in contemporary society and also necessary if we wish to enjoy many modern conveniences; we can no more be separated from it than we could be separated from the physical shadow cast by our body on a sunny day.

This is not a wholly new concern as the threats to individual privacy posed by digital "databanks" have been analyzed by commentators at least since the mid-1960s when some of the first large-scale computerized systems for storing and processing individual records were instigated (e.g., Vance Packard's 1964 book *The Naked Society*). Yet it is apparent that the growth in both the extent and level of detail of people's data shadows has inexorably and dramatically accelerated in the last decade as digital geographies are mediating more daily transactions.

The growth of our data shadows should not be viewed solely in dystopian terms, as it is an ambiguous process, with varying levels of individual concern and the voluntarily trading of privacy for convenience in many cases. But much of the data captured through routine surveillance are hidden in the background, easily accepted as part of everyday activities (Lyon 2003). Those who try to opt out of using digital technologies as far as possible in their personal life are hard pressed to avoid their routine inclusion in government, business, and medical databases. Even technologically sophisticated people often focus on the benefits that flow through their data shadow and give little thought to the type and amounts of personal data that are captured every time a card is swiped or a pin number entered. It is likely to become even harder to undertake routine daily transactions in an anonymous fashion over the next few years. Increasingly, developments in sociotechnical systems are able to personally identify and track people through the objects people use. Examples include smartcard tickets, electronic road pricing, new intelligent postal

systems that can track the sender of all letters via "personalized stamps" (using 2D barcodes), and the likely deployment of radio frequency identification (RFID) labels in retail goods. The security paranoia, post-9/11, is making it much easier for governments and corporations to justify the introduction of new layers of tracking, facilitated in large part by digital geographies.

The data shadow is undergoing changes as it becomes mobile, continuous across time and space, longer lasting, and more widely accessible. The very wireless technologies that afford us new flexibility in constructing our personal daily geographies are simultaneously providing the means for our tracking. The ability to determine the location of individuals at all times via cheap and accurate Global Positioning Systems (GPS) and wireless tracking systems will become commonplace in the next few years, encouraged in large part by the development of novel location based services. There will be significant implications for the nature of individual privacy as the data shadow can be tied to place on an almost continuous basis. Conventionally, locational coordinates for a person have only been recorded sporadically in their data shadow at certain points of interactions (e.g., using an ATM). As yet, few people have really begun to think through the consequences of the fact that their movements through space are being tracked by mobile phones and recorded by the phone company (see Phillips 2003 for an in-depth discussion).

8. FOREVER STORAGE AND BOTTOM UP SURVEILLANCE

While people's data shadows are becoming mobile and continuous, they are also developing much longer memories, potentially holding digital records forever. The capability to log, process and permanently store streams of transaction-generated information about individuals (e.g., time, place of a mobile phone call) has become feasible for most businesses and organizations as the cost of computer storage has tumbled. Hard disks, in particular, have become orders of magnitude bigger in the last decade, which has driven down the cost per megabyte of storage at a rapid pace. This has effectively removed the technical and cost barriers to storing the complete data shadow for the whole life of the subject, with the consequence that what you say or do today (e.g., post a message to a listserv, paying in a store with a credit card, speaking to a friend on the phone) may well be logged and kept for the rest of your life, with the potential to be recalled and analyzed at any point in the future. (Note, there are, of course, still major technical challenges in the intelligent summarization and analysis of such huge and detailed peta-byte databases.)

Long-term data retention is also being encouraged by the realization of the commercial value, or likely future potential value, locked up in individual-

level transaction data. Also, governments are mandating long term data retention on certain service providers (especially banking, health, and telecommunications) because of its perceived rich evidentiary potential for law enforcement. Like India ink, the marks people leave in cyberspace may remain indelibly with them forever. The costs for individuals and society as a whole of data shadows that never forget are manifold (see Blanchette and Johnson 2002). When we all live in place with no fading memory, will this give rise to a much more intolerant and self-policed society?

The emergence of "forever storage" of personal data is not only available to institutions with large IT budgets. Access to massive digital storage is within range of most anyone, with average retail PCs having ballooning hard disks. Many academics and other professionals, for example, can store all their e-mail communications in searchable archives, realizing their value as information repositories. Many will have experienced the fact that each new generation of PC they purchase has a storage capacity several times larger than the old one, and they can simply copy over their entire digital store of work. It becomes easier to keep documents and data just in case they might be needed in the future as there is no longer a constraint of digital space for the majority of users. This may well give rise to new forms of individual memory keeping, the creation of permanent digitized scrapbooks and a virtual diary of life events (an experimental example of this is the *MyLifeBits* project, see Gemmell et al. 2002).

The beginnings of wholesale storage of your own copy of your data shadow can be interpreted as part of a larger societal shift from a centralized "Big Brother" to distributed "bottom-up" surveillance (Batty 2003). Digital tools and software are providing many individuals with new opportunities for detailed surveillance of physical and virtual spaces. Examples include networked webcams, picture phones, and location tags for tracking loved ones. Also, many large and detailed information archives and databases are now online and available to individuals and can be quickly and easily searched. Indeed, a surprising amount of personal information is seeping onto the web and can be freely accessed directly through search engines. There is a noticeable "Google effect" as information can be tracked down much more effectively, fast dissolving the accepted notion of "privacy through obscurity."

> Twenty-somethings are going to search engines to check out people they meet at parties. Neighbors are profiling neighbors. Amateur genealogists are researching distant family members. Workers are screening co-workers. (Lee 2002, 1).

In the realm of academic research, the *JSTOR* archive (www.jstor.org) has provided access to the full content of many major journals, through a simple, searchable web interface. It has unlocked a wealth of previously hard-to-access

material and added real value to the journal articles. Another example, is the Internet Archive's *Wayback Machine*, a serial archive of the web that provides a powerful illustration of the potential of "forever storage." The *Wayback Machine* makes it possible to travel in virtual time to surf websites as they looked in the past (**Figure 7-3**). It enables everyone to access web pages that have long been deleted.

8. FUTURE RESEARCH AGENDA

Newly emerged digital geographies have already had pervasive effects on the contemporary economy and society, from businesses to peer-to-peer communications, from consumption to urban space, and from network infrastructure to the digital self. Digital geographies entail ever more complex webs of infrastructural, social, cultural, and economic interactions that are increasingly supported by, and are, digitized information. While the interactions among technology, society, and geography are by no means unique to the Internet or mobile phones, this chapter identified a set of processes and emerging trends which are particular to digital communication technology. Visions of utopian and ubiquitous information superhighways and placeless commerce are passé, yet individuals and places are increasingly embedded in new digital geographies while private and state entities are increasingly embedding these digital geographies in all people and places.

Digital geographies are "democratizing" spatial data, making it less and less the preserve of the professional geographer, cartographer, and surveyor. As GPS and other spatially aware digital tools become more affordable and widely used, the unique power of the locational key becomes available to any business or individual, as easily as reading the time. Just as the marine chronometer of the 18th century allowed ships to more efficiently locate themselves and thereby facilitate the expansion of global trade, digital and mobile GPS systems are ushering in a new era in the use of locational knowledge, only at a vastly finer social and geographical scale.

Continuous and real-time knowledge of location is also inspiring a raft of innovative new projects, particularly from computer-savvy artists and community activist groups. Notable examples include GPS drawing, virtual treasure hunts and games of hide and seek played in real places, and the posting of geo-notes, so-called "mid-air messaging." (This is a piece of information assigned to geographic location that can then be read by people at the place). These are speculative projects at the moment to a large degree but focus attention on the ways that new digital geographies of wireless communications, information sharing, and ubiquitous location data will be able to "remake" material geographic environments in surprising, playful, and useful ways.

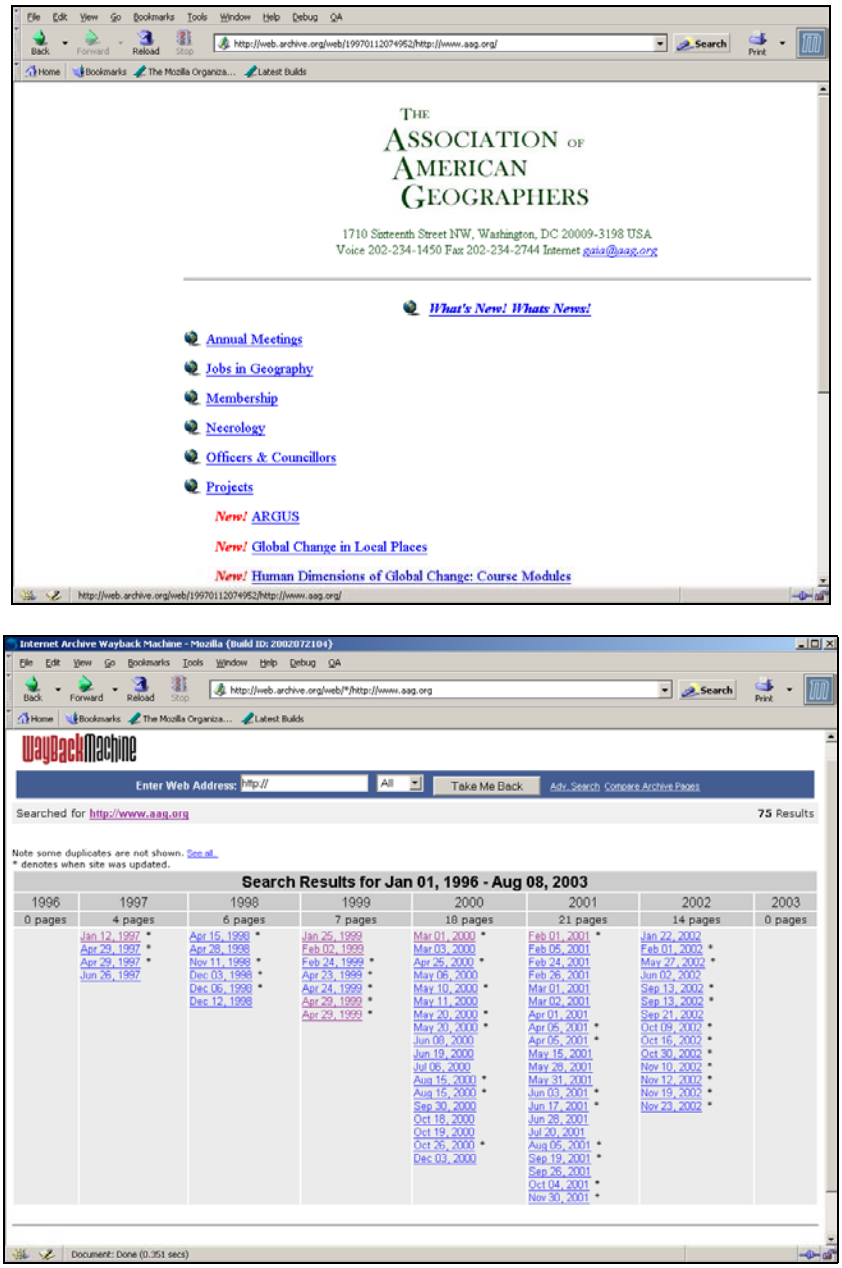

Figure 7-3. Top: A screenshot of the AAG homepage as it was in January 1997 available from the Wayback Machine. Bottom: A listing of all available views of the AAG web pages from different dates stored in the Wayback Machine. (Source: http://www.archive.org/)

There is also hope that these types of efforts can lead to the creation of fine-scale spatial data that is gathered in a participatory fashion, a kind of ground-up, open-source digital map that is richer and more diverse in themes than the conventional topographic data of government and commercial mapping concerns.

In the realm of academic geography research, these digital geographies potentially open new avenues as they make available unique new data sources and quantitative methods of analysis. To give just one example, drawing on the themes of visualization and individual tracking through the mobile data shadow, we believe there is scope for a new type of real-time social geography. The fusion of fine-scale individual activities patterns that are automatically logged and novel forms of geovisualization could give rise to fully dynamic time-space diagrams. (The work visualization in Kwan 2003b is clearly pointing in this direction.) When many individual diagrams are aggregated to the level of cities and regions, these visualizations may provide geographers, for the first time, with truly dynamic maps of dynamic human processes. One might imagine them as twenty-first century "weather maps" of social processes. Yet, at the same time as the digital geographies give us new means to observe and model society, they will also challenge current notions of privacy and make the object of study that much more fragmented, dynamic, and chaotic. The challenge will be to appreciate and use the complexity and richness of the new digital geographies without dissolving into chaos or crystallizing into authoritarian structures.

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