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I could tell you how many steps make up the streets rising like stairways, and the degree of the arcades' curves, and what kind of zinc scales cover the roofs; but I already know that this would be the same as telling you nothing. The city does not consist of this, but of relationships between the measurements of space and the events of its past.

—Italo Calvino, *Invisible Cities*, 1974

In Italo Calvino's *Invisible Cities* (1974), fluid assemblages of signs and images litter a subterranean landscape, marking the destinations to which Marco Polo has traveled.[1] Polo recounts these destinations to his emperor, Kublai Khan, without recourse to a map or a wayfaring guide; he offers little by way of their geography, or any sense of the spatial connections between each recalled location. Instead there are only fragments, the improbable exceptions of remembrance and experience. These "invisible cities" are all given names, women's names like Irene, Chloe, Raissa and Adelma. Irene, for example, "is the city visible when you lean out from the edge of the plateau at the hour when the lights come on" (p. 112). There are many cities, but in fact they are always the one: Venice. This is the Venice collapsed or hidden behind its contemporary, overexposed tourist facade, whose "invisibility" Calvino cultivates as the imaginative potentiality of everyday encounters with a familiar space. Of this Venice no general claims are made; instead, from the singularity of this one city are teased provisional cities that capture a mood, a memory, a fleeting gesture, or the tracery of a half-glimpsed pattern.

What might Calvino's peculiar treatment of urban spatiality offer to today's practitioners of urban computing? Boyer (1996b, 142) has noticed the way *Invisible Cities* represents a network "much like the matrix of a hypertext, in which the reader can select multiple routes and draw a variety of conclusions." Calvino, during the 1960s, was interested in how the combinatory complexities of cybernetics offered a new way of perceiving the world, as a series of discrete, divisible parts rather than being more continuous in form.[2] *Invisible Cities* can in this sense be understood as an attempt by Calvino to engage the narrative potentials of cybernetics' recombinatory logic,

allowing for an imaginary projection of urban space to be shaped according to a set of algorithmic relationships. Here, as Calvino (1974, 164) recounts, places and experiences exchange their qualities of form, order, and distances, as they become variously assorted "like the letters in a name."

By introducing the quotient of experience—"the events of the past"—to his representation of the city, Calvino considered the application of this recombinatory logic not only to discrete spatial entities, but also to an intimately temporal sphere as well. But here, time is not continuous, rather it is experienced as discontinuous and elliptical. Just as there is no clear linear passage through the spatial environment of the city of Venice, so too there is no clear passage through its shifting temporalities, or the discrete stages and events of Marco Polo's journey. "All the future Berenices," he writes, "are already present in this instant" (p. 146). This is a temporality that figures like the experience of memory, in which recollections emerge without warning, as discrete, embodied moments that might flash up at any given time—such as, perhaps, when you lean out of a window in the early evening.

As he was attracted to the narrative potentials of cybernetics, Calvino also remained ambivalent about the implications of its abstracted mode of knowledge. As Boyer has observed, Kublai Khan had focused so narrowly on a chessboard of black and white squares that the game's meaning had eluded him, having simply become an abstract piece of wood (Boyer 1996b, 143). But when Marco Polo reminded him that this chessboard was "inlaid with two woods, ebony and maple," Khan's imagination took flight. Boyer suggests that in this way Calvino teaches us a lesson: we might reduce events to abstract patterns that facilitate the procedures of logical operations, or we can work to engender or revive imaginary projections—in this case, making words reveal the very tangible qualities of a given object—which in turn might allow for "the continued presence of the unfathomable, the invisible" (Boyer 1996b, 143).

This chapter retrieves Calvino's imaginative conception of invisible cities and considers its place within the contemporary, emergent terrain of urban computing. It explores how an enduring attraction to that which remains "invisible" within the contemporary city has historically inspired alternative, sometimes radical urban interventions, which have sought out different ways of knowing and experiencing cities, against the predominance of visual representations and abstracted schemas. These have inspired situated, embodied, and sensory accounts of urban spatial experience, which have resisted a tendency to rely on visual urban abstractions as a means to "improve" cities. Returning to the now well-told story of urban modernism's failure to realize its utopian project of urban social reform, the chapter revisits some imaginative conceptions of invisible cities, particularly as they emerged in response to the failures of twentieth-century urban modernism. It then moves on to discuss a specific project I have initiated, which has taken up some of these concerns and applied them to a mobile production project. This project, released in 2008 by the Australian

Broadcasting Corporation (ABC) as *Sydney Sidetracks*, has made extensive use of sound archives to generate different ways of "seeing" contemporary spaces in central Sydney, Australia. Sound has been used in this project in a way that foregrounds an embodied, experiential approach to navigating networked digital environments, working against the more dominant visual representational techniques of network mapping and data visualization. As it has offered a creative response to the potentials of mobile urban computing today, the *Sidetracks* project has also explored the potential for invisible cities to inspire different spatial practices within the emerging environments of urban computing.

"Forget Old Ways to Describe Cities": Picturing the Invisible in the Real-Time City

Today, the ability to graphically enhance our imaging of cities as multiscalar, networked environments offers profound potentials, introducing an array of new urban management and design techniques that make use of more detailed, real-time urban data.[3] Just as a shapeless dust cloud invaded the continents of *Invisible Cities*, today's real-time cities are underpinned by an information architecture of sensors and applications, whose databases express the mutating, multiscalar complexities of the material world. Embedded sensor networks reveal that which might otherwise be invisible to the naked eye; like coins rubbed over wax paper, they make visible a myriad of fluid, complex exchanges between material, social, and informational universes.

For many, this computational intensification of the material world retrieves hidden, hitherto banished possibilities, and can be put to disruptive uses (Foth 2009, 19). To Foth, practitioners of urban informatics can act as "urban anatomists," dissecting urban environments and infrastructure by "trying to microscopically uncover the connections and interrelations of city elements," seeking to "picture the invisible and . . . zoom into a fine-grained resolution of urban environments."[4] Peter Hall and Janet Abrams (2006, 12) have suggested "mapping has emerged in the information age as a means to make the complex accessible, the hidden visible, the unmappable mappable." The application of hyperlocal, multiscalar, and real-time mapping techniques, it is argued, presents opportunities to expose "hidden" or hitherto invisible relationships, including the relationships between center and periphery, power and influence (see Sassen 2008; Boyer 2006).

For Hill, there is the potential to avoid grand infrastructural interventions, which inevitably become "hardwired into the urban fabric" for subsequent generations, and to instead develop a more "iterative, responsive field of 'urban acupunctures.'"[5] Location-aware computing has also been seen to greatly expand the range of possibilities for artists, architects, and designers to "re-enchant the world," offering "a way of making visible all these hidden stories of place" (Crang and Graham 2007, 815; see also Shirvanee 2007). The embedding of microprocessors via sensor web networks in

physical environments also enables the informational life worlds of millions of "users," human or otherwise, to be made visible, such that the needs not only of humans but also of natural environments can be revealed as diffuse, complex systems of interaction.

In many ways, the potentials associated with real-time mobile networks are predicated on the ability to make visible that which has hitherto remained unseen—whether the enhanced visibility of traffic flows, social usage patterns, environmental data, or those "hidden stories of place." But when considering the kinds of disruptive uses these visualization tools might be put to, toward enhanced modes of political and creative engagement, or improved techniques of urban management, we need also to remain mindful of their limitations. It helps to remember that today's real-time cities are not themselves "new," but emerge with their own historical geography of sorts. And this historical geography reminds us that there are limitations associated with relying too heavily on technologies of visual abstraction as a basis on which to create a politically reformist agenda for the city.

While today's computational capacity far outstrips that which has preceded it, nevertheless many contemporary claims made for the progression of new political, environmental, and societal reforms using networked urban computing devices echo earlier claims made "when old technologies were new" (Marvin 1988). Indeed, when current shifts toward enhanced speed, mobility, and information processing are placed in a historical perspective, we can see they are an intensification of processes that have a history as long as the modern, industrial city itself (Graham and Marvin 1996, 74; Townsend 2009; Mumford 1961). As Scott McQuire (2008, 4) has also noted, "the widening of the gap between ways of life primarily grounded in place, and emergent ways of life in which spatial experience is increasingly opened to events occurring elsewhere, has been a primary characteristic since industrial modernity." By connecting distant peoples and places, the establishment of train networks during the nineteenth century profoundly restructured people's understandings of everyday space and time, and was anticipated to provide the basis for a "universal bond" among hitherto disparate societies (Mattelart 2002, 179; Galloway 2008, 112). The installation of the first optical telegraph line in France in 1794 was likewise accorded an emancipatory capacity to "organize humans in one great family in pursuit of the same objective: the establishment of a concord that transcended social and national division" (Mattelart 2002, 180).

The introduction of wireless radio networks in the United States in 1912 was expected to bring "mutual understanding to all sections of the country, unifying our thoughts, ideals and purposes, making us a strong and well knit country" (Douglas 1986, 54). As Eric Gordon (2005, 252) writes, "unlike other elements of the urban environment, like crowds of people and the congestion of buildings that were increasingly associated with crime and danger in the popular press, the crowding of invisible

messages on radio waves carried redemptive possibilities." Gordon suggests that radio's emergence as a popular medium brought the invisible to the forefront of everyday life and significantly altered how a city could be imagined: "It de-emphasised its centre and placed importance on the hubs surrounding it in a radial fashion" (p. 252).

Historical advances in the tools used to visualize urban space have likewise had a profound impact on claims to restructure and improve cities, from the first maps to the latest in satellite imagery (Townsend 2009, 20). The aerial perspective unleashed a wave of rethinking about urbanism, enabling the city to be revealed in the minutest of detail (Campanella 2001 in Townsend 2009, 22). New ways of visualizing urban space encouraged the reworking of cities as abstracted, unified entities, whose efficient reorganization would rid existing urban geographies of their unwanted, disorganized, unhealthy elements. As technologies of speed and motion altered the sense of proximity and distance, the accomplishment of more abstracted urban schemas encouraged highly utopian fantasies about the role of urban planning in reforming urban society. These presumed that the ills of urban society could be reformed through the development of new urban schemas; Geddes' Regionalism and Howard's Garden City concepts were each predicated on classificatory schemas for "the city" devised as an abstracted and generalizable form (Hall 1988; Welter 2002, 86).

"Where Did I Lose You, My Trampled Fantasies?"

Today, many of the modern urban visions inspired by new technologies of seeing are remembered as tragic (Buck-Morss 1991, 89; Pinder 2005, 46), particularly for their failure to account for the material production of spatiality, including the social relationships and economies of production that would give rise to specific urban formations.[6] During what Ed Soja (2000, 95) has called the "urban crisis" of the 1960s, the critique of urban modernism was particularly acute, as critics lamented the tendency to assume that urbanism's progressive potential lay in riding the waves of technological and economic development, and persistently ignoring specific social and historical contexts (see also Scott 2007, 24).

In 1961, for example, Jane Jacobs published *The Death and Life of Great American Cities*, now a classic urban planning textbook, in which she challenged the modernist urban designs of urban planning, which resorted to abstracted schemas or blueprints—"the dishonest mask of pretended order"—as a basis from which to represent, and renew, cities. In her straightforward prose, her evocative rendering of Greenwich street life, and her pointed emphasis on the importance of local, unplanned diversity to the city, Jacobs successfully unsettled the planning establishment despite her position as a relative outsider (Sennett 1970). To Jacobs "the city" was not a plan, a grid, or a highway network, it was a disorganized collection of haphazard incidents and accidental encounters between strangers. Jacobs later reflected that in writing *Death and*

Life, "learning and thinking about city streets and the trickiness of city parks launched me into an unexpected treasure hunt."[7] It was through daily intimate observation that she revealed the complexities of urban life in a way that many traditional planning designs, informed more by abstracted aerial views, did not tend to do.

In Europe of that year, there were different kinds of treasure hunts going on, which also sought alternate spatial representations of the city, though articulated as a more overtly radical program of action.[8] In 1961 Raoul Vaneigm (1961, 120) published "Comments against Urbanism" in the *Internationale Situationniste* in which he decried urbanism as "the most concrete and perfect fulfillment of nightmare" and noted the incredible dullness "in everything having to do with urbanism." That same year the French leader of the Situationists, Guy Debord, delivered via tape recorder a lecture on the "Prospects for Conscious Modifications of Everyday Life" that drew attention to the "scandalous poverty" of everyday life. Debord had been a part of the Lettrist International of the early 1950s, which had been devoting themselves to a certain kind of urban exploration—that of the *derive*. Drifting through the city for days, weeks, or months at a time, the group sought out what they called the city's "psychogeography," to find signs of what Chtcheglov called "forgotten desires"—images of play, eccentricity, secret rebellion, and creativity against the dominant practices of the city (Marcus 2002, 4). Through practices of psychogeography it was argued that the historical "absences" produced by urban planning could be retrieved.

These French Situationists sought to revive the spaces of the city not simply through the production of tracts, or books, or the radical redesign or representation of environments, but simply by wandering the city (*errant*) (Pinder 2005, 149). Their ideas were strongly influenced by the ideas of Henri Lefebvre, sometimes described as a Marxist phenomenologist, who, like Jane Jacobs, was critical of attempts to progress purely visual abstractions of the city in ways that were not grounded in the reality of everyday urban existence. In *The Right to the City*, Lefebvre (1996, 138) considered "planning as ideology," specifically urban ideology, which "formulates all the problems of society into questions of space and transposes all that comes from history and consciousness into spatial terms. He argued that such spatial terms, rationally ordered into circulatory patterns—for example, the city as a network of circulation and communications, or of information and decision making—present as "truth and total dogma," enabling the spatial planner, and the architect, to position themselves as "architect of the world, human image of God the Creator" (p. 137).

Against these tendencies, Lefebvre sought to reclaim space as not only conceptual but also experiential. Like Calvino, he drew on the resources of memory to challenge spatial abstractions, thinking of space and time together, by using auditory metaphors such as that of rhythm (Lefebvre 1994, ix). He also turned to writers such as Bachelard (1994, xxxv), whose spatial terrain was the poetic, eulogized space of the imagination, a topophilia of felicitous space, "the spaces we love and inhabit." To Bachelard, all

"really inhabited space" contains a notion of home; as inhabited spaces, such sites become places of memory, anchoring the past in the present, and the present in the past.

Importantly for both Lefebvre and Bachelard, the activation of the resources of memory was not simply a recourse to nostalgia. Instead they turned to ideas about intimate, "everyday" spatiality as a means by which to retrieve hidden sources of possibility and progressive change, by articulating a phenomenology of experience from which the impulse for change might emerge. To Bachelard (1994, 57), "if we have retained an element of dream in our memories, if we have gone beyond merely assembling exact recollections, bit by bit the house that was lost in the midst of time will appear from out of the shadow." Like Calvino, Bachelard wanted to establish a way of thinking about space that included that which cannot be seen, taking into account the role of memory and imagination in shaping the way we experience space as an embodied encounter. Crang and Travlou (2001, 163) have more recently suggested that such tactics resemble less a theory of *representation* (as original, copy, simulation) than that of spatial *practices* associated with temporal folding and marking within a "memory topi," where the past features "literally and figuratively, [as] a presence."

In seeking out different ways of knowing and experiencing the city, the formation of these different spatial epistemologies challenged the primacy of abstracted visual schemas and their mobilization as a basis for urban reform. Against the backdrop of technological modernization, they maintained a place for invisible cities—cities of memory, of topophilia, of auditory reverberations, of psychogeographic ambiences or accidental treasure hunts—in order to disrupt the reliance on visual modes of representation in understanding, and in turn reforming, cities.

Such alternate spatial epistemologies are worth remembering when we consider the potentials of mobile urban computing in the real-time cities of today. Of course, the promises of today's real-time cities are very much predicated on the ability to disrupt these modernist, abstracted, urban views, through recourse to more contextually aware, embedded datascapes that are much better at capturing complex data. And yet, real-time mobile networks are not necessarily neutral in the way they activate "hidden" data. Crang and Graham (2007, 789) have expressed concern that embedded within the everyday life worlds of "sentient cities" is what they call a "politics of visibility," which relates to how technologies are made visible to us, and how we are made visible to them. They have suggested that an increasing saturation of urban spaces with "anticipatory technologies," which profile users in more and more sophisticated ways, may potentially pacify users by creating a sense of delegated agency. By linking imaginations and anticipations of future behavior(s) to categorical renderings from computerized memory, it may be that digital urbanists today "risk delegating whole sets of decisions and, along with that, the ethics and politics of those decisions, to invisible and sentient systems." They argue that as they become seamlessly integrated

through mobile devices into local, urban environments, such practices may in fact "enact and organize global and transactional flows producing an ongoing geography of distanciated, technological performance" (p. 789).

Critical reflections like these remind us that urban computing does not simply activate the invisible, dormant potentialities of urban spaces. To argue this suggests that these spaces somehow exist as empty or neutral containers for action, and might otherwise remain stagnant and alienating places without the enhanced vitality of interaction characteristic of mobile networks. This instrumentalist treatment of urban spatiality unfortunately has much in common with the views of the urban modernists, though the geometrical forms may no longer be Euclidean. When practitioners of urban computing therefore claim the benefits associated with "picturing the invisible," it is worth remembering that to some, this may be, as Calvino suggested, "the same as telling you nothing."

Listening in to the (Invisible) Past within the Present: Archival Detours and Auditory Detournements

This chapter returns to the imagined spaces of invisible cities as the inspiration for an alternative way of engaging the creative and political potentials of urban computing today. As part of a recent mobile plot project, released by the ABC in 2008 as *Sydney Sidetracks*, I drew from these ideas as a way of exploring the spaces of central Sydney via mobile platform. This project reimagined the spaces of central Sydney as wireless geographies, filled not just with contemporary mobile usage data but historical wireless broadcasts as well, drawing on the ABC's sound archives recorded on location during different moments of a site's history. The project took what auditory traces remained of these historical moments and used them to frame a particular auditory encounter with the same sites today, digging the archives out of obscurity and making them available for digital download to mobile device. The invisibility of an auditory trace of the past was used here to frame a visual encounter with the present day. In this way, the *Sydney Sidetracks* project saw Calvino's narrative technique adopted as a tool for audio production using the mobile device, as the "measurements of space" were calibrated by the auditory traces associated with the "events of its past."

The project was not confined to its use of sound archives but also located extensive amounts of documentary film, television, and photographic archival material as well, which were featured as part of over fifty "points of interest" across central Sydney. Nevertheless its original focus was on making particular use of sound archives for a mobile listening experience, making use of the qualities of mobile listening in framing contemporary urban experience. To Michael Bull, the proliferation of mobile listening devices—mobile phones, iPhones, iPods, and so on—means that sound has become "a way of perceiving the world" (2007, 6), and means that mobile users today have

overpowering resources to construct urban spaces to their liking (2004, 122). Bull is critical of the role of mobile devices in shaping a listener's experience of the city, and argues that listening to an iPod promotes an idealized or aestheticized experience of public spaces of the city that mimics the listener's desires, enabling mobile listeners to become enclosed in "pleasurable and privatized sound bubbles" (2004, 122). But the *Sidetracks* project also recognized that mobile devices not only distance people *from* their environments; they might also promote different ways of listening *to* urban spaces. The soundwalks of Janet Cardiff have, for example, overcoded the present city with memories of the past, enabling listeners to experience a space that is not quite of the now but is rather haunted by ghostly, technologically preserved or recalled presences. The UK artist group Proboscis developed Urban and Sonic Tapestries to encourage users to create their own recordings of their everyday habitats (see urbantapestries.net). In Sydney the UK arts group Blast Theory introduced their Rider Spoke game into the Rocks in 2009, offering participants GPS-equipped bikes to explore and document the psyche of the city and its inhabitants, as riders search for undiscovered hiding places and record their own responses to the terrain.

The *Sidetracks* project was different from these mobile sound projects because instead of generating new recordings it excavated archival radio recordings as invisible substrata of the wireless city. Research toward this project was particularly focused on identifying sound traces that amplified how much had changed to the urban environment over time, making extensive use of recordings of buildings now demolished, raucous crowds now dispersed, and detailed, historic descriptions of places long gone, annihilated by the relentless modernization of Sydney during the decades of the 1960s and 1970s. The recordings identified included street recordings of the Builders' Labourers' Federation (B.L.F.) Green Bans protests as they held up development work around the Rocks and Woolloomoloo during 1973–1974; of Vietnam War protesters gathering outside the old Commonwealth Centre (now Chifley Square); and the muffled sounds of former Prime Minister Robert Menzies being heckled by communists at the now-demolished Sydney Stadium in 1948. The project also featured short audio compilations or "soundwalks" that contain collections of interviews and archival field recordings capturing changing streetscapes and locations. These include a recording of the auctioning and demolition of the Hotel Australia, the demolition of the Pyrmont Incinerator designed by Walter Burley-Griffin, and a collection of recordings about the decade-long construction of the Sydney Opera House at Bennelong Point, including the sounds of ships in Sydney Harbour the day of its opening in 1973 by Queen Elizabeth II.[9]

As a user experience, the "sidetrack" therefore offered a journey that charted locations and events mostly invisible to the naked eye. In this way, the project foregrounded a listening experience that might establish a certain kind of displacement: listening to a recorded event or lost site as it was originally documented in situ could

on the one hand affect a sense of distance—being from another time and capturing what can no longer be seen—just as it revisited the event "here" as it "really happened." Rather than promoting a screen-based mobile-phone experience, *Sidetracks* therefore used the built environment as a spatial context or platform from which to excavate its invisible history, through the act of listening in to the traces of its recorded documentation.

Conclusion

To some, the idea of getting lost in cities presents a certain allure. To German sociologist Walter Benjamin, writing in the first decades of the last century, it was an aspiration. "Not to find oneself in a city may well be uninteresting and banal," he wrote, "it requires ignorance—nothing more. But to lose oneself in a city—as one loses oneself in a forest—that calls for quite a different schooling" (Benjamin [1932] 1999). Benjamin explored the metropolitan spaces of Paris and Berlin for their labyrinthine qualities, in which all kinds of lost dreams, hopes, and artifacts, often swept aside in accounts of modern development and Haussmann-like "disencumbering," might be unwittingly stumbled on. Like many of the writers and theorists discussed in this chapter, Benjamin's approach sought a kind of urban engagement that retrieved the hidden, invisible cities nestled in among the proliferating spaces of technological modernity.

As this chapter has discussed, throughout the twentieth century ideas about invisible cities have been recalled as a basis from which to explore different ways of understanding cities, which extend beyond the activation of advanced visualization techniques to encompass other senses and other spaces: poetic, imagined, or perhaps only half-recalled. Through the project *Sydney Sidetracks* I have explored how the excavation of historic wireless broadcasts might enable a way of listening in to a different historical terrain from that which might be "seen" within the city today. As a creative response to the potentialities of mobile-phone use today, it seeks to remind us that while the increasing computational intensification of urban space may radically enhance our capacity to "picture the invisible" and reveal that which has hitherto remained hidden from view, there remain other pathways, other spatial epistemologies, that confirm the enduring potency of what cannot be seen.

Notes

1. With respect to the title of this chapter, "Street Haunting" comes from Virginia Woolf's short story by the same name. See Woolf 2005.

2. Calvino discussed cybernetics in a 1967 talk called "Cybernetics and Ghosts." See Boyer 1996b, 142.

3. On the quote in the heading, see the project notes for "Mobile Landscape: Graz in Real-Time" by the SENSEable City Lab, http://senseable.mit.edu/graz/#city.

4. See the Workshop description for *Digital Cities 6: Concepts, Methods and Systems of Urban Informatics*, http://cct2009.ist.psu.edu/workshops.cfm.

5. See Hill's prediction for 2009 at Archinect online, http://tinyurl.com/yhpp2r3.

6. The quote in the heading is from Bachelard 1994, 57.

7. See the foreword to the Modern Library edition, 1993, http://www.walksf.org/essays/janejacobs.html.

8. Many critical responses to urbanization during the 1960s drew heavily on the writings of Marx and Engels, an intellectual tradition attuned to conditions of disorder, upheaval, discontinuity, and economic crisis if not directly concerned with cities (see Soja 2000, 97).

9. Individual audio recordings discussed in this chapter can be found at http://www.sitesandsounds.net.au or through *ABC Sydney Sidetracks* at http://www.abc.net.au/sidetracks, which offers access to recordings online or through a mobile application that can be downloaded directly to the phone. Note that the mobile application does not make use of GPS technology but rather includes all content in the phone application itself, to save users any potentially unpleasant data charges.

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