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Alan Wiig

ABSTRACT *Harnessing the utility of mobile communication and the mobile Internet is a common, everyday aspect of the urban condition. The wireless connectivity these pocketable devices are produced through an electromagnetic overlay that emanates from cellular antenna and towers. These sites have a distinct if often overlooked presence in the urban landscape of the United States. Through fieldwork in Philadelphia, Pennsylvania, this essay examines the aesthetic impact of telecommunications network equipment such as cellular sites as a means of locating these sites as key socio-technical actors in one of the information and telecommunication infrastructures of contemporary, networked urbanism.*

KEYWORDS *Infrastructure; Wireless; Mobile Communication; Cellular Antenna Tower; Philadelphia; AT&T*

Introduction

Study a city and neglect its sewers and power supplies (as many have), and you miss essential aspects of distributional justice and planning power. Study an information system and neglect its standards, wires, and settings, and you miss equally essential aspects of aesthetics, justice, and change. (Star, 1999: 379, citing Latour and Hermant, 1998)

Anywhere a connection to a mobile communication network can be found, a cellular site is nearby. Cellular antenna broadcast their communicative potential throughout an area, disregarding distinctions between public and private spaces—as well as the built and natural environment—as the network equipment connects individuals to each other and to the Internet via larger systems of fiber-optic cabling, data centers, and so on (for further discussion of the engineering of telecommunications systems, see Ascher, 2007; Hayes, 2006). To check an e-mail, find directions with a locative mapping program, interact with social media, or to access any number of other uses of the mobile Internet requires the dispersal of ubiquitous, monotone grey and white, thin vertical rectangular boxes mounted throughout high points in a city. The “always-on” nature of mobile connectivity is created through the maintenance of these cellular networks, a situation

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described by human-computer interaction as well as urban scholars as “ubiquitous computing,” which is defined as the dispersal of computing power—through devices like mobile phones—into the urban landscape itself, with the subsequent changes to urban movement and the flow of information throughout a city and the world (Dourish and Bell, 2011; Greenfield and Shepard, 2007; Weiser, 1991). The potential of ubiquitous computing is inherently dispersed throughout a city’s “electromagnetic terrain” (Mitchell, 2003: 55), but at the same time the connection to information and communication networks requires the cellular sites—among other equipment such as wireless Internet (wi-fi) routers—from which this service emanates.

The individual device, such as an Apple iPhone, may fit in a pocket, but the background network is immense, stretching across cities and encompassing much of the world. The last leg of the infrastructural support is wireless and immaterial, but the rest of the system exists as distinct spaces of network equipment embedded within the landscape (see Ascher, 2005; Hayes, 2006; Graham and Marvin, 2001). As the writer Andrew Blum’s work charting the infrastructure of the Internet shows, data centers house the servers which contain our digital information footprint; a vast array of terrestrial and submarine fiber-optic cabling transmits this information (Blum, 2012), and the final connection to the user can be made through cellular antenna (Hayes, 2006). The aesthetic design and utility of, for instance, an Apple iPhone is of particular concern to the individual user and to Apple, but the design of the infrastructural support is more mundane, similar to other elements of municipal infrastructures such as electricity pylons or wooden telephone poles tying together fixed-line telecommunication systems. Because cellular sites often sit higher than the surrounding city, they become what engineers Claire Barratt and Ian Whitelaw call an “everyday landmark” of the city (Barratt and Whitelaw, 2011: 184). Considering cellular sites as landmarks of contemporary networked urbanism is a productive first step in examining the role this equipment plays in cities today.

Philadelphia presents a productive location for examining these issues because the city encompasses many interwoven urban eras from the Colonial to the post-industrial present day. The physical infrastructures of modern, nineteenth-and-twentieth-century Philadelphia—water, electricity, gas, street transportation, and railroads—are layered with the late-twentieth-century’s information and communication infrastructures, as well as freeways, a major airport, and the ubiquitous connectivity systems of the twenty-first century, on a street grid originally laid out in the seventeenth century by the city’s founder, William Penn (Dunn and Dunn, 1982). Freestanding cellular sites in Philadelphia often occupy the interstitial margins of the city, wedged into an empty lot alongside a major roadway or standing over a residential neighborhood. While an analysis of the locations of cellular sites indicates that many of the skyscrapers and other buildings of the central business district have cellular antenna either on top of or bolted to the side of their walls, these locations are high up on private property and consequently difficult to observe (General Data Resources, 2013).

The infrastructural aesthetic for cellular equipment seems to focus on presumptions of invisibility and anonymity as well as functional concerns placed before formal design considerations. Muted colors such as whites and greys dominate, with seemingly little attention paid to integrating the design of the structures into the urban fabric of the adjacent neighborhood. The towers’

heights are meant to disperse cellular signals over a large area, while the antennae themselves act as “base stations” sending and receiving radio-transmissions of information and are typically clustered in groups of three that are parallel to the ground to broadcast their signals (IEEE, 2012b). At the street level, these towers and their attendant ground-level equipment are typically surrounded by a chain link fence displaying some information about who owns and operates the tower, such as AT&T or Verizon, as well as one or more “No Trespassing” signs. Cellular sites are a perpetually repeatable component dispersed throughout cities and the world to provide wireless network connectivity; the aesthetic intent of this equipment is not locally variable nor does it readily adapt to the particular historic legacies of the neighborhoods in which the equipment is situated. Cellular sites may not have a unique presence in the landscape, but they are still key actors in enabling networks to exchange information in cities.

This essay focuses on the equipment that supports the wireless exchange of information in the urban space of Philadelphia as a means of locating and grounding these immaterial flows in the built and natural environments of the city itself: of making visible the systems responsible for transforming the landscape into a space for the active, wireless transmission of information. I first discuss mobile communications and the mobile Internet as components of networked urbanism today using recent developments spatializing and urbanizing Actor-Network Theory to do so (Farias and Bender, 2010; Latour, 2005; McFarlane, 2011). The majority of the essay takes the information and infrastructure studies scholar Susan Leigh Star’s call for ethnographies of infrastructure (1999), from which the introductory quote is drawn, to investigate the aesthetics of cellular antenna and tower sites. The intent of this examination is to draw attention to this new layer of urban infrastructure that in less than 20 years has become a pervasive element in the landscape of cities and open spaces throughout the United States, and to consider what it takes for a mobile computing device to connect to globalized telecommunications networks.

Mobile Communication Infrastructure and Contemporary Networked Urbanism

Telecommunications have had significant impacts on urban spaces since the telegraph first became a tool for information transfer over distance (Gleick, 2012; Matelart, 1996, 2000). The service became a utility for businesses, city services, and individuals, but the equipment—cables, poles, relays, and the like—also has had an aesthetic impact on the landscape itself (Tarr et al., 1987: 71). The widespread dispersal of digital information and communication technologies, of which mobile communication and the mobile Internet are the latest incarnation, has been considered by scholars one of the central components of networked urbanism today (Amin and Thrift, 2002; Castells, 2000, 2010; Crang and Graham, 2007; Graham, 2002; Graham and Marvin, 1996, 2001; Kaika and Swynedouw, 2000; Kwinter, 2010; McFarlane and Rutherford, 2008; Mitchell, 2003; Shepard, 2011; Varnelis, 2008). Even as these new, wireless systems do not change the fabric of cities significantly, as the geographer Aharon Kellerman considers (Kellerman, 2009 and 2010), they follow in a lineage of information transmission developments such as the decentralization of office and industrial business transactions as well as the growth of suburban developments and

edge cities (Easterling, 2001; Garreau, 1991; Graham and Marvin, 1996). Networked urbanism perpetuates cities as “socio-technical constructions supporting mobilities and flow to more or less distant elsewhere: flows of people, goods, services, information, capital, waste, water, meaning” (Graham, 2002: 1); the role of mobile communication in contemporary cities has intensified and diversified these information flows.

For mobile communication systems, space becomes not a unique attribute to a place but itself a medium of exchange. Information resides not only in the data centers and mobile devices that access the data, but also becomes latent in the city itself, accessible through mobile devices, as long as the individual user has subscribed to a service plan managed by a corporation such as AT&T. For space to become a system of wireless connectivity requires the installation and maintenance of cellular sites; these locations become actors in the socio-technical telecommunications networks. Building off the sociologist Bruno Latour’s work examining the human and non-human assemblages that make up socio-technical networks, the urbanist Keller Easterling has introduced the term “active form” to denote the situation where space becomes instrumentalized to do something, in this case to transmit data (Easterling, 2012; Latour, 2005; Easterling, 2011a; Easterling, 2011b). With regards to mobile communication, this “doing something” that Latour writes of (2005: 46) occurs through distinct infrastructural things, through cellular sites that re-materialize the immateriality of digital exchange. Cellular sites are three things at once: network equipment mounted to towers, tall buildings, or other structures; repeatable components of a global telecommunications network that broadcast wireless connectivity to mobile devices; and localized elements mediating the boundary between material and digital aspects of social exchange.

The cellular site is the thing—the non-human actor—that actively enables mobile connectivity in the urban landscape; it is the common object that translates between users, creating the digital signal traveling through a network of telecommunication systems to become meaningful content to that individual, be that a conversation with a friend or family member, or checking e-mail or investigating public transit timetables. From this point, it is possible to interrogate this equipment and the places it occupies: to conduct a study of the sort Star (1999) proposes in her call for an ethnography of infrastructure that opens this essay and argues that aesthetic and design considerations matter.

Latent within the design and organization of infrastructural systems are larger aspects of a city, including aesthetic considerations. The relative disregard of the aesthetic impact of mobile communication infrastructure in Philadelphia tells a story of its own. Philadelphia’s contemporary urbanism may be woven through with the ethereal pervasiveness of mobile connectivity, but the technological devices of high design—the Apple iPhone is a prime example—that connect to the networks, function through these cellular sites that, even as they embody a significant amount of telecommunications engineering and financial investment on the part of large corporations, appear as an aesthetic afterthought. As the connectivity latent in this equipment reconfigures the locations of social exchange for users, and as a connection to information and communication networks becomes ubiquitous, the visual and spatial impact of this infrastructure becomes an entry point into a discussion of how massive, global socio-technological systems become localized and commonplace.

The Aesthetics of Cellular Communication Infrastructure in the United States

To provide a very brief overview of mobile communication in the recent past, the mobile phone was invented by Motorola in 1973, but it took ten years for the device to be approved for commercial use (IEEE, 2012a). Two federal regulatory events in the 1990s brought about the growth in mobile connectivity: first, in 1995 the Federal Communications Commission auctioned off the electromagnetic spectrum. Then the passing of the Telecommunications Act of 1996—the first major overhaul of telecommunications policy in the United States since 1934—pushed for the development of wireless technologies in addition to many other changes to federal policies (FCC, 1996; Wikle, 2002). Among many other facets, the act sets policies dealing with the siting of cellular antenna; it stipulates that at the federal, state, or municipal level, no one can prevent the building of cellular towers or the installation of antennae for any reason, including environmental, health, or safety concerns. The one provision for valid objection is because of aesthetic concerns; this has allowed telecommunications providers to install towers quickly and without having to go through intensive local permitting processes (FCC, 1996: Section 704). Banning cellular sites due to aesthetic reasons applies primarily in suburban residential areas, and even there the rationale for banning cannot be a blanket dislike of towers or antennae but has to be through a documented impact that that “the tower would diminish property values, reduce the ability of property owners in the vicinity of the proposed tower to enjoy their property, or damage the scenic qualities of the proposed location” (Ruane, 2008: 2). In commercial or industrial areas, this argument cannot be applied.

Even as community protests and court cases argued over the extent of regulatory oversight state and local government had regarding cellular towers and antennae, the growing use and popularity of mobile communication signaled the desire for more connectivity. Individuals and groups fought to limit the “visual pollution” of cellular sites and often won concessions from the telecommunications providers to camouflage the sites (Nagle, 2009). All the while, the demand for cellular sites to build out the wireless network continued. This process is well documented by the geographer Thomas Wikle (2002), who found that in the early 1990s there were fewer than 10,000 cellular towers in the United States. However, by 1996—when the Telecommunications Act exempted mobile communication providers from local zoning requirements—there were 30,000, and by 2000 there were over 100,000. According to the Antenna Search website, as of early 2013 there are over two million antenna sites in the United States; within a mile of Philadelphia’s City Hall there are at least 750 antennae (General Data Resources, 2013). This number includes towers and antennae used for microwave, paging, cellular, and other uses, but it indicates how many antennae are required to provide wide-ranging wireless coverage across the country. In less than 20 years, cellular sites have gone from little to no presence in the landscape to a pervasive element in the ever-growing desire for mobile connectivity. The increase in sites is a factor of the growth in the use of wireless communication devices like mobile phones and the subsequent need for connective infrastructure. The particular locations of these cellular sites is a factor of zoning requirements or the lack thereof from the federal level down to the state and local level.

In Pennsylvania, the guidelines for the regulation of wireless telecommunications facilities stipulates that mobile communication is a “public service” (Fink, 2013). As such zoning and other local oversight should not hinder telecommunications providers from installing antennae, towers, and other network equipment: the right to locate cellular sites supersedes the right of local government to object to the sites in most circumstances (Pennsylvania General Assembly, 2006). To reduce the possibility of community complaints about cellular antennae and towers, the state recommends that local zoning ordinances stipulate that sites first be installed on existing structures, since community objection to the aesthetic impact of sites is more often to freestanding towers. Encouraging the placement of cellular sites in areas zoned for industrial uses, which have the least amount of regulations, are listed as another way of easing the installation process (Commonwealth of Pennsylvania, 2002). The deployment of wireless coverage follows a logic of connectivity that is determined by the possibilities of and technological constraints around connecting mobile devices. The aesthetic impact and spatial ramifications of this infrastructure are secondary considerations to providing this connectivity. Telecommunications companies may locate antennae and towers where their internal analysis deems most efficient and economic, and local ordinance must allow for this.

The right of communities to object to cellular sites due to aesthetic reasons has often led to efforts on the part of service providers to mask towers as trees or conceal antennae behind false panels on top of or on the side of buildings. As Ted Kane and Rick Miller (2008) discuss with regards to Los Angeles and the greater Southern California megalopolis, the veiling of cellular infrastructure as palm trees, pine trees, or other constructs is common in areas of the United States. This masking of utility continues, where, as the towers are disguised, they stand out even more, a point raised by digital media scholar Jason Farman (2013) with regards to a fake pine tree in Silver Spring, Maryland. Unless cellular sites are found to cause more specific inconvenience than general connectivity, they will remain visible reminders of mobile communication’s infrastructure, exclamation points standing tall off the ground. Since palm trees are extremely uncommon in southeast Pennsylvania, attempts to conceal cellular sites in the region as a palm tree would stand out significantly. False pine tree decorations are installed occasionally in suburban neighborhoods, but, given the general lack of tree cover over much of Philadelphia’s dense, post-industrial landscape, the presence of a tall pine tree would stand out as well.

Even before the widespread installation of cellular sites, Philadelphia’s urban landscape already contained many vertical infrastructural elements, including radio and television antenna masts, as well as electrical transmission pylons, all visible to residents or visitors to the city. There are many instances of cellular antennae mounted to the decommissioned brick smokestacks of the older, industrial city; this is a re-use of existing but outmoded equipment. Less prevalent but not uncommon are antennae circling the rooftop water towers that occasionally remain in place on older factories or apartment buildings. Today it is possible to find cellular antennae bolted to existing structures in addition to freestanding and mounted onto residential, commercial, and industrial buildings. Informal windshield surveys conducted by driving through urban and suburban Philadelphia indicate that in Philadelphia, cellular sites are for the most part out in the open and visible from the street: antennae poking above the roofline or towers standing tall in the cityscape’s distance. In general, the tall masts and latticework

of cellular sites is a common addition to high points throughout the urban and suburban region.

In Philadelphia, the relationships between individual users of wireless, mobile technologies and the infrastructure that supports these interactions have not affected the urban fabric significantly; instead the changes to urban space are primarily found in how a part of the flow of information throughout the city is now pocketable, locatable in mobile devices. With regards to the laws regarding cellular sites, the city's zoning requirements stipulate that the towers should not detract from neighborhood aesthetics, but—evidenced by the significant variation in the locations and installation of cellular antennae—how this code is interpreted varies. Effective as of 2012, Philadelphia's new zoning code has additional stipulations not in the older version requiring new antenna sites to be better incorporated into the built environment and no longer stick up above rooflines, which is a common sight today (Philadelphia, 2011 and 2013). The new zoning code does not allow for towers to be constructed in residential neighborhoods without adequate setback in case the tower or equipment on the tower were to fall (Philadelphia, 2013). This implies that the site described below in the "Site Two" section could not be installed today without having a variance granted because of its placement wedged between a block of row homes and a recreation center.

Cellular Sites as Emblems of Contemporary, Networked Urbanism in Philadelphia

Below I will discuss four sites: three definitively on AT&T's network and one located above an AT&T retail mobile phone store that represent typical antenna locations found in different neighborhoods of Philadelphia (See Figure 1). With 39 percent of the mobile communication market, AT&T is one of the key mobile communication providers in the United States (*The Economist*, 2011), and they have a significant presence in Philadelphia. Focusing solely on AT&T is intended to keep the analysis fixed within one company's network and how this particular provider's infrastructure is situated in the city.

Site One: Downtown

On Sixteenth Street just south of Market Street (See Figure 2)—the main east-west thoroughfare in the downtown—a half block of somewhat run-down, two-story commercial properties provide services to the bustling foot traffic on the street. A popular national doughnut chain recently shuttered their location on the corner, and the steak sandwich business is also boarded up, but an AT&T mobile phone store and a hair salon upstairs are still open for business. The analog clock outside the AT&T store only tells the correct time on the south-facing side: the north side was stuck perpetually at 11:00. On the roof of the building are multiple arrays of antennae poking up both at the street-facing edge and at the back of the property. Information available does not clearly indicate which telecommunications providers might lease the use of either site (General Data Resources 2013). I present this location to highlight the sort of adaptations to providing mobile connectivity in a dense area with buildings of mixed-height: co-locating many antennae on the roof of an amenable landowner. From the

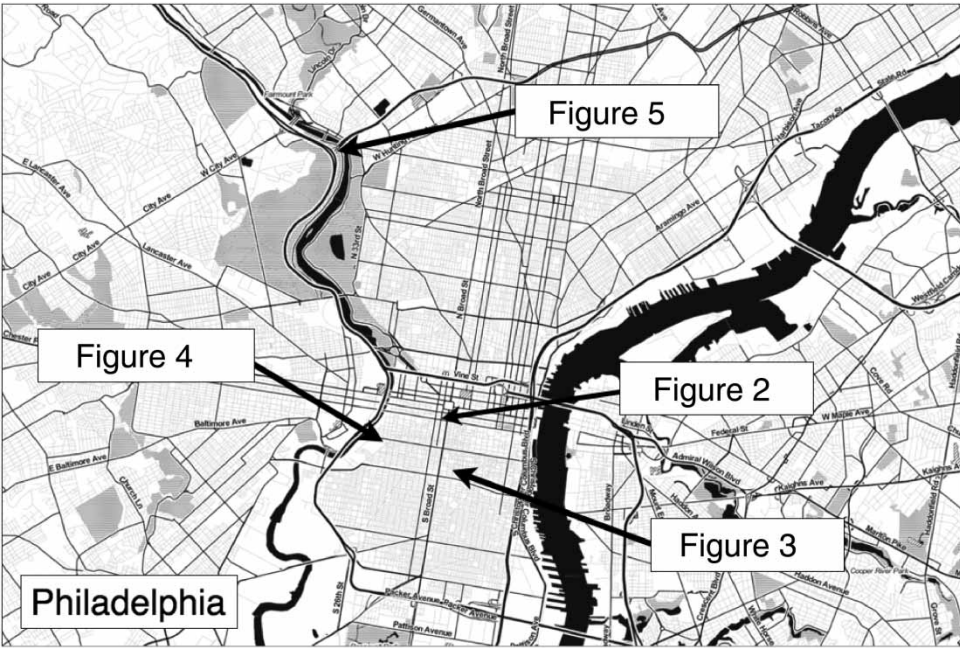


Figure 1: Map of the locations in Philadelphia of the cellular antenna sites discussed in this essay. Map tiles by Stamen Design (<maps.stamen.com>) under Creative Commons Attribution CC BY 3.0. Data by OpenStreetMap (<openstreetmap.org>), under Creative Commons Attribution CC BY SA. Map formatted by author, 2013.

standpoint of this exercise into the aesthetics of cellular sites, both sites are visible from the street, which is not often the case downtown, where antennae are more commonly found hundreds of feet up on office building rooftops. Likely this site is useful to co-locate antennae precisely because it is low off the ground, providing strong signal reception for pedestrian and automobile-based subscribers below and easy access for installation and maintenance. The under-performance of some of the retail tenants has no bearing on the location's abilities to transmit wireless connectivity through the area. Unfortunately, there was no information listed on the Antenna Search website for this particular address; I do not know if AT&T has an antenna on the roof above its store or not, but it would be a given that subscribers to AT&T's system cluster in this space nonetheless.

Before continuing, I want to note the challenges of determining ownership of cellular sites if the locations do not state such information or the locations are not publicly accessible. Searching addresses or other latitude and longitude coordinates on the few databases returns many results, but not always to the particular address that, based on field visits, has antennae on it. Furthermore, these databases are not designed for archiving results with a unique website address to cite, so the interested reader would need to take the location information and process it themselves to find many of the results I discuss here. Another difficulty to conducting this research is the lack of a complete and public archive of cellular sites and their owners. Even the Federal Communications Commission's (FCC) database relies on data provided by the corporations themselves and is scattered with missing information points. The Antenna Search website that I use to cross-reference to the FCC's data is more



Figure 2: In downtown Philadelphia not far from City Hall, a cellular antenna array is located on top of a AT&T mobile phone retail store and a hair salon. *Photograph taken by author, 2013.*

complete, and it geo-locates cellular tower and antenna data on top of Google Maps imagery. This is quite useful both to prepare for field work and to reference locations after the fact, even though it also contains gaps and does not publicly list the full range of databases it draws from, but the FCC's database is likely one of its sources. I present the information about site ownership to highlight the complexities of what, to individual users, is a pervasive network connection, how providing this service involves a complex assemblage of landowners leasing space, telecommunications providers, and user-subscribers paying for a service, all occurring behind the scenes of these sites themselves. A complete discussion of the ownership, installation, maintenance, and repair of cellular sites is beyond the scope of this essay but would be an important addition to this line of urban scholarship.

Site Two: In a Residential Neighborhood

Moving into the residential edge of south Philadelphia, there is a freestanding AT&T cellular tower constructed in 2000 (FCC, n.d.a), located on Carpenter Street a block north of Washington Avenue, a major east-west artery cutting between the Delaware River and the Schuylkill River. Standing high over a neighborhood of two-and three-story brick row-homes, the site is sandwiched between basketball courts and a jungle gym playground for the Hawthorne Cultural Center and the small backyards of a residential block (See Figure 3). Unlike the site in Fairmount Park that is discussed below, this location's base is at street-level. On the sidewalk, behind an eight foot chain-link fence furnished with "No Trespassing" and "Private Property" signs indicating that AT&T owns and operates the location, is a small concrete building housing networking equipment,



Figure 3: Standing high above its south Philadelphia neighborhood, this AT&T cellular tower backs on to the playground for a community center. *Photograph taken by author, 2012.*

alongside some back-up power generators. The latticed steel tower carries a number of thick black cables up to the antenna array, providing electricity and the connection to AT&T's telecommunications network. The tower is so tall that the site is visible from blocks away, standing much higher than even the five- and six-story brick commercial buildings and apartments two blocks away. In multiple visits to the site, I noticed birds perched at the top of the tower, not nesting but using the location nonetheless. This site is located on a small pocket of land wedged between homes and a park and playground. Mobile connectivity flows through these antennae, circulating information throughout the neighborhood, yet at ground level, the site is closed off to the street, an anonymous space behind a tall fence, landscaped with gravel and concrete, monotone grey steel boxes, and thick black cables. In Philadelphia, these wireless, communicative exchanges are enabled through spaces that often stand out visually through their apparent anonymity. By virtue of standing much higher than electrical pylons and streetlights, higher even than most buildings to more efficiently broadcast their signal, these prominent if slender vertical elements have become a quotidian component in the urban landscape.

Site Three: Alongside a Freeway Flyover

The third AT&T cellular site (See Figure 4) is located in the north-west corner of Fairmount Park, a large urban park that runs north along both sides of the Schuylkill River upstream and out of central Philadelphia. The park is a popular destination for recreation including cycling and running, as well as a central artery for suburban traffic entering and leaving the city. The site is adjacent to the Schuylkill Expressway portion of Interstate-76, an elevated, above-ground freeway that cuts across the park running parallel to the river itself; to



Figure 4: At the center of the image is an AT&T cellular antenna affixed to an electricity pylon alongside the Schuylkill River flyover for Roosevelt Boulevard in Fairmount Park, Northwest Philadelphia. *Photograph taken by author, 2012.*

the side of the freeway is an in-use rail transportation corridor. Alongside a flyover bridge connecting Roosevelt Boulevard, a primary arterial street, to the Expressway sits a cellular site fixed into the latticework of a rusting, aged electric power transmission tower that carries power lines across the river. The site appears as an array of antennae propped on top of a grey tube holding the connecting cabling connecting both communication lines and electricity to power the antennae and descending to the base station that sits beside the railroad tracks. The site sits approximately 30 feet above the public path alongside the river, surrounded by deciduous trees overgrown with ivy. I determined that the site is an AT&T property by conducting a search for it at the Antenna Search website instead of trespassing onto the rail corridor to look for signage indicating ownership at the site itself (General Data Resources, 2013). The FCC antenna registration information for this site indicates that AT&T filed permits to build the structure in November 1996 and completed the structure in June 1997. While the FCC webpage notes that the antenna was dismantled in 2010 (FCC, n.d.b), it is still listed on the Antenna Search website and as of spring 2013 there are still antennae visible. These antennae sit at the intersection of the expressway and the major thoroughfare heading into Northeast Philadelphia. The location's utility to AT&T is likely to provide connectivity primarily to customers traveling along the roadways in automobiles. Bolting the antenna onto an existing electrical tower is likely either a decision based on the financial considerations of *not* having to construct a tower, an issue with securing rights to use the property, or spatial restrictions with building alongside the railroad right-of-way. This site occupies an infrastructural corridor, at the intersection of road, rail, recreational, and electrical uses of the space itself. The location is not readily nor legally accessible to passersby, but is visible from a distance.

Site Four: On Top of a Fortress-Like Telecommunications Node

The final site has two white rooftop antennae arrays mounted at the edge of AT&T's mobile services switching center (See Figure 5). These telecommunications nodes are where calls from a mobile phone on AT&T's network pass through in order to be routed out to their recipient, whether on AT&T's mobile or terrestrial, landline networks, or on other providers' networks (ATIS, 2011; TelcoData.us, 2011). While the antennae on the roof provide connectivity for passersby, the equipment inside the building connects AT&T's sites discussed in this essay to one another. Information about when these antenna were installed is not available in the FCC's antenna registration database used to find construction dates of the two previous sites. A search of the Antenna Search website reveals no dates for the installation of antennae at the location but does indicate that the site belongs to AT&T (General Data Resources, 2013). By finishing with this building, I want to highlight where the localized information flows that transmit through the sites discussed above might travel out of the city and disperse into regional, national, and global telecommunications networks.

Built in 1972, this six-story, 400,000-square-foot brick building squats squarely on its site, towering over the two-lanes of Twenty-Seventh Street on its east side, bounded in turn by the approach to the South Street Bridge on the south, railroad tracks and the Schuylkill River on the west, and a private parking lot for employees to the north (Philadelphia Office of Property Assessment, 2011a; 2011b). Across from the building to the east and south sit two-and three-story brick and stucco row homes. The skyscrapers of the central business district are in the near distance; this building is the tallest and bulkiest in the neighborhood. What goes on inside the facility can be unpacked somewhat by delving into documents of telecommunications network's topology. The listings of interconnection points between the different telecommunications providers are tied to street addresses; in Philadelphia the building's address of 500 South Twenty-Seventh Street comes up numerous times, indicating its position as an organizing location for many other networks throughout the region (TelcoData.us, 2011). Also, parallel to the railroad tracks is a buried fiber optic cable marked by a waist-high white plastic marker with a bright orange top, warning not to dig. This cable is likely the backbone of AT&T's northeast United States network, running between Boston, New York, Philadelphia, and Washington, DC (Hecht, 2004; Long-Lines, 2011).

AT&T's building is a squat, relatively featureless, aging, post-industrial building with few visual cues to indicate its utility; for passersby, the only way to know that the building belongs to AT&T is a large, wall-mounted logo on the west side of the building and visible from Interstate 76 across the Schuylkill River. There is no public front entrance, there are no windows at street level, and the building is composed primarily of windowless brick walls extending up six stories. It appears to be a late-twentieth-century bunker or fortress, marooned in a neighborhood built in the nineteenth century. At street level, the facility presents a forbidding sight. There is a gated vehicular entrance at the north-east corner of the complex, off South Twenty-Seventh Street, with a guard booth that does not seem to be in use or occupied. To the side of the vehicular entrance is a large vinyl banner stating "500 South Twenty-Seventh Street," without a name for the building or the business present at the location. Heading south from this point is a tall, imposing black metal fence buttressed with brick columns. There is a gated and locked pedestrian entrance off the sidewalk, with a small sign to



Figure 5: Alongside the Schuylkill River on the western edge of downtown Philadelphia, two of AT&T's cellular antenna arrays are bolted to the top of this building, 500 South 27th Street, which is a prominent node in AT&T's national telecommunication network. *Photograph taken by author, 2011.*

the side that states in three lines: "NO TRESPASSING," "PRIVATE PROPERTY," "AT&T Communications." The building's foundation sits a few steps off the sidewalk; there is some graffiti on the steel access doors set into the foundation, but overall the appearance is of an anonymous post-industrial building, one that is particularly conspicuous due to its size and bulk in relation to its neighbors.

Conclusion

Mobile communication turns space itself into a telecommunication service. While the utility of this service is most visible in the devices through which individual users access their information and social networks, the cellular network equipment that transmits this wireless connectivity has a distinct, material presence in cities today. As long as a signal is present, a user does not need to know where in particular the cellular antenna that connects his call is located, but situating that antenna in the city becomes a means of examining the socio-technical actors involved in producing these flows of digital information throughout the landscape. While the presence of cellular sites is visually inert and the design of those sites is functional instead of being tied into locally specific, historic, or modern urban traditions, this condition is not indicative of stasis or inertia. Cellular sites are vibrant, vital components of urban life. They provide instantaneous, two-way communication of all sorts to anyone within range of the signal and with a connective device. Considering this network equipment as an active element of cities provides a language to describe this condition, of transforming space itself into a platform for exchange. In a way, the functional aesthetic of cellular sites defines a part of the visual impact of contemporary networked

urbanism: these things have an importance that is not easily recognized in their visible form.

Updates to Philadelphia's zoning code will require new cellular antennae to sit below rooflines and for the ground around towers to be screened with shrubbery (Philadelphia, 2013). This suggests that as new cellular sites are installed, they will stand out less. Yet the presence of cellular sites in the urban landscape provides a distinct marker of the digital information and social exchange that are a part of Philadelphia's infrastructural flows as much as the material movement of people, goods, and older, physical forms of information transmission. Mobility and connectivity do not have to be designed into the aesthetic of a cellular site; nothing need signify these aspects of the infrastructure's utility, but recognizing the ability of the equipment to perform this information exchange is a means of identifying the utility of these interconnected sites.

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