

## CHAPTER 4

# Deep Time of Media Infrastructure

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When it first appeared in English usage in the mid-1920s, “infrastructure” referred to roads, tunnels, other public works, and permanent military structures. Google’s Ngram viewer, which displays the frequency with which words appear in Google’s corpora of books, shows that the term was rather obscure until around 1960—roughly the same time that “media” began to take off and “telecommunications” came into widespread use. Thus it is no coincidence that infrastructure—a word whose Latin roots, denoting any form of substructure, would seem to lend it to liberal use—is commonly associated with modern electronic communications and the trafficking of audiovisual signals.

Yet those trafficked signals long precede the age of telecommunication. And infrastructure itself has a much longer history: it has existed as long as has civilization. In fact, we could say that infrastructures made human settlement possible. I am speaking not only of roads and aqueducts and sewers, the kinds of infrastructures that archaeologists and ancient historians commonly examine. *Media* infrastructures, too, have been integrated into our cities, either by design or by accident, since the days of Eridu and Uruk. Anthropologist Clifford Geertz, urban historian Peter Hall, and archaeologist Paul Wheatley all suggest that the birth of cities is rooted just as much in the need for ceremony and communication as it is in economics, which is the prevailing theory.<sup>1</sup> Thus, early cities had to provide spaces conducive to pageantry and communication. Lewis Mumford, author of two grand histories of urbanity, agrees that “what

transform[ed] the passive agricultural regimes of the village into the active institutions of the city” was not merely a growth in size or population density or economy, but an extension of “the area of local intercourse, that engenders the need for combination and co-operation, communication and communion.”<sup>2</sup> That “area of local intercourse” is an infrastructure—a structure that undergirds communication and communion.

By rethinking what constitutes a media infrastructure, and by acknowledging its deep history, I hope to provide a useful counterpoint to the other studies in this volume. I want to think beyond telecommunications, beyond the nineteenth century, back beyond those technological systems administered by modern states, governmental agencies, and multinational corporations. Taking inspiration from the field of geology and the work of Siegfried Zielinski, we—media and infrastructure scholars, urban historians, even engineers and urban designers—would do well to look at the *deep time* of media infrastructure.<sup>3</sup> And in this more expansive thinking, I want those of us in media and design studies to consider what we might learn from fields of study and practice that have long been examining infrastructure, but which have had little contact with our field. Archaeology and urban and architectural history in particular have much to offer the study of signal traffic. Of course, media studies has already witnessed the arrival of a subfield called “media archaeology,” involving such figures as Zielinski, Friedrich Kittler, Erkki Huhtamo, and Jussi Parikka—and while this work does offer an alternative, nonlinear, materialist means of writing media histories, it regards archaeology metaphorically or methodologically rather than literally. I want instead to consider insights from trowel-wielding archaeologists.

Infrastructure historian Paul Edwards admits that, today, infrastructure “has become a slippery term, often used to mean essentially any important, widely shared, human-constructed resource”; this could include hardware, organizations, “socially communicated background knowledge”—any sociotechnical systems that offer “near-ubiquitous accessibility.”<sup>4</sup> Despite, or perhaps *because* of, the flexibility of the term, I think we in media and design studies have much to learn from the way Edwards and other historians and theorists of infrastructure conceive of and work with their object of study. In the next section I examine what archaeologists and urban and architectural historians can tell us about how ancient cities provided infrastructures for vocalicity—for public address and conversation—and for writing. And in the final section I explore how these other fields’ methods, or conceptual units, resonate with the historiographic approaches of media studies and can encourage us to reflect critically on how we construct our media—as well as our urban and architectural—histories.

My goal is to demonstrate both how thinking in terms of infrastructure can enhance existing research within media studies—particularly work on the “media city”—and how thinking in terms of the urban environment can elongate our historical view of media infrastructure and allow us to understand more broadly what constitutes a media infrastructure. What can be gained by looking back to the deep time of media infrastructure and its role in engendering and shaping our cities? First, from the perspective of media scholars, we can appreciate media as potentially embodied on a macro scale, as a force whose modes and ideologies and aesthetics of operation can be spatialized, and materialized, in the landscape. We can read the archaeological record, conduct forensic analyses—or, when we are dealing with a medium like the voice, for which there is no collectable artifact, we can use techniques from archaeoacoustics to “listen” to spaces past. We can dig up the cables, pull out the wires, trace the epigraphy on building facades, analyze the disks—and then observe their layering and interconnection.

And when examining media at the macro scale, we also have to acknowledge that media’s history is entwined with that of our cities, their streets and buildings, their political-economic and social networks, and so on. In the process, we come to realize that those cities carry in them the “residue” of all media technologies past—and that, furthermore, these “past” media are not merely artifacts or ruins. Much like Raymond Williams’s category of the “residual,” they are “formed in the past, but . . . still active in the cultural process, not only and often not at all as an element of the past, but as an effective element of the present.”<sup>5</sup> This is why our cities today are not solely virtual but are simultaneously aural, graphic, textual, sonic, visual, and digital. We tend in media studies to write format-specific histories, and to suggest that new technologies supplant the old—but when we look at our media histories through our cities, we observe a layering, or resounding, of media epochs. Such realizations open up new methodological opportunities for studying media.

Second, work on infrastructure has the potential to contribute to urban and architectural history, too. For instance, it is possible to reevaluate theories about the birth of cities, which tend to privilege economic explanations for urbanization, and reinforce the central role played by media and communication in urban history. Furthermore, we can highlight the role of communication in giving *form* to our cities. Prevailing theories suggest that urban form is shaped primarily by topography, transportation, defense, or even cosmological or philosophical views. Yet various means of communication—whether the voice or print or digital technologies—have also shaped cities throughout history.

## Deep Time of the Media City

There is a well-established but ever growing area of study within media studies that seems to lend itself to the interdisciplinary study I am proposing here. Scholars focusing on the “media city” have tapped into insights from architectural and urban history and theory in order to think about media in relation to “the urban,” yet they have tended to focus their attention on *modern* media—photography, film, television, and the like. There is a plethora of research on architecture and cities in relation to mechanically reproduced still and moving images. For instance, many photographic, architectural, and cultural historians, inspired greatly by Walter Benjamin, have examined the city as a photographic subject, photography’s early role in the documentation of urban transformation and as an instigator of social change, and photography’s influence on particular modern architectural and urban designers.<sup>6</sup> There is also a tremendous amount of work on the city and film as contemporaneous developments, the representation of the city *in film* (this is the dominant thread by far), and film’s influence upon architects and planners, including some investigations of the city as a physical and social infrastructure for the rise of film.<sup>7</sup> In more recent decades, scholars like Lynn Spigel and Anna McCarthy have begun to address the synchronous rise of television and postwar suburbs, the politics of screens in public places, and the impact of networked digital media on urban design and urban experience.<sup>8</sup> There has also been excellent work on the impact of radio and modern sound technologies on architecture, zoning, and urban experience.<sup>9</sup>

Some media-cities research evinces an assumption that the mediation of the city began with modern media. Scott McQuire, in *The Media City*, observes that the mediation of urban experience “has been underway at least since the development of technological images in the context of urban ‘modernization’ in the mid-nineteenth century.”<sup>10</sup> Eric Gordon, in *The Urban Spectator*, locates the origin of the media city even later than does McQuire: “from the hand-held camera at the end of the nineteenth century to the mobile phone at the end of the twentieth, the city has always been a mediated construct.”<sup>11</sup> I contend that “always” begins well before the late nineteenth century and the era of telecommunications.

Cities have, of course, been represented for millennia in maps, paintings, woodcuts, lyric poems, and other media formats. Yet the city as a “mediated construct” certainly encompasses much more than mere portrayals of the city; media technologies—particularly media infrastructures—have been embedded in and informing the morphological evolution of our cities since their coming into being. The “media cities” research very rarely looks at infrastructure.

That has changed a bit during the past two decades, with the rise of digital and locative media and ubiquitous computing, which has inspired scholars, designers, engineers, and artists to turn their attention to the technical networks that make new forms of urban mediation possible. But these scholars and practitioners rarely look back to see the technical networks that have always been there, making cities communicative spaces. There is a tendency to overlook the infrastructures that precede the “cyber” and the electronic, as well as those systems that emerged even before the term “infrastructure” itself.

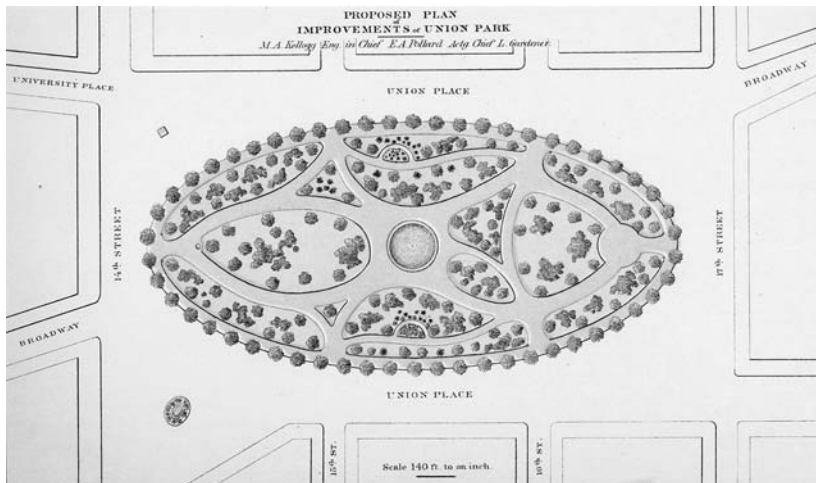
In the fifteenth century, for example, as architectural historian Mario Carpo has explained, new printing technologies brought with them new infrastructures of publishing and education that dramatically influenced design practices.<sup>12</sup> Publishing centers, with their embedded political-economic, social, and technical infrastructures, arose in cities across Asia and Europe. The emergence of new print forms also influenced how people navigated and comprehended their cities. Even today, metaphors of the book inform how we “write” and “read” our cities. Planners talk of “legible urbanism” and of reading the city as a “text,” while designers build augmented reality applications layering text and image atop views of the city, making possible a palimpsestic urban “reading.”<sup>13</sup>

The voice, too, has long been built into urban form. Since their very beginnings, cities have been places of public address and conversation, and acoustic considerations have, to some degree, informed design and construction. Yet if we look back to the agora of Athens or the Forum in Rome, we will not find infrastructures in the form of electrical wiring and public address systems and stages with acoustic paneling. Instead, as I argue elsewhere, urban surfaces, volumes, and voids have functioned as sounding boards and resonance chambers for mediation, and as transmission media themselves (much of the following discussion on oral communication draws from that previous publication).<sup>14</sup> Particularly in cases like these, media scholars can benefit from the work of archaeologists by excavating the urban contexts and deep pasts of media infrastructures. For instance, archaeology and its subfield of archaeoacoustics, along with architectural and urban history, can enhance understanding of the ways in which these material spaces have, either by design or by accident (archaeologists and architectural historians disagree on the intentionality of ancient acoustic design), functioned as infrastructures of speech and vocality.

“Never in my opinion,” Quintilian writes, “would the founders of cities have induced their unsettled multitudes to form communities had they not moved them by the magic of their eloquence.”<sup>15</sup> Aristotle, likewise, prescribed a city that would contain no more people than could hear a herald’s voice, and architect Vitruvius tells us in the first century BC of fellow designers who sought

to cultivate acoustics that maximized the “clearness and sweetness” of orators’ voices.<sup>16</sup> Architectural historian Diane Favro and classicist Christopher Johanson are creating digital models of the Roman Forum to understand how the space accommodated funeral processions, and, in part, **how it functioned acoustically as a space for speech.**<sup>17</sup> We find similar acoustic concerns even earlier, in ancient Greece. Classicist Christopher Johnstone has drawn on archaeological research to explore how the architecture of Athens’s agora, and, later, civic buildings like the stoa, law courts, and various auditoria shaped both an orator’s delivery and his audience’s engagement—and even limited the size of the audience, which might be a governing body or jury.<sup>18</sup> **These urban volumes thus undergirded the central modality of communication and therefore became a means of governance and a prime medium for sociality in ancient civilization.**

What about a city whose infrastructures were formed millennia later, in a different age of media infrastructure? Consider New York in the mid-nineteenth century, when, as David Henkins writes in *City Reading*, mass-produced print was plastered all over the city in the form of posters, signs, and newspapers. During this period the mechanically reproduced image was gaining popularity and telecommunications were rising.<sup>19</sup> Even then, the city was a place of public address; the “residual” medium of oral communications was still shaping urban morphology. Samuel Ruggles, one of the developers of New York’s Union



**Figure 4.1.** Proposed plan improvements of Union Park; by Charles Spangenberg. From New York City Parks Department *Annual Report* (New York, 1871); Mid-Manhattan Library Picture Collection, New York Public Library.

Square, claimed in 1864 that the square was “deliberately designed to support participatory democracy. The triangular parcels of land left over by the imposition of the elliptical park on the grid were expressly made for ‘the assemblage of large masses of our citizens in public meetings.’”<sup>20</sup> Through its continual renovation, planners aimed to use the square as an infrastructure to create “active and informed citizens as well as foster social harmony,” yet it remained, and *remains*, a site for radical meetings and rallies. Today, Union Square, like many squares and plazas in Athens and Rome and other ancient cities of the world, serves as an urban infrastructure for the integration of a variety of media: locative technologies, text messages, cloth banners, and, still, the bull-horned or naked human voice.<sup>21</sup>

Infrastructures of writing have also long informed how cities took shape. Of course, the first writing surfaces, made of clay and stone, were the same materials used to construct ancient buildings. And often those building facades were the substrates for written texts. The “epigraphic habit” distinguished ancient Greece and Rome. “The Romans seemed to inscribe into everything,” according to Johanson. Around the Forum an ancient could find “the written word covering every surface of every major monument.”<sup>22</sup> These monuments and building facades were not *designed* to be used as substrates for writing—as an architectural infrastructure for communication—but through the Romans’ social practices, “the fabric of the city” ultimately served to record major laws, achievements, legal transactions, and other missives. The city was “informally archiving itself on its skin.” Archaeologist Louise Revell acknowledges that such epigraphs constitute a “natural adjunct” to the public architecture on which they were posted or inscribed; the writings played an integral part of political processes and religious services and thus were bound up in the social practice of what it was to be Roman.<sup>23</sup> It is important to note that this “mediation” of Roman identity did not adhere to a single modality; the Forum provided an infrastructure for the public performance or presentation of multiple modes of communication—public address, inscription, sculpture, and other forms of multimedia pageantry. The same can be said of ancient forums adapted for contemporary use, although today’s media mix now includes digital technologies among the analog.

The Arabic world has been similarly rich with epigraphy. Art historian Irene Bierman writes of how, in the tenth through the twelfth centuries, the Fatimids of Cairo displayed official writing on the exteriors of minarets and other public structures. Thus, as in Greece and Rome, architecture functioned as an infrastructure for communicating territorial claims and codifying beliefs, and, as Bierman argues, the specific aesthetic properties of those “public texts”—their “color, materiality, and form”—played a key role in how and what they



communicated.<sup>24</sup> Art historian Robert Harrist makes similar claims about Chinese *moya*, writings in stone that functioned as “landscape” texts and that, “through their placement in and their interaction with the natural world, both embed historical memory in the topography of China and evoke mythic worlds that transcend the experiences of everyday life.”<sup>25</sup>

But writing is not merely inscribed *on* our cities’ walls. Lewis Mumford and Harold Innis discuss writing as central to the rise of trade, accountancy, and governance, and thus to the administration of the first cities. Writing is an integral urban political-economic infrastructure.<sup>26</sup> Anthropologist Brinkley Messick argues that we can even find parallels between writing and urban form. He examines the history of Islamic architectural inscriptions and their formal parallels in the very “articulation” of urban space.<sup>27</sup> Messick discusses so-called Arabic “spiral texts,” texts in which the writing rotates in a spiral shape, entwining form and content, and he argues that “this poetics of written space then can be extended to general domains of spatial organization: towns, architecture, and the space of the state.”<sup>28</sup> He contrasts the “curvilinear urban script” of the Yemeni town of Ibb—which he describes as “a labyrinth of closely packed multistoried houses on narrow and winding alleys and culs-de-sac,” with plenty of “residual, irregular spaces”—with the zoned, planned-out newer regions, characterized



**Figure 4.2.** Spiral urban form in Ta'izz, Yemen. Bezur, Ta'izz, with Aschrafayya Mosque, Wikimedia Commons, CC BY-SA 3.0, <http://en.wikipedia.org/wiki/File:Taizz.jpg#file>.



by “relatively straight-line, wide thoroughfares with some space left between the buildings.”<sup>29</sup> This “new separation and precedence of urban form over urban content,” and the parallel evolution in urban form, he argues, “is analogous to the changeover from spiral texts to their straightened successors.” Whether we can claim a *causal* relationship is perhaps beside the point; **what we see here is a morphological resonance between an integral political-economic and cultural media-infrastructure and the shape of the city itself.**

Today, architectural and urban theorists seem ready to posit deterministic formal relationships between digital infrastructures and our new “smart cities” in Songdo, Korea, or Masdar, U.A.E. The builders of these networked developments often design *out* opportunities for unplanned (and un-modern) modes of communication: streets seem intended primarily to shuttle people from one telecommunication station to another, rather than to foster face-to-face interactions; and building facades are constructed of anti-graffiti materials. It seems that, in such places, there is little “residual” media infrastructure to dig into. Yet there has already arisen a huge contingent of critics who argue that such developments, by contradicting millennia of urban design experience, are destined to fail.<sup>30</sup> As Richard Sennett has argued, these over-zoned, over-rationalized cities, devoid of any historical sensibility, defy “the fact that real development in cities is often haphazard, or in between the cracks of what’s allowed.”<sup>31</sup> “The danger now is that this information-rich city may do nothing to help people think for themselves or communicate well with one another.” **A media city that makes no provisions for a layering of communicative infrastructures, that wipes away the deep time of urban mediation, is more stupefying than smart, more machine than metropolis.**

These examples demonstrate that **our media histories are deeply “networked” with our urban and architectural histories (and futures) and that, in many cases, these cultural and technological forms are mutually constructed.** Thus, particularly in studying the deep time of our media infrastructures, scholars and practitioners in *all* fields need to regard these systems *in relation* to one another. What’s more, we need to recognize that the integration of these various structures simultaneously shapes, and is shaped by, the social practices and everyday experiences of the people who live with them.

## Methods for Digging into Infrastructure’s Deep Time

In this final section, I examine how archaeology’s, urban history’s, and infrastructure studies’ methods and central concepts resonate with the methodological approaches of media studies, and how these “imported” intellectual tools

might encourage us to think more critically about how we construct our media histories. I hope also to reinforce suggestions made in the previous section—that thinking in terms of infrastructure can enhance media studies research on the “media city,” and thinking in terms of the urban environment can extend the historical scope of media infrastructure and allow a broader understanding of what constitutes an infrastructure. In what follows, I outline six historiographic or methodological lessons that emerge from thinking about the media-city in relation to infrastructure and from thinking about media infrastructure in relation to urban history. By no means are these six lessons, or concepts, mutually exclusive; there is actually a good bit of redundancy, but I think that, in some cases, restating the same principle using different language can only enhance its potential utility.

### TECHNO-SOCIO-SPATIO-MATERIAL ENTANGLEMENTS

The deep time of urban mediation is manifested in material strata—in literal *layering*. Henri Lefebvre has argued that urban space is formed by superimposed capital regimes and the infrastructures they create in their own image; the result, he has famously suggested, is not unlike a flaky *mille-feuille* pastry.<sup>32</sup> But the palimpsest is not a mere metaphor. In his excellent study of infrastructure in urban Nigeria, anthropologist Brian Larkin writes that the “physical shape of the city emerges from the layering of . . . infrastructures over time.”<sup>33</sup> The nature of that layering, however, is not one of mere supplanting or obsolescence. If we dig down through the strata, we find much more than *ruins* (and this is where, I think, the archaeological metaphor can at times be a bit misleading). Digging into these layers, we often find that, depending on different contextual factors, various infrastructures have distinctive temporalities and evolutionary paths.

As I have argued elsewhere, through “excavation” we can assess the lifespans of various media infrastructures and determine when “old” infrastructures “leak” into new-media landscapes, when media of different epochs are layered palimpsestically, or when new infrastructures “remediate” their predecessors.<sup>34</sup> Geographers Stephen Graham and Simon Marvin write that “because of the costs of developing new telecommunications networks,” for instance, “all efforts are made to string optic fibers through water, gas, and sewage ducts; between cities, existing railway, road, and waterway routes are often used.”<sup>35</sup> And in the Roman Forum, as Johanson explained, sculpture, architecture, epigraphy, and public address all reinforced one another in the spectacle of the funeral procession and other public pageantry. The same architecture that served as a sounding board for public address also served as a substrate for epigraphy—and today serves as a substrate for graffiti and as a scaffolding for cell phone

antennae. The historical media infrastructures on the “lower levels” of our cities are often very much alive in, and continuing to shape, the contemporary city. They are Williams’s “residuals.” This intermingling of temporalities fits Christopher Witmore’s definition of “archaeological time”: “the entanglement, the intermingling, the chiasm of pasts and presents.”<sup>36</sup>

## NETWORKED HISTORIES

Graham and Marvin list some of those intermingling—“superimposed, contested and interconnecting”—infrastructural layers, or what they call “scapes”: the “‘electropolis’ of energy and power,” “the ‘hydropolis’ of water and waste,” “the ‘cybercity’ of electronic communication.”<sup>37</sup> But by taking the long view on this intermingling, it is possible to understand these “scapes” as tangled up with one another not only spatially but also temporally. The history of any of these scapes is plugged into and inextricably linked with the histories of the others—in the same way that, as we saw in the archaeological examples above, our media-infrastructural histories are deeply networked with our urban and architectural histories.

Richard John suggests that the “concept of an information infrastructure [for instance] . . . highlights the fact that the transmission of information has long been coordinated by a constellation of institutions, rather than by a single government agency or business firm.”<sup>38</sup> As mentioned above, that infrastructural constellation includes not only institutions but also the everyday practices of ordinary people. It is important to recognize the codependency, the intertwining of these various entities and systems—the telegraph and the telephone, the railroad and the telegraph, transportation infrastructures and the postal system, print and writing infrastructures, writing and oral address, architecture and inscription, and various social and regulatory systems—and perhaps write their histories *together*.

Edwards, Jackson, Bowker, and Knobel lay out a general framework for how these “constellations” might form—in the cyberinfrastructure world, at least. It begins with system building; then technology transfer across domains; the emergence of variations in the original system design and the appearance of competing systems; the eventual merger of these various systems via *gateways*, into *networks*; the standardization of these networks and their merger into *inter-networks*—with, all the while, “early choices constrain[ing] the options available moving forward.”<sup>39</sup> Such a model might seem rather deterministic to those of us looking at technology from a humanities orientation, or to those of us who are constructivists—yet I think this model identifies several phases, or pivot points, that occur during the maturation of technological systems that we already recognize and should be encouraged to look for. As Edwards, et al. suggest,

“modeling” the formation of these networked infrastructural “constellations” does not imply that they are rigidly interlocked systems:

The eventual growth of complex infrastructure and the forms it takes are the result of converging histories, path dependencies, serendipity, innovation, and “bricolage” (tinkering). Speaking of cyberinfrastructure as a machine to be built or a technical system to be designed tends to downplay the importance of social, institutional, organizational, legal, cultural, and other non-technical problems developers always face.<sup>40</sup>

These myriad infrastructures need to be networked into our media-infrastructural historiography. It is also important to situate those networked histories within the *longue durée*—to recognize, as John does, that systems and institutions have “long been coordinated” into an information infrastructure; or, as Edwards, et al. indicate, that their constellations are the result of “converging histories.” So, rather than simply examining the intertwined technical, social, institutional, and cultural systems that gave rise to, say, cyberinfrastructure, we could acknowledge that *this* particular information infrastructure is networked into the long history of information infrastructures. Information itself has a deep time, as intellectual historians and library scientists have revealed.<sup>41</sup>

### PATH DEPENDENCY

Path dependency, which Edwards et al. reference, is a particularly useful concept for scholars who have been taught to avoid at all costs being labeled a “techno-determinist,” which, as Geoffrey Winthrop-Young jokes, “is a bit like saying that [one] enjoys strangling cute puppies.”<sup>42</sup> Such suspect thinking often surfaces in “smart cities” rhetoric. There, the city, typically built *tabula rasa*, is equated with its technological infrastructure; the digital network *is* the city. Yet few live in cities that are born overnight; most metropolises are the product of decades, centuries, or millennia of expansion and renovation, razing and rebuilding, infilling and layering. In thinking about how these layers interact, humanities scholars often, in our overcompensation to avoid the scarlet *TD*, resist acknowledging the existence of well-trodden paths and how they have limited future choices. We see such paths in the long-term evolution of cities’ media infrastructures. Architectural historian Kazys Varnelis offers a concrete example of paths’ potency: “New infrastructures do not so much supersede old ones as ride on top of them, forming physical and organizational palimpsests—telephone lines follow railway lines, and over time these pathways have not been diffused, but rather etched more deeply into the urban landscape.”<sup>43</sup> Thus it is possible to trace those infrastructural “paths” back into deep history. Doing so compels the recognition that those spaces built to accommodate historic forms of communication

also *inform* and function as part of today's media infrastructures. The conceptual model of path dependency balances a recognition that technologies have material effects—that the channels laid and spaces configured by preceding technologies *do* steer the development, to some degree, of successor technologies—with an acknowledgment of the roles played by serendipity and tinkering, by historical social and cultural factors, in technological development.

## PEOPLE AS INFRASTRUCTURE

The historical material record shows that people have not been mere beneficiaries of infrastructures but have actually served as infrastructures themselves. If, for instance, the public water supply does not extend into a particular neighborhood, residents of that neighborhood will often fill up their tanks and buckets within the service zone and tote their water that “last mile” home. People, in other words, do the work of absent pumps and pipes. This has been the case for millennia. There are plenty of parallels in media infrastructure. For instance, as Greg Downey has compellingly argued, messenger boys were a central link in the telegraph network.<sup>44</sup> In ancient Rome, as Johanson explained, residents transformed every surface of the built environment as a substrate for writing, and people used their voices to turn the volumes and surfaces of ancient cities into resonance chambers for public address. If important public notices were not distributed to peripheral urban zones, residents of those areas would bring *themselves* into the city center to hear or read the news. And as AbdouMalik Simone argues, even today in Africa—and, undoubtedly, in much of the Global South and throughout much of global history—people often compensate for “underdeveloped, overused, fragmented, and often makeshift urban infrastructures.”<sup>45</sup> The “incessantly flexible, mobile, and provisional intersections of residents . . . operate without clearly delineated notions of how the city is to be inhabited and used”—and they themselves fill in where their wires and pipes fall short.<sup>46</sup> Looking through the *longue durée* at the role *people* have played in infrastructural constellations helps us to appreciate the deeply entrenched and continuing centrality of *biopower and human intellectual labor* in our infrastructural constellations—“automated,” digital, or otherwise.

## INFORMAL / SHADOW DEVELOPMENT

Simone's mention of the flexible, mobile, and provisional suggests that infrastructure history—and media history in general—has been deeply informed by informal and “shadow” developments. In many parts of the developing (and even developed) world, where institutions do not provide, and perhaps have

never provided, universal access to public services like media, islands of access within seas of exclusion are the norm. This is when people typically “go rogue.” Brian Larkin writes about the jury-rigging, repurposing, or pirating of existing infrastructures in Nigeria. Such improvisations have appeared throughout media history—as in the cooptation of building facades as substrates for public writing in ancient Rome and Egypt—and these peripheral practices should factor into our media-infrastructureal histories. Consider the long history of people making unofficial marks, graffiti, on urban walls; or the long history of pirated publication and urban shadow-markets for unauthorized texts; or the long history of people making unauthorized noise—proselytizing or hawking their wares—in public space.<sup>47</sup>

Thinking about the “deep time” of media infrastructure—back beyond those technological systems administered by modern states, governmental agencies, and multinational corporations—reveals that as infrastructures have become increasingly institutionalized, centralized, and networked, what constitutes “informality” has also evolved. **Situating informal infrastructures in relation to the long history of infrastructure uncovers the fact that an infrastructure’s “shadow” has a history too.**

## SCALE

In examining infrastructures of vocality and writing I have considered entities as small as the individual voice and as big as an entire urban form. **Today’s infrastructures, of course, encompass global networks and even extraterrestrial domains.** Infrastructures thus compel thinking about the granularity of observations; Graham and Marvin list various scales of infrastructural analysis, including the corporeal, local, urban, regional, national, international, and global.<sup>48</sup> When writing media-infrastructureal histories, it matters whether one is writing media object histories, local media histories, urban media histories, national media histories, or cultural media histories, and making a choice between them can be complicated by the fact that infrastructures extend across these scales, connecting technologies into networks and internetworks. **Paul Edwards suggests that scale need not be conceived of as merely a geographic quality; it is also possible to consider scales of force (from the human body to the geophysical), scales of time (from human time to geophysical time), and scales of social organization (from individuals to governments).**<sup>49</sup> Again, infrastructures span all these scales. And those scales—what constitutes the “nation” or how one conceives of the boundaries of the “subjectivized” body, for instance—also have a deep history.



The macro spatiotemporal view is particularly illuminating in that it forces consideration of the forms of media and infrastructures in relation to their long-term functions—“the reasons they came to exist in the first place.”<sup>50</sup> Rather than thinking about how the telegraph supplanted the postal service, or how writing supplanted the voice, for instance, these two systems can be thought of as two instantiations of a shared infrastructural purpose. As Edwards suggests, contextualizing the telephone, the telegraph, the post, and other modern technologies within James Beniger’s “control revolution” concept “allows us to understand not only the genesis and growth of the many large infrastructures that characterize modernity, but also the process of linking these infrastructures to each other.”<sup>51</sup> Of course, we would need to identify alternative infrastructural purposes to encompass our premodern infrastructures, too. Whatever those purposive thematics or ideologies might be, this act of linking and contextualizing foregrounds the historical continuity (and perhaps some discontinuities) among infrastructures—the long now, the “deep time”—and the myriad structures that have intertwined in order to allow us to traffic in signals of myriad forms across the ages.

## Notes

1. Clifford Geertz, *Negara: The Theatre State in Nineteenth-Century Bali* (Princeton, N.J.: Princeton University Press, 1980); Peter Hall, *Cities in Civilization* (New York: Pantheon, 1998); Paul Wheatley, *The Pivot of the Four Quarters: A Preliminary Enquiry into the Origins and Character of the Ancient Chinese City* (Chicago: Aldine, 1971).

2. Lewis Mumford, *The Culture of Cities* (1938; repr., New York: Harcourt Brace Jovanovich, 1966), 6.

3. Siegfried Zielinski, *Deep Time of the Media: Toward an Archaeology of Hearing and Seeing by Technical Means* (Cambridge, Mass.: MIT Press, 2006). In their 2007 NSF-funded workshop on cyberinfrastructure, Paul Edwards and several colleagues argued for the importance of studying the “long now” of cyberinfrastructure: the two hundred years’ worth of “slower-pace[d]” political, cultural, and technical changes that have been happening “in the background”—changes like the rise of scientific disciplines and statistics—that have laid the foundation for digital networks (Paul N. Edwards, Steven J. Jackson, Geoffrey C. Bowker, and Cory P. Knobel, “Understanding Infrastructure: Dynamics, Tension, and Design,” workshop, “History and Theory of Infrastructure: Lessons for New Scientific Cyberinfrastructures,” University of Michigan, Ann Arbor (January 2007), 3. Of course I would argue that media studies could benefit from a much longer view, one that recognizes that “infrastructure” precedes the “cyber” and the electronic—but still, these scholars’ focus on historical contextualization is useful. And the concept of the “long now,” a contemporary that extends into the past, complements Zielinski’s call to “find something new in the old”—to find the “now” in

history—and recent efforts to consider the “geology” of media: the natural resources used to make our media hardware. See Jussi Parikka, “Deep Times and Geology of Media,” *Machinology*, August 20, 2013, available at <http://jussiparikka.net/2013/08/20/deep-times-and-geology-of-media> (accessed September 20, 2014). These latter efforts are particularly relevant to our efforts to dig into deep history, given that the very concept of deep time emerged in geology.

4. Paul Edwards, “Infrastructure and Modernity: Force, Time, and Social Organization in the History of Sociotechnical Systems,” in *Modernity and Technology*, ed. Thomas J. Misa, Philip Brey, and Andrew Feenberg (Cambridge, Mass.: MIT Press, 2003), 186–87, 188.

5. Raymond Williams, *Marxism and Literature* (New York: Oxford University Press, 1977), 122.

6. James Ackerman, *Origins, Imitations, Conventions: Representation in the Visual Arts* (Cambridge, Mass.: MIT Press, 2002); Beatriz Colomina, *Privacy and Publicity: Architecture as Mass Media* (Cambridge, Mass.: MIT Press, 1994); Peter Bacon Hales, *Silver Cities: Photographing American Urbanization, 1839–1915* (Philadelphia: Temple University Press, 1983); Levine, Neil. “‘The Significance of Facts’: Mies’s Collages Up Close and Personal,” *Assemblage* 37 (December 1998): 70–101; Richard Pare, *Photography and Architecture: 1839–1939* (Montreal: Canadian Center for Architecture, 1982); Shelley Rice, *Parisian Views* (Cambridge, Mass.: MIT Press, 1999).

7. Walter Benjamin, *Illuminations*, trans. Harry Zohn (New York: Schocken, 1969); David B. Clarke, ed. *The Cinematic City* (New York: Routledge, 1997); Colomina, *Privacy and Publicity*; Edward Dimendberg, *Film Noir and the Spaces of Modernity* (Cambridge, Mass.: Harvard University Press, 2004); Sergei Eisenstein, “Montage and Architecture,” trans. Michael Glenny, *Assemblage* 10 (1938/1989): 111–31; Scott McQuire, *The Media City: Media, Architecture and Urban Space* (Thousand Oaks, Calif.: Sage, 2008).

8. David Heckman, *Small World: Smart Houses and the Dream of the Perfect Day* (Durham, N.C.: Duke University Press, 2008); Anna McCarthy, *Ambient Television: Visual Culture and Public Space* (Durham, N.C.: Duke University Press, 2001); Scott McQuire, Meredith Martin, and Sabine Niederer, eds, *Urban Screens Reader*, Institute of Network Cultures Reader, vol. 5 (Amsterdam: Institute of Network Cultures and Creative Commons, 2009); Lynn Spigel, *Make Room for TV: Television and the Family Ideal in Postwar America* (Chicago: University of Chicago Press, 1992).

9. Karin Bijsterveld, *Mechanical Sound: Technology, Culture, and Public Problems of Noise in the Twentieth Century* (Cambridge, Mass.: MIT Press 2008); Steve Goodman, *Sonic Warfare: Sound, Affect, and the Ecology of Fear* (Cambridge, Mass.: MIT Press, 2010); Brian Larkin, *Signal and Noise: Media, Infrastructure, and Urban Culture in Nigeria* (Durham, N.C.: Duke University Press, 2008); Emily Thompson, *The Soundscape of Modernity: Architectural Acoustics and the Culture of Listening in America, 1900–1933* (Cambridge, Mass.: MIT Press, 2004); Shundana Yusaf, *Broadcasting Buildings: Architecture on the Wireless, 1927–1945* (Cambridge, Mass.: MIT Press, 2014).

10. McQuire, *Media City*, vii.

11. Eric Gordon, *The Urban Spectator: American Concept-Cities from Kodak to Google* (Hanover, N.H.: Dartmouth College Press, 2010), 2.

12. Mario Carpo, *Architecture in the Age of Printing: Orality, Writing, Typography, and Printed Images in the History of Architectural Theory* (Cambridge, Mass.: MIT Press, 2001). See also Diane Favro, "Meaning and Experience: Urban History from Antiquity to the Early Modern Period," *Journal of the Society of Architectural Historians* 58, no. 3 (1999): 364–73; Rose Marie San Juan, *Rome: A City Out of Print* (Minneapolis: University of Minnesota Press, 2001); Bronwen Wilson, *The World in Venice: Print, the City, and Early Modern Identity* (Toronto: University of Toronto Press, 2005).

13. See also Shannon Mattern, "Paju Bookcity: The Next Chapter" *Places*, January 14, 2013, available at <https://placesjournal.org/article/paju-bookcity-the-next-chapter> (accessed September 20, 2014); and "Interfacing Urban Intelligence" *Places*, April 28, 2014, available at <https://placesjournal.org/article/interfacing-urban-intelligence> (accessed September 20, 2014).

14. Shannon Mattern, "Ear to the Wire: Listening to Historic Urban Infrastructures" *Amodern* 2 (Fall 2013), available at <http://amodern.net/article/ear-to-the-wire> (accessed September 20, 2014).

15. Quintilian, *Institutio Oratoria* (ca. 95 CE), 2.16.9, available at <http://perseus.uchicago.edu/perseus-cgi/citequery3.pl?dbname=LatinAugust2012&getid=1&query=Quint.%202.16.15> (accessed September 20, 2014); See also Indra Kagis McEwen, "Hadrian's Rhetoric I: The Parthenon," *RES: Anthropology and Aesthetics* 24 (1993): 55–66.

16. Aristotle, "Politics," in *Complete Works of Aristotle*, Revised Oxford Translation, ed. Jonathan Barnes (Princeton, N.J.: Princeton University Press, 1998), 1326b5–7; Vitruvius, *The Ten Books on Architecture* (Cambridge, Mass.: Harvard University Press, 1914), 139.

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18. Christopher Lyle Johnstone, "Communicating in Classical Contexts: The Centrality of Delivery," *Quarterly Journal of Speech* 87, no. 2 (2001): 121–43.

19. David Henkin, *City Reading: Written Words and Public Spaces in Antebellum New York* (New York: Columbia University Press, 1998).

20. Joanna Merwood-Salisbury, "Patriotism and Protest: Union Square as Public Space, 1832–1932," *Journal of the Society of Architectural Historians* 68, no. 4 (2009): 543.

21. *Ibid.*, 551.

22. Christopher Johanson, interview with the author, February 26, 2013.

23. Louise Revell, *Roman Imperialism and Local Identities* (New York: Cambridge University Press, 2009), 3–4.

24. Irene A. Bierman, *Writing Signs: The Fatimid Public Text* (Los Angeles: University of California Press, 1998), 20.

25. Robert E. Harrist Jr., *The Landscape of Words: Stone Inscriptions from Early and Medieval China* (Seattle: University of Washington Press, 2008), 23.

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28. Messick, *Calligraphic State*, 231.
29. *Ibid.*, 246–7.
30. See London School of Economics, *Electric City* (London: LSE, December 2012), available at <http://lsecities.net/publications/conference-newspapers/the-electric-city>, which includes work by several key “smart city” critics, including Orit Halpern, Dan Hill, Saskia Sassen, and Richard Sennett. See also Volume 34 “City in a Box” Special Issue (December 2012); Adam Greenfield’s *The City is Here for You to Use* series of e-books; and Shannon Mattern, “Methodolatry and the Art of Measure” *Places* (November 5, 2014), available at <https://placesjournal.org/article/methodolatry-and-the-art-of-measure> (accessed September 20, 2014).
31. Richard Sennett, “No One Likes a City That’s Too Smart” *Guardian*, December 4, 2012.
32. Henri Lefebvre, *The Production of Space*, trans. Donald Nicholson-Smith (1974; Oxford: Blackwell, 1991).
33. Larkin, *Signal and Noise*, 5.
34. Mattern, *Ear to the Wire*, 2013.
35. Stephen Graham and Simon Marvin, *Telecommunications and the City: Electronic Spaces, Urban Places* (New York: Routledge, 1996), 329.
36. Christopher L. Witmore, “Vision, Media, Noise, and the Percolation of Time: Symmetrical Approaches to the Mediation of the Material World,” *Journal of Material Culture* 11, no. 3 (2006): 279.
37. Stephen Graham and Simon Marvin, *Splintering Urbanism: Networked Infrastructures, Technological Mobilities and the Urban Condition* (New York: Routledge, 2001), 8.
38. Richard R. John, “Recasting the Information Infrastructure for the Industrial Age,” in *A Nation Transformed: How Information Has Shaped the United States from Colonial Times to the Present*, ed. Alfred D. Chandler and James W. Cortada (New York: Oxford University Press, 2000), 56.
39. Edwards et al., “Understanding Infrastructure,” i–ii.
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41. See Ronald E. Day, *The Modern Invention of Information: Discourse, History, and Power* (Carbondale: Southern Illinois University Press, 2001); James Gleick, *The Information: A History, a Theory, a Flood* (New York: Vintage, 2012); University of California, San Diego Global Information Industry Center’s “History of Information,” available at <http://giic.ucsd.edu/historyofinfo.php>; or the syllabus for Shannon Mattern, “Archives, Libraries and Databases,” graduate seminar, available at <http://www.wordsinspace.net/lib-arch-data/2014-fall>.
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43. Kazys Varnelis, "Centripetal City," *Cabinet* 17 (Spring 2005): 27–28.

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47. See Adrian Johns, *Piracy: The Intellectual Property Wars from Gutenberg to Gates* (Chicago: University of Chicago Press, 2010); Jennifer A. Baird and Claire Taylor, *Ancient Graffiti in Context* (New York: Routledge, 2011); Hillel Schwartz, *Making Noise: From Babel to the Big Bang and Beyond* (Brooklyn: Zone, 2011).

48. Graham and Marvin, *Splintering Urbanism*, 411.

49. Edwards, "Infrastructure and Modernity," 186.

50. *Ibid.*, 204.

51. *Ibid.*, 207.