25 "STUFF YOU CAN KICK": TOWARD A THEORY OF MEDIA INFRASTRUCTURES

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The word "infrastructure" emerged in the early twentieth century as "a collective term for the subordinate parts of an undertaking; substructure, foundation," and first became associated with permanent military installations (OED). Since then the term's meanings have expanded to include electrical grids, telecommunication networks, bridges, subways, dams, sewer systems, and so on, and infrastructures have been the topic of research in fields such as Urban Studies, Communication, Geography, and Science and Technology Studies.[1] In digital humanities scholarship, researchers have explored the topic of "networks" developing important historical and critical studies of networked technologies, institutions, corporations, and cultures.[2] Fewer, however, have investigated the physical infrastructures through which audiovisual signals and data are trafficked.[3] By physical infrastructure I am referring to the material sites and objects that are organized to produce a larger, dispersed yet integrated system for distributing material of value, whether water, electrical currents, or audiovisual signals. Engineers often refer to infrastructures as "the stuff you can kick." Such stuff is typically relegated to the fields of electronic or civil engineering or urban planning and is thought of as irrelevant to or beyond the purview of humanities research.

In an effort to develop a humanities-based approach to the study of infrastructure my recent research has combined approaches from phenomenology, cultural geography, and object studies to explore the sites, objects, and discourses that shape and inform what might be called *infrastructural imaginaries*—ways of thinking about what infrastructures are, where they are located, who controls them, and what they do.[4] By exploring such topics as the endpoints of cable television systems, the locations of cell phone towers, and the territories of satellite and wireless footprints, I have tried to develop a critical methodology for analyzing the significance of specific infrastructural sites and objects in relation to surrounding environmental, socio-economic, and geopolitical conditions.[5] This critical methodology has involved site visits and physical investigations of infrastructural objects using personal observation, photography, maps, video, art, drawings, and other visualizations. These observations

and mediations are intended to foster infrastructural intelligibility by breaking infrastructures down into discrete parts and framing them as objects of curiosity, investigation, and/or concern.

While most research on physical infrastructures has taken place beyond the bounds of the digital humanities and media studies, these fields have evolved a rich body of work on screens, interfaces, and networks.[6] To build upon this work, this essay explores "media infrastructures"—–the material sites and objects involved in the local, national, and/or global distribution of audiovisual signals and data. Media infrastructures include phenomena such as broadcast transmitters, transoceanic cables, satellite earth stations, mobile telephone towers, and Internet data centers. I use the term "infrastructure" as opposed to "network" for several reasons. First, the term infrastructure emphasizes materiality and physicality and as such challenges us to consider the specific locations, installations, hardware, and processes through which audiovisual signals are trafficked. Second, the term infrastructure helps to foreground processes of distribution that have taken a back seat in much humanities research on contemporary culture, which has tended to prioritize processes of production and consumption. Third, since it refers to physical sites and objects that are dispersed across vast territories, the concept of infrastructure can encourage digital humanities' further interdisciplinary engagements with fields such as environmental studies, geography, and science and technology studies. Finally, an infrastructure is difficult to visualize in its entirety within a single frame and as such can help to stimulate new ways of conceptualizing and representing what processes of media distribution are, where they are situated, and what kinds of effects they produce. In sum, this concept can bring a renewed focus upon critical issues of materialism, distribution, territoriality, and conceptual visualization.

Broadly, then, the term "media infrastructure" refers to the material resources that are arranged and used to distribute audiovisual content. These resources extend far beyond the studio and the screen, and include raw materials such as the sun, electricity, land, water, petroleum, chemicals, heavy metals, plastics, and spectrum. Without these resources, film and television as we know them would not exist. As Nadia Bozak (2011) observes in her book, *The Cinematic Footprint,* "accessing images at all means tapping into a complex system of resources" (2). She continues, "Images, however intangible or immaterial they might. . .appear to be, come bearing a . . . biophysical make up and leave behind a residue—a "cinematic" footprint, as it were" (8). One of the goals of Bozak's book is to "expose the energy requirements, economy of obsolescence, and . . . lingering afterlife of digital technology concealed behind the crisp, clean infrastructure that supports binary-based images and information" (12).[7] While Bozak focuses on what she calls the "resource-image," I am interested in the resources that are required to distribute audiovisual content around the planet and the layered infrastructural "footprints" (whether carbon or territorial) that emerge as a result.[8]

To begin building a critical vocabulary for the study of media infrastructures, this chapter analyzes media representations of three infrastructural objects—mail sorters, power poles, and satellite dishes—which are part of three media infrastructures: the postal system, electrical grid, and global satellite system. My analysis is intended as a critical provocation rather than a detailed historical study. It draws upon short historical films, a media art project, news media, and film segments, all of which are archived online, as evocative platforms for conceptualizing media infrastructures and demonstrating the kinds of concerns that can emerge through an infrastructural analysis. Each of my examples features human workers as part of infrastructures and, as such, reinforces critical theories of the post-human and historical studies of technologized labor that conceptualize human-technology relations as "integrated circuits" or as part of biotechnical or technosocial formations.[9] I argue that since infrastructures cannot be captured in a single frame, we must read media with an *infrastructural disposition* – that is, when viewing/consuming media we must think not only about what they represent and how they relate to a history of style, genre, or meaning but also think more *elementally* about what they are made of and how they arrived. While the examples I discuss represent infrastructures quite literally, I want to suggest that all images can be read with an infrastructural disposition, that is, with questions of resources and distribution in mind. Even when infrastructures are not visible at all in the frame, it is possible for them to be inferred and imagined.

Mail Sorters

Media infrastructures are not just a product of the most contemporary technological formations of the digital age; they should be thought about in an historical and intermediale sense. That is, media infrastructures demand a consideration of the ways that distribution processes have emerged, changed, and been layered upon one another over time, how they are part of a media archaeology.[10] To advance this logic, I begin with a short film dated August 7, 1903, produced by American Mutoscope and Biograph Company entitled "Throwing Mail into Bags," which offers a fifty-five second glimpse of activity within a US postal service sorting center in Washington, DC.

Three postal workers can be seen coordinating their labor. One brings in large bundles of mail and drops them off on a table as two others quickly pick up individual parcels, visually scan them, and toss them with astonishing precision into delivery bags arrayed in a semicircle in the center of the room. Another film from the same company entitled "Carriers at Work" dated August 22, 1903, features a similar though slightly longer sequence (one minute and fifty-eight seconds) in which four workers bustle around a postal sorting area, rapidly sort mail

Figure 25.1
Screen capture from the 1903 film "Throwing Mail into Bags" featuring US postal workers sorting mail into geographically zoned delivery bags

into a bank of mailboxes, stack and stamp letters, and move them to a table where a sorter picks them up and flings them into geographically zoned delivery bags.

The tableau perspective and slight high angle of the camera in these films present the postal sorting room as if the side of the building had been sliced open. As cinematography and mise-en-scène spotlight the sorting process with a tableau perspective they also introduce an arrangement of space, objects, and movement that is hardly ever seen by most people who receive mail. The films represent a tiny sliver of the physical infrastructure by which postal mail once moved into individual mailboxes in the United States and invites the viewer to imagine his or her own letters transiting through this same sorting process. In doing so, the sequences address the viewer as a citizen of infrastructure—as one who uses, subsidizes, and recognizes the infrastructure of postal distribution.

While these films represent the practice of mail sorting at the turn of the twentieth century, when viewed retrospectively, they also anticipate the current era of Internet servers and cloud computing, an era in which use of the human mind and muscles to sort mail into delivery bags has been supplanted by automated packet switching and remote data storage and processing. Yet even this more contemporary level of automation requires hands-on

engagement as manual laborers regularly service the machines responsible for the routing of information. In this sense these early films serve as an historical metonym for content distribution as they visualize and model the physical movement of media (mail) to a portal through which the mail is scanned and sorted into separate containers that correspond with different zoned areas that are linked to distinct locations. What we do not see or know, however, is where the bundles of mail came from and where exactly they will end up. It would be impossible to present a photorealist view of an entire postal infrastructure within a single frame, so we are given a part of it and invited to use this part to infer and imagine the rest of it. Such a view can be used to activate an *infrastructural disposition*—a disposition toward audiovisual media that approaches what is framed as a starting point for imagining and inferring other infrastructural parts or resources, such as the vehicles, horse power, electricity, and petroleum used to transport bundles of mail, the human labor required to lift and carry parcels, the paper on which the letters were written, or the time it takes for a letter to travel through this system.[11] What I am suggesting is a way of engaging with media that not only involves questions of documentation or representation, but one that fosters *infrastructural intelligibility*—a process by which ordinary people use images, sounds, objects, observations, information, and technological experiences to imagine the existence, shape, or form of an extensive and dispersed media infrastructure that cannot be physically observed by one person in its entirety.

By isolating moments in which content is *in the process of moving from one site to another*, these short films foreground the physicality of distribution and the dynamism of media infrastructure. In doing so, they challenge us to imagine other forms of content distribution in the present. For instance, how would one visualize contemporary phenomena such as packet switching or cloud computing, phenomena that occur at scales and speeds that neither the human eye nor the medium of film can readily bring into view? The closest contemporary analogies to these early films of postal sorting might be videos of technicians working inside Google's or Facebook's data centers that have been uploaded to YouTube ("Inside a Google Data Center" 2009). While it might be tempting to imagine and represent packet switching or cloud computing as fully automated and digitized (as advertisements often do), even the cloud relies on human labor. Cloud computing requires people to organize, install, and maintain equipment at huge data centers, to develop applications that manage and monitor transactions that occur "in the cloud," and to secure and clean the buildings in which data centers are located.[12] Though millions of people on the planet now receive email in their inboxes each day, few have ever seen inside the enormous data centers that host servers and clouds. Not only are most consumers socialized to have little interest in the "back ends" of the infrastructures that they use each day, these data centers are so thoroughly privatized or militarized that they are typically secured away from public view. Within this context, these historical films are instructive.

Figure 25.2
"Vertical classroom" as explored in Michael Parker's 2009 multimedia installation, "Lineman." Photo by Michael Parker, courtesy of Michael Parker.

Besides providing opportunities for intermediale analysis, they prompt further consideration of the kinds of infrastructural views and details that we, as citizens of infrastructure, should demand access to.

Power Poles

While mail sorters can be thought of as an historical metonym for content distribution in the digital age, power poles mark an infrastructure of equal significance. My second example focuses on contemporary electrical infrastructure in the United States. To explore it, I engage with the work of media and performance artist, Michael Parker, whose multimedia project, "Lineman," features the technicians who install and rig the electrical power poles that are strung throughout urban and rural landscapes across the country. In 2009 Parker trained with forty-nine electrical linemen at the Los Angeles Trade-Technical College during a sixteen-week course and collaborated with them to produce videos, photographs, and a newspaper-like yearbook, some of which are archived on the Internet.[13]

Parker's project set out to capture the linemen's weekday training exercises from 6:45 am to 2:30 pm, five days per week, in a pole yard known as the "vertical classroom." The linemen's

Figure 25.3
Linemen trainees carrying a heavy wooden pole to a site so that it can be installed into the ground and mounted with electrical equipment. Photo by Michael Parker, courtesy of Michael Parker.

training included technical pole climbing, gloved and blindfolded knot tying, removal and replacement of poles, mounting of cross-arms, and wiring setups. As one lineman aptly put it, this job is about being "connected to all that is out here that we can't see…. It's power" (*Lineman* 2009: 21). Many of the trainees with whom Parker collaborated were Latino and African American men who grew up in South Central or East Los Angeles, and some had been recently laid off from other jobs during the US recession that began in 2008. Parker documented their work using photography and video and featured the linemen working both together and individually.

One photo shows eighteen trainees in hard hats carrying a log pole to its destination before it is turned upright and lodged in the ground for rigging. Another photo reveals a trainee at the top of a pole, dangling backward and outstretched in his harness while attempting to install an insulator on the crossbow. While most of the photographs documented training exercises, one photo appears to have been carefully staged by the group at the end of the course and shows the forty-eight linemen vertically arrayed along the sides of three poles. Each lineman is leaning out from the pole wearing a safety harness, spiked boots, gloves, and a hard hat while waving to the camera. The photo transforms an infrastructural object and class of workers that usually go unnoticed into a lively spectacle, inviting the viewer to recognize and celebrate the human resources that support the electrical grid.[14]

Figure 25.4
Staged photo of linemen trainees, that is, the human capital supporting the construction and maintenance of the electrical grid. Photo by Michael Parker, courtesy of Michael Parker.

Figure 25.5
Linemen pass around a camera designed by Michael Parker to reveal the world as seen from an infrastructural perspective. Photo by Michael Parker, courtesy of Michael Parker.

To enable the linemen to record videos during their training exercises, Parker devised a special camcorder mount that could be carried up the pole and handed off safely from one lineman to another. A video projected as part of Parker's multimedia installation opens with several wide shots of the pole yard where linemen are practicing climbing up and down the poles, and then transitions to several short segments shot by linemen from the top of the poles. A split screen is used to convey several camera hand-offs. As the camera is passed from one lineman to another, the video emphasizes the linemen's connection to and integration with the pole and constructs what might be described as an *infrastructural perspective* in that the viewer can see, and indeed imagine, the world from the vantage point of a power pole. This perspective is characterized by high angles and bird's-eye views, as well as the sounds of safety belts squeaking against the wood when they are raised and lowered, boot spikes piercing the poles, and the atmospheric noise of the wind and environs. One of the linemen eloquently alludes to this perspective in his yearbook comments: "…this atmosphere of electricity wants me there with it…. The electricity wants me with it. It wants me to join with it…. All those voltages, watts; it's power, pure power and I feel like I *am* that, like I'm wrapped up in that" (*Lineman* 2009: 21).

There are approximately 270,000 linemen employed in the United States, but we rarely see the world from the vantage points of the linemen or electrical poles that make our digital

culture possible (Bureau of Labor Statistics). As Parker's project visualizes the training and physical labor involved in mounting and rigging electrical poles, it also draws attention to the objects that are so common in the built environment—power poles, cables, and metal fixtures—that we scarcely notice them, and challenges us to think about their position, function, and value. By revealing workers' bodies moving up and down these poles, Parker's project also dramatizes the process of infrastructural formation and encourages the viewer to recognize that the distribution of electrical power is contingent not only on the training of personnel to install and rig electrical poles but also on particular arrangements of resources such as lands, trees, and cables. As much as "Lineman" celebrates the dexterity, strength, and coordination of electrical linemen, it also forces the viewer to confront vital questions about the energy and resource requirements of the digital age. How much energy is used to produce and distribute videos, television shows, and films around the world each year? How much electricity is used to power the television sets, theaters, computers, mobile devices, and networks that people use to access these media? In 2011 CNN published a story with the headline: "The Internet: One Big Power Suck," explaining that the electricity needed to power the millions of servers that support the audiovisual streaming on the Internet has increased 10 percent each year over the last decade (Hargreaves 2011).

Historically, power poles have been strung together across the environment to energize film theaters,[15] radio stations, television networks, and satellite earth stations; today, they are also powering Internet server farms and mobile telephone networks. By honing in on power poles and linemen, Parker's project sharpens our focus on what can be understood as the underbelly of modern media—that is, the extensive, patch-worked, and varied electrical infrastructures that undergird world processes of mediation. Parker's project is particularly meaningful because it brings this process of mediation full circle—that is, his conceptually driven artwork uses electrical energy to transform views of power poles and linemen's labor into digital media that are powered by the very electrical currents that transit through the power poles that the linemen have learned to install, climb, and rig. Parker's scenes of linemen can in fact be understood as representing a kind of below-the-line labor, or as part of "pre"-production cultures, in that they draw attention to the electrical infrastructure that is a necessary precondition of digital media production, distribution, and/or consumption.[16]

Satellite Dishes

Just as quickly as physical infrastructures are built, they can be susceptible to attack, sabotage, or destruction, whether by a computer virus, an air raid, a lightning strike, or a repressive state. My final example of infrastructural analysis draws upon a series of photographs and

Figure 25.6
Iranian special forces removing satellite dishes from an apartment building in Iran. Photo by Hamid Forootan, courtesy of Hamid Forootan.

videos of police confiscating and destroying satellite dishes in Iran and of Iranians manufacturing and installing them. If the case of the mail sorters helps to make infrastructures intelligible and the case of the power poles enables an infrastructural perspective, then the case of satellite dishes in Iran brings *infrastructural contestations* into scrutiny. As Hamid Naficy discusses in his *Social History of Iranian Media* (2012), satellite dishes have been banned in Iran since 1994 because the government claims that they import negative influences from the West. Despite this official ban, dishes, Naficy explains, have "cropped up everywhere" and become a "public obsession" (2012: 345). It is estimated that 65 percent of Tehran's residents use satellite dishes, and 30 to 40 percent of people use them in religious cities such as Qom (Esfandiari 2012). Since 2009 the Iranian government has ramped up efforts to enforce the ban, deploying state special forces and police to destroy, remove, and/or confiscate satellite dishes and receivers throughout the country. In May 2011 police confiscated more than 2,000 dishes in a single day in Tehran, and during October 2011 Iranian police seized more than 6,000 dishes in the Mazandaran province in northern Iran ("Iran Police" 2011). Another aggressive round of dish raids occurred in Tehran in February 2012. Organizations such as Iranian Student News Agency (ISNA), Mission for the Establishment of Human Rights (MEHR), and the Iranian police have photographed and videotaped these satellite dish removals and circulated them online, where they have triggered a range of responses to Iran's restrictive communication policies.

Figure 25.7
Iranian special forces officer stomping on and destroying a satellite dish. Photo by Hamid Forootan, courtesy of Hamid Forootan.

Some of the photos, which have also been published in state newspapers as warnings to satellite dish users, feature Iranian state special forces suspended from ropes while removing satellite dishes from the facades of high-rise apartment buildings, or exiting buildings with confiscated satellite dishes or receivers (Esfandiari 2012; Foroutan 2011). In other photos police can be seen bending, stomping on, or pummeling satellites dishes so that they can no longer be used, exemplifying the brute force the state has applied to terminate citizens' access to satellite infrastructure and international signal traffic. Still other photos reveal ruined dishes scattered in parking lots next to police cars, piled up in the back of trucks being hauled away, or in mounds on the sides of streets, serving as telling reminders of their illegality.[17]

As the most visible part of satellite infrastructure, the satellite dish functions as a peoples' portal to an expansive and complex global media system that is based on the organization of resources ranging from heavy metal deposits to building facades, from bandwidth in the

Figure 25.8
Iranian police officer carrying destroyed satellite dishes to his car. Photo by Hamid Forootan, courtesy of Hamid Forootan.

Figure 25.9
Pile of satellite dishes and media equipment confiscated by Iranian police. Courtesy of Hamid Forootan.

electromagnetic spectrum to slots in the geostationary orbit (Parks 2012: 64–84). Photos of satellite dish removal in Iran are significant because they highlight the kinds of contestations that occur at the edges of this global infrastructure, through the sites and objects where it interfaces with publics. These photos also serve as reminders that media infrastructures are fueled by biopower: that they are dynamic assemblages subject to practices of localization, contestation, intervention, and control that can vary worldwide. When the satellite dish is forcibly destroyed, it becomes an object of even greater attention, investment, and affection.

Just as soon as satellite dishes are destroyed in Iran, they are rapidly replaced. Iranians report buying and installing new dishes right after old ones are removed and trying to position them so that police cannot see them. They pay, on average, USD$150 for a satellite dish and its installation. A 2008 documentary film entitled *The Dish* details the risky job of installing satellite dishes in Iran, which typically occurs on high-rise apartment buildings at night. The film also reveals that satellite dishes are manufactured illicitly within Iran. One sequence features a makeshift operation where old pots and pans are melted down, reshaped in the form of satellite dishes, spray-painted gray, placed in car trunks, and delivered to locations throughout the country. In another sequence, a man on a motorcycle delivers a satellite dish to a customer in a remote location who uses a generator to power his family's television set, satellite receiver, and sound system. After the dish is installed, the man of the household appears overjoyed to be able to receive international music television channels in his home, despite the fact that people caught with satellite dishes in the area are reportedly beaten, whipped, or banished from the community (*The Dish* 2008).

Another film by Iranian filmmaker Saman Salour entitled *Lonely Tunes of Tehran* (2008) features a war veteran and former radio communications operator named Behrooz who finds himself back in Teheran where he encounters a long lost cousin and former telecom engineer named Hamid. Both unemployed, the two decide to start an illegal satellite dish installation business together. They retrieve satellite dishes from hiding spots in the city, climb up high-rise apartment buildings, and bicker or contemplate the meanings of life while working, often in the dark of night.

In one segment the two characters appear standing side by side on a Teheran rooftop with their bodies half occluded by the two satellite dishes, just as integrated with satellite infrastructure as the linemen are with the electrical grid. As the sequence develops, they discuss Behrooz's romantic life and their shadows are projected onto the surfaces of the two satellite dishes as the massive state TV tower looms in the distance. This clever mise-en-scène efficiently brings a constellation of infrastructural tensions into frame, contrasting the state's centralized and highly visible control over media infrastructure with Iranians' clandestine use of satellite dishes to downlink signals from elsewhere. The dish, according

Figure 25.10
Screen capture from *The Lonely Tunes of Teheran* featuring the two lead characters eclipsed by satellite dishes while standing on a rooftop. Reproduced under the Fair Use Doctrine.

to the film's narrative logic, is a way of contending with solitude, a mechanism for making life in Teheran feel less lonely.

These images resonate powerfully with Cristina Venegas's (2010) discussion of what she describes as the "human rooftop antennas" featured in Cuban filmmaker Fernando Perez's 1994 film, *Madagascar*. Venegas suggests this "inspirational image encapsulates an ethos of Cuban identity in the 1990s as one adrift and in search of reinvention and connection" (43–44). This "antenna body," Venegas continues, "provides a metaphorical interface for new pathways of information," and articulates a self that "exceeds national definition" and is "calling out to be heard" (44, 53). Iranian citizens have found themselves in a similar position in recent years in light of Iran's rigid controls over political expression and information flows. In 2009 Iranians too were "calling out to be heard" when they loudly protested the results of their country's presidential election and forged communication pathways via cellphone and Internet to expose state violence and corruption to the world. Understood in this context, the illicit making, mounting, and using of satellite dishes in Iran is part of a broader set of infrastructural contestations in which ordinary people refuse to surrender the technologized power to communicate—to produce, send, and receive audiovisual signals—to the state. As Naficy puts it, "the desire to be in touch with the world and to defy the Islamic Republic's isolation and censorship" is "a key reason for Iranians' love affair with satellite TV" (2012: 347).

Conclusion

In focusing on representations of mail sorters, power poles, and satellite dishes, I have tried to show how audiovisual media can be read *infrastructurally*—that is, to evoke infrastructures that cannot be reduced to the frame or perceived by one person in their entirety. Though we live in a digital age and processes are increasingly technologized, not all infrastructures are fully automated and not all labor is immaterial. The examples I presented corroborate the persistence of bodily acts in media infrastructure, whether tossing mail into bags, climbing and rigging power poles, or hanging from a roof to knock out a satellite dish. A theory of media infrastructure would account not only for the bodies of actors that appear on screen but for those involved in *supporting acts* such as the trafficking of content, the flow of electrical currents, and the policing of audiovisual signals. While in this chapter I used mediations of infrastructure to draw attention to such processes, these processes are often invisible and their relation to digital humanities and media studies research is under analyzed. A theory of media infrastructures would also need to draw attention to the biophysical resources required to make those acts possible, the sites, materials, and objects that have been organized to move signals throughout the world, whether via the fanned arrays of bags in the mail room, the trees of which power poles are made, or the aluminum used to make a satellite dish.

In foregrounding such objects and materials, I hope to suggest the need for further research on media infrastructures in different local, national, transnational, and non-Western settings. While communication scholars have provided historical analyses of the rise and dominance of Western telecommunication networks, we know relatively little about the historical processes by which media infrastructures have emerged in different parts of the world. For instance, when and where were broadcast transmitters, cellphone towers, satellite earth stations, transoceanic cables, or Internet data centers installed in certain regions and why? Where did the labor and materials needed to build those media infrastructures come from? What are the specific local, national, and/or global implications of these physical installations? While pondering such questions, it is important to remember that "infrastructure" means different things across cultures, and infrastructural sites and objects often take on distinct forms or physical characteristics as they are scaled and adapted to local economic, political, cultural, and environmental conditions. Given such considerations, critical studies of media infrastructures should engage with theories of difference, critiques of knowledge/power, analyses of geopolitics and processes of territorialization. My final point is that to fully appreciate media infrastructures, it is important not only to analyze how infrastructures appear in media culture but also to visit infrastructure sites and objects, witness the infrastructural construction processes, interact with infrastructure workers, and get as close as possible to these massive and

dispersed things that always feel so unintelligible or so far away. A theory of media infrastructure, in other words, needs to be formulated not only through the frame but also through the body and from the ground up.

Notes

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1. See, for instance, Leigh Star, "The Ethnography of Infrastructure," *American Behavioral Scientist* 43 (1999): 377–91; Stephen Graham and Simon Marvin, *Splintering Urbanism, Networked Infrastructures, Technological Mobilities, and the Urban Condition*, London: Routledge, 2001; Kazys Varnelis, ed., *The Infrastructural City: Networked Ecologies in Los Angeles*, Barcelona: Actar, 2009; Geoffry C. Bowker, Karen Baker, et al, "Toward Information Infrastructure Studies: Ways of Knowing in a Networked Environment," in *International Handbook of Internet Research*. J. Hunsinger, et al, eds. Dordrecht: Springer, 2010, 97–118; and Christian Sandvig, "The Internet as Infrastructure," in *The Oxford Handbook of Internet Studies*, William Dutton, ed., Oxford: Oxford University Press, forthcoming.

2. See, for instance, Manuel Castells, *The Rise of the Network Society*, Hobboken, NJ: Wiley-Blackwell, 2009; Michael Hardt and Antonio Negri, *Empire*, Cambridge: Harvard University Press, 2001; Geert Lovink, *Dark Fiber*, Cambridge: MIT Press, 2003; Tiziana Terranova, *Network Culture: Politics for the Information Age*, London: Pluto Press, 2004; Michael Hardt and Antonio Negri, *The Multitude*, London: Penguin: 2005; Alex Galloway, *Protocol: How Control Exists after Decentralization*, Cambridge: MIT Press, 2006; Alex Galloway and Eugene Thacker, *The Exploit: A Theory of Networks*, Minneapolis: University of Minnesota Press, 2007; Wendy Chun, *Control and Freedom: Power and Paranoia in the Age of Fiber Optics*, Cambridge: MIT Press, 2008; Zizi Papacharissi, *A Networked Self: Identity, Community, and Culture on Social Network Sites*, London: Routledge, 2010.

3. The concept of infrastructure has, however, made inroads in the work of some film and media studies scholars. Jonathan Sterne (1999: 503–30), for instance, has investigated the historical processes by which US television emerged as a system of distribution and perceives its infrastructural formation as a critical problematic, insisting, "In the formation of American television, the creation of a national infrastructure was a problem and a project, not a given." Brian Larkin (2008: 6) has examined media infrastructures in urban Nigeria, using the term to explore the "technical and cultural systems that create institutionalized structures whereby goods of all sorts circulate, connecting and building people into collectivities." And Jonathan Beller (2006: 209) implicitly addresses infrastructural matters

when he observes, "Rather than requiring a state to build the roads that enable the circulation of its commodities, as Ford [Motor Company] did, the cinema builds its *pathways of circulation* directly into the eyes and sensoriums of its viewers." These scholars have adopted the concept of infrastructure to analyze the emergence of broadcast networks, theorize processes of cultural distribution, and critique the cinema's modes of production. See Jonathan Sterne, "Television under Construction: American Television and the Problem of Distribution," *Media, Culture and Society* 21 (1999): 503–30. Brian Larkin, *Signal and Noise: Media, Infrastructure, and Urban Culture in Nigeria*, Durham: Duke University Press, 2008, at 6. Jonathan Beller, *The Cinematic Mode of Production: Attention Economy and the Society of the Spectacle*, Lebanon, NH: Dartmouth College Press, 2006, at 209. Also see *Signal Traffic: Critical Studies of Media Infrastructures*, Lisa Parks and Nicole Starosielski, eds. Champaign-Urbana: University of Illinois Press, 2015..

4. Giuliana Bruno, *Atlas of Emotion: Journeys in Art, Architecture and Film*, London: Verso, 2007; Doreen Massey, *Space, Place, and Gender*, Minneapolis: University of Minnesota Press, 1994; Mike Crang and Nigel Thrift, eds., *Thinking Space (Critical Geographies)*, London: Routledge, 2000; Irit Rogoff, *Terra Infirma: Geography's Visual Culture*, London: Routledge, 2000; Bruno Latour, *Re-assembling the Social: An Introduction to Actor Network Theory*, New York: Oxford University Press, 2007; Fiona Candlin and Raiford Guins, eds. *The Object Reader*, London: Routledge, 2009. My work in this area has also been influenced by a 2005 UC Humanities Research Institute research residency led by Amelie Hastie entitled "The Object of Media Studies." See project online here: http://vectors.usc.edu/projects/index.php?project=65.

5. See my essays, "Where the Cable Ends: Television beyond Fringe Areas," in *Cable Visions: Television beyond Broadcasting*, Sarah Banet-Weiser, Cynthia Chris, and Anthony Freitas, eds. New York: New York University Press, 2007, 103-126; "Around the Antenna Tree: The Politics of Infrastructural Visibility," *Flow*, March 2009, available at http://flowtv.org/?p=2507; and "Postwar Footprints: Satellite and Wireless Stories in Slovenia and Croatia," in *B-Zone: Becoming Europe and Beyond*, Anselm Franke, ed. Barcelona: ACTAR Press, 2005.

6. See, for instance, Ann Friedberg, *The Virtual Window: From Alberti to Microsoft*, Cambridge: MIT Press, 2009; Kate Mondloch, *Screens: Viewing Media Installation Art*, Minneapolis: University of Minnesota Press, 2010; Wendy Chun, *Control and Freedom: Power and Paranoia in the Age of Fiber Optics*, Cambridge: MIT Press, 2008; Alex Galloway, *The Interface Effect*, Cambridge, UK: Polity, 2012.

7. For another book that investigates these issues, see Rick Maxwell and Toby Miller, *Greening the Media*, Oxford: Oxford University Press, 2012.

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11. A 1960s documentary about the US postal service entitled *River of Mail* emphasizes the multiple resources required to distribute mail. Available at http://www.youtube.com/watch?v=yR9iOKvDlD0&feature=relmfu, accessed August 10, 2012.

12. For an analytical discussion of the cloud, see Paul T. Jaeger et al, "Where Is the Cloud? Geography, Economics, Environment, and Jurisdiction in Cloud Computing," *First Monday* 14 (5: May 4, 2009), available at http://www.uic.edu/htbin/cgiwrap/bin/ojs/index.php/fm/article/view/2456/2171, accessed August 21, 2012. For an interesting discussion of regulatory issues and cloud computing, see Jennifer Holt, "Platforms, Pipelines, and Policy: Regulating Connected Viewing" in *Connected Viewing*, Jennifer Holt and Kevin Sanson, eds. New York: Routledge, 2014.

13. Information about the "Linemen" project and select photos can be found on Michael Parker's website, www.michaelparker.org/1/lineman.html (accessed August 20, 2012). The full "Linemen" multimedia installation was presented as part of Parker's MFA thesis exhibition at USC in 2009.

14. For another homage to electrical linemen see, Michelle Larson's illustrated children's book, *Lineman: The Unsung Hero*, Bloomington: AuthorHouse, 2012.

15. For a fascinating study of electricity and early film studios in France, see Brian R. Jacobson, "Building a *Cité du Cinéma* in Paris: Film Studios as Urban Industrial Centers," in *Studios before the System: Architecture, Technology, and Early Cinema* (PhD dissertation, University of Southern California, 2011), 231–93.

16. Vicki Mayer, *Below the Line: Producers and Production Studies in the New Television Economy*, Durham: Duke University Press, 2011; John Caldwell, *Production Culture: Industrial Reflexivity and Critical Practice in Film and Television*, Durham: Duke University Press, 2008.

17. In addition to photographing this process, some have posted Youtube videos that reveal police removing dishes or satellite dishes destroyed by Iranian police. See, for instance, "Police raid on satellite dishes, Tehran 2009," posted July 3, 2009, available at http://www.youtube.com/watch?v=7-UE7pcqhT4, accessed, August 20, 2012; "Iran May 2011 – Wall Climber of the Iranian Regime destroying satellite dish," posted May 28, 2011, available at http://www.youtube.com/watch?v=nfB_gkjDE9A&feature=related, accessed August 20, 2012; "Iran Police collect Satellite Dishes from houses . . .!" posted August 30, 2011, available at http://www.youtube.com/watch?v=KU_nnFiytZM, accessed August 20, 2012; Iran turmoil when police try to dismantle satellite dishes in Tehran, posted August 8, 2011, available at http://www.youtube.com/watch?v=1suFmvGiOSA, accessed August 20, 2012.

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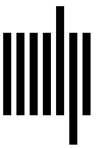

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