AMODERN 2: NETWORK ARCHAEOLOGY

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Networks have structured our social – and media – development long before the emergence of the "network society."[1] From the letter-writing networks of the proto-Italian aristocracy to the electrical networks that facilitated industrialization; from the spread of woodcuts, pamphlets, and ballads that supported the Protestant Reformation to the twentieth century emergence of broadcast radio and television networks, media have always been situated in the matrices of networks of circulation and distribution, facilitating historically specific modes of connection.[2] These histories often remain disconnected from research on digital networks, the latest to re-shape our socio-technical environment into a mesh of interconnecting nodes. An archaeological approach, one that routes between contemporary and historical networks, Alan Liu argues, has the potential to regenerate a sense of history that would temper the presentism of digital culture, all too often experienced as instantaneous and simultaneous.[3]

This special issue of *Amodern* features original research, initially presented in 2012 at the Network Archaeology conference at Miami University of Ohio, on the histories of networks, the discrete connections that they articulate, and the circulatory forms of data, information, and socio-cultural resources that they enable. Drawing from the field of media archaeology, we conceptualize network archaeology as a call to investigate networks past and present – using current networks to catalyze new directions for historical inquiry and drawing upon historical cases to inform our understanding of today's networked culture.[4] In this introduction, we elaborate how network archaeology opens up promising areas for critical investigation, new objects of study, and prospective sites for collaboration within the productively discordant approach of media archaeology.

First, network archaeology encourages the interrogation of the temporality of networked culture and media. Networks are often seen as synchronic rather than diachronic structures; as in much research on digital media, the emphasis of network studies has often been on the "new" and the "now." Scholars have argued that

networking perpetuates processes of acceleration – a speeding up and flattening of historical time. How might we instead understand the network itself as a historical structure, one conditioned by the possibilities of different periods? Are there ways to describe the differential temporal effects of networks – their ability to decelerate as well as accelerate, to ebb as well as flow? The essays included here examine the diverse temporalities of network culture, multiplying our understanding of network pasts and presents.

Second, by replacing "media" with "network" in our approach, we call attention to the definition of the object or phenomenon that is being excavated. How has media archaeology's focus on media rather than "network," "system," or any other term, affected the composition of that field of study? A focus on network archaeology would orient us toward a different set of questions. For example, what does it mean to excavate a connection? Might network archaeology help to historicize processes that leave no traces or artifacts, or bring new kinds of traces and artifacts into view? Network archaeology also points to media's relationship with other networked systems, including the electrical grid and transport network, and suggests new objects for media studies, such as the architecture of public parks, the telephone pole, the tunnel and the list.

Third, an attention to the specificity of "network" in media archaeological discourse reveals the ways in which networks have already structured the archaeological approach, both rhetorically and practically. Network archaeology therefore not only concerns the archaeological examination of networks but also what Liu refers to as the "networked structure of media archaeology itself."[5]

Fourth, we hope that by posing these questions, the concept of network archaeology can foster a new set of potential collaborations – linking media archaeologists to historians of networked technology and to network theorists. It suggests new, non-media-related archives as sites for media studies inquiry, such as the archives of public works projects or other infrastructure systems, and new methods for mapping and arranging the contents of these archives.

Finally, the rhetorical move to invoke network archaeology alongside media archaeology is strategic, as we feel that the term "network" carries political weight in contemporary society. The currency of networks, in both theoretical and popular

discourse, marks it as a volatile locale of struggle being courted and contested by left-radical, centrist, neo-conservative and anarcho-libertarian elements. Through the investigation of this term, we hope to foreground implications of networked activity to the polis across history and mark the potential for archaeological projects to intervene in these politics.

In sum, by proposing and formulating network archaeology we aim to highlight networks as assemblages that would benefit from an archaeological approach; to expand the scope of the media archaeological project and expose its methodological dependence on the network; and to thereby pose a new set of directions for collaboration and for research. The remainder of this introduction expands these lines of inquiry, weaving together a review of relevant critical texts with the featured research articles. The opportunity to present this research in a journal named for Bruno Latour's concept of the amodern is especially appropriate given that to be amodern means to become aware of the networks or hybrids that modernity has multiplied and simultaneously repressed, not to shy from the analysis of complex networked phenomena, but to instead enter the imbroglios, circulate with their flows, and begin to trace their radiating contours.

Network Temporality

The study of networks emerged as a broad, multi-disciplinary endeavor in the late twentieth and early twenty-first century in order to grapple with social, cultural, political and economic changes accompanying the expansion of information and communication technologies. Manuel Castells argued that networks powered by these technologies, rather than "information" or "knowledge," constituted the fundamental structure of contemporary society.[6] Jan van Dijk described the twenty-first century as the "age of networks," a fundamental transition from the mass society.[7] In the humanities, arts, and social sciences, and across disciplines that had historically been distinguished by diverse objects of study, researchers documented the cultures and aesthetics of digital networks, from Tiziana Terranova's delineation of network culture to Steven Shaviro's science fiction experiments with networked cultural theory; from Geert Lovink's critical engagement with networked communities and praxis to Saskia Sassen's examination of the city's role in circuits of global exchange.[8] Alongside work on the transitions brought about by "new"

digital media, this research described the revolutionary aspects of networked systems for social, political, and mediated life in late modernity.

The theorization of networks, and the development of network science, pre-dates this shift. Drawing from graph theory, network scientists have long calculated relationship structures using network models. Fields such as social network analysis (a key approach to the sociological analysis of groups), network diffusion and proximity (which investigates how information spreads through networks), and actor-network theory (developed in science and technology studies) have all used link-node structures to understand the organization of a wide variety of phenomena – not simply those connected via technical information and communication technologies. As Christopher Kelty reflects, in science studies networks are both material and traceable, "but they are not to be mistaken for the world, they are the tool that the analyst uses to make sense of the world."[9] Rather than seeing networks as historically specific, for much of network science they are an ahistorical form of organization, a tool for analysis that can be useful in any era.[10]

The network itself is often viewed as an antihistorical structure. The discourse on distributed networks, for example, often draws from Delueze and Guattari's conception of the rhizome, a formation they describe as both "antigenealogy" and "a short-term memory, or antimemory."[11] Alexander Galloway argues that the rhizome is a perfect example of a distributed network: it is a "horizontal meshwork" without a beginning or an end and has a "complete disregard for depth models, or procedures of derivation."[12] To a similar effect, network temporality is often described in terms of acceleration to the point where time is eviscerated as a historical dimension.[13] Paul Virilio warns us of the "dictatorship" of speed that accompanies the development of information networks, which threatens to reduce our rich histories by locking us into a global, universal time – what Castells describes as a "timeless time."[14] This temporal logic is seen as "instantaneous rather than durational and causal" and "simultaneous rather than sequential," constituted in relation to immediate crises.[15] The network is understood as ever-present, real-time, a structure that flattens rather than historicizes.

Network representations – and in particular the network graph – foreground simultaneity and synchronicity over historicity and diachronic relations. Scholars including Galloway and Anna Munster have critiqued the pervasive, uniform, and

“static” nature of network visualization, which remains dominated by hub-and-spoke aesthetics, nodes and links represented via orderly dots and direct lines, and clusters of branching structures.16 Take, for example, a recent network visualization using data from Wikipedia, “The Graph of Ideas” (Figure 1). Dominated by multicolored circular nodes and barely discernable links, this image includes figures from across history, but lacks any indications of historical change.

Fig. 1: “The Graph of Ideas”

We do not see the duration of the contact between different thinkers or the ordering of their connections. Tony Sampson has argued that network graphs such as these fail to register the intensities of encounters and movements, “freezing” the temporality of events.17 “The Graph of Ideas” flattens history to a uniform two-dimensional space. Beyond such typical network diagrams, images of existing material networks often lack a sense of the past or distinct temporality. Photographs of Internet infrastructure, as Andrew Blum observes, are almost always close-ups: “There [is] no context, no neighborhood, no history” (see Figure 2).18

Fig. 2: The Network Access Point of the Capital Region [19]

Ultimately, the synchronic image obscures the changing morphology of networks and their relationships with past and future systems.

In undertaking an archaeology of networked connections, we might benefit from re-readings of synchronic network representations; unearthing alternative network visualizations that evoke a sense of unfolding temporality or an affect of disconnection; or even the development of new representations ourselves.[20] Friedrich Kittler's historically conscious examination of networks, "The City Is a Medium," provides one useful example: the image of an "unflattenable graph."[21] In the unflattenable graph, complex city infrastructures consisting of multiple networks of exchange, transportation, and distribution overlap and cannot be easily reconciled into a complete, transcendent image of a networked city. This points toward the inability of spatial images to contain the complexity of network connections in a particular instant. An analysis of such network images and maps can assist researchers in diagnosing the conceptual and ideological inclusions and exclusions that condition a network's structure.

Three contributions to this issue, in the section *Historicizing Network Aesthetics*, interrogate issues of network visibility. Through their analysis of poems, films, maps, and photographs, these articles detail the representations, imaginations, and aesthetics of networks as historical productions. James Purdon's article "Electric Cinema, Pylon Poetry" poses the question at the outset: "what does a network look like?" Sebastian Gießmann and Brooke Belisle offer different approaches to answering this question, excavating the historical contingencies of the London Tube map's development and the disjunct form of connection embodied by early railroad photography, respectively. These essays illuminate the work that images perform in producing interconnection, as well as the social networks involved in producing images, and in doing so develop diachronic understandings of network temporality.

It is our hope that a network archaeological approach will inspire studies of networked media to engage in a more precise and rigorous analysis of different kinds of networks and their diverse temporalities – not simply by examining the phenomenological experiences of temporality within networks, but by treating

networks as temporal structures in themselves. This extends both to the microtemporalities of machine time as well as to the long durée. In his interview in this issue, Jussi Parikka draws our attention to the management of microtemporal network "bursts" instead of simple flows. On the other hand, Shannon Mattern's essay in this collection argues for an attention to the deep time of urban networks that extends beyond even the production of technical media. To situate networks *in* time, we must theorize them in relation to different historical moments, geographic sites, and cultural practices, attend to the ways that differential transformations of temporality occur across a network, and ultimately, chart how what counts as networked-ness or connectivity changes over history.

Media Archaeology and Network Archaeology

In this context, we propose network archaeology as an analytic that connects the studies of networked media culture to a deeper, richer lineage of networking in order to complicate the registers of temporality associated with contemporary networks; to offer new insights into the ways that networks are seen, felt, heard, and known as historical; and to contribute to a more robust exploration of network change over time.

Conceptualizing this project, we draw inspiration from the "undisciplined discipline" of media archaeology.[22] Providing a succinct definition of media archaeology is difficult and ultimately counterproductive given that the non-discipline arose in order to subvert standard, normative approaches to the study of media. As Erkki Huhtamo and Jussi Parikka suggest in their edited volume *Media Archaeology: Approaches, Applications, Implications*, "Discontent with 'canonized' narratives of media culture and history may be the clearest common driving force" behind disparate archaeological studies of the media.[23] Indeed, media archaeologists seek to explode traditional, linear histories of media forms while identifying and analyzing outlier media technologies, dead and imagined media forms, and objects that would not fit within the standard rubric of media history.

While media archaeology is still disciplined by the "media" moniker, network archaeology does not exclusively address media forms as such. By focusing

attention on the network as an object of historical study, it expands media history to include analyses of mediating forms, ranging from transportation infrastructures to electrical systems, which have remained beyond the limits of traditional research. For example, James Purdon's article in this issue examines the contact between literary and poetic circulations and the large electrical pylons that extended over the British landscape in the early twentieth century. In a similar vein, Brian Jacobson's essay documents the intertwining of the electrical grid with film production in Paris. The shift to network archaeology might also invite further analyses of both physical and computer architectures; essays in this issue focus on data structures that facilitate networked movement, such as the list and the stack. Rather than looking at media as such, these studies – like the analysis of material infrastructures – focus on the networked conditions of possibility accommodating different media forms, for example, Peter Schaefer's study of local area networks in this issue.[24] If, as Liu observes, "the object of media archaeology is the specificity of media itself," the archaeology of networks will entail a similar attention to the specificity of different modes and circuits of exchange.[25] It is our hope that network archaeology will work to displace the aura of media, catalyze research into historical networks that might have little to do with traditional or even non-traditional media forms, and in doing so, widen our understanding of the importance of networks throughout media history.

Given that many scholars included within this special issue are invested in expanding (and disarticulating) the trajectory of media studies, these network archaeologies contain a strong link to the analysis of media by other means. These studies take up Liu's call to conceptualize "media as *networks*, complete with the event-driven states and dependency configurations of their dynamic *networking*."[26] For example, the essays in the *Circulatory Practices* section treat media as networks, directing attention toward the circuits in which media objects are embedded, and the kinds of transformations – mediated and non-mediated – that occur in networked environments. Sandra Gabriele's essay analyzes the material traces of newspaper media as they are transfigured through historical networks of remediation and archival practices. Darren Wershler, Kalervo Sinervo, and Shannon Tien also examine the movement of media through the archives, and following Liu, demonstrate how the varying topologies of historical and contemporary networks necessitate different approaches. Replacing "media" with "network" marks a

difference between focusing on media technologies (and their representational results) and the analysis of network structures themselves, tracing the non-representational paths, addresses, and intersections of various objects and ideas.

Three important points crystallize here. First, network archaeology refracts media archaeology by shifting focus from media artifacts and their representations to analyses of "media as *networks*" or how these artifacts accrue significance through their networked circulation, exchange, and distribution. Second, the idea that we should study media as networks also explodes a particular media form into a multiplicity of nodes which allow for the bottom-up emergence of a form's significance – thus, cinematic apparatus theory could be interpreted as positing the connected nodes of technology, reception, psychic structures of the subject, and labor, to articulate a network of determinants which help us understand how the "cinema" produces (and reproduces) an ideological system. Third, network archaeology seeks to define networks as media, or at least mediating structures, which can be analyzed in terms of their own formal properties. It encourages a focus on the specificity of the network *as such* in different historical periods, treating the network as media and as a mediating force in historical situations as opposed to simply using an ahistorical network theory to analyze past social relations.

The Networks in Media Archaeology

In addition to expanding media archaeology to focus on network forms, a turn to network archaeology also harbors the possibility of clarifying and deepening the media archaeologist's methodology, which itself entails the mapping of networks. Media archaeologists "move fluidly" argue Huhtamo and Parikka – "roaming," "rummaging," "leaping" and "traveling" amongst the disciplines without a "permanent home."[27] This itinerant and travelling methodology inscribes media archaeology as a kind of networking where various disciplines, concepts, institutions, material infrastructures, and traditional and non-traditional media objects become nodes in an interconnected system of analysis which attempts to unearth alternative histories of the media. For example, Huhtamo describes his idea of topos studies in media archaeology, in which one traces the reoccurrence of stereotypical formulations, in terms of mapping networks: "When a topos emerges, it should be treated as a node in a complex network of references and determinants."[28]

Media archaeology is steeped in metaphors that align with common discussions of networks – the archaeologist is seen as constructing a constellation of connections between various disciplines, entities, concepts, and so on, in order to map his or her object of concern. This nomadic mapping enables the media archaeologist to uncover new forms of knowledge that expose older networks of power and their role in stabilizing and reproducing dominant ideologies.

The fact that media archaeology is infused with the terminology and discourse of networks is not surprising. One of the key interventions of Michel Foucault's *The Archaeology of Knowledge*, a text that establishes a theoretical approach to archaeology as a historiographic method, is to substitute traditional, linear approaches with discontinuous and non-linear modes of mapping historical formations. Early in the text, Foucault describes the necessity of shattering the perceived unity of the book as a medium and the idea of a coherent body of work or *oeuvre*. If it is seen as a unified and closed object of discourse, the book operates as a solid foundation – a technological or mediating ground – for historical studies that purport to reveal narratives of unity, coherence, and continuity within history itself. Thus, Foucault writes, "The frontiers of the book are never clear-cut: beyond the title, the first lines, and the last full stop, beyond its internal configuration and its autonomous form, it is caught up in a system of references to other books, other texts, other sentences: it is a node within a network."[29] Dismantling the media form of the book as a unifying ground for historiography reveals a network structure that must be mapped in order to trace historical situations.[30]

While the appearances of the network in Foucault remain on the general level of metaphor, Friedrich Kittler more substantively articulates his historical approach as a mapping of networks. In an oft-quoted definition from *Discourse Network 1800/1990*, Kittler describes a notation system as "the network of technologies and institutions that allow a given culture to select, store, and process relevant data."[31] In another essay he argues that a medium itself is a "network of processing, transmission, and recording, or restated: of commands, addresses, and data."[32] Media here are no longer self-contained unities but networks of technologies and data that, when mapped, explain how cultural information is stored and processed in different historical situations. Within the theoretical foundations of the discontinuous and nomadic historiography that many media archaeologists embrace,

the network emerges as a key form of orientation for non-linear historical approaches.

By inviting an excavation of the influence of networks and network terminology on the formation and theoretical imaginary of media archaeology, we suggest that network studies can in turn provide a resource for conceptualizing different, perhaps experimental, forms of mapping media histories. Some of the essays in the section *Archaeologies of Protocol*, such as Liam Young's article analyzing lists and Rory Solomon's archaeology of the stack, begin to lay out conceptual frameworks, inspired by technical networks, that could be useful for thinking about archaeological methodologies. Network archaeologies can plumb the depths of graph theory, technical protocols, computer architectures, and telecommunications history in search of useful concepts which can be applied to archaeological research. 33

An Archaeology of Network Archaeology

In his contribution to *Critical Terms for Media Studies*, Galloway examines the networks in *Agamemnon* in order to question the assumption that networks are relatively new forms "somehow synonymous with the technologies of modernity or postmodernity."34 Not only do networks exist across history, he argues, but they also differ "both in their architectonic shape and in their values and motivations." Network forms are neither "internally simple, nor globally uniform" and studying them requires an attention to their historical forms and internal inconsistencies.

A number of disciplines already focus on such historical networks. In particular, historians of technology have traced the emergence and interconnection of networked technological systems. Thomas Parke Hughes's classic work *Networks of Power: Electrification in Western Society 1880-1930*, for example, charts the development of electrical networks and sets a model for the analysis of large-scale technical systems, examining how technology was transferred, problems were solved, and interconnections were made.35 Inspecting the networks of trade, shipping, railways, and communications during roughly the same period, Daniel Headrick documents the construction of these systems by colonial powers and the role of cities as "nodes" in the distribution of services, goods, and culture.36 An

extensive range of scholarship, from Jill Hills's survey of global telecommunications systems to Bernard Finn and Daqing Yang's collection on undersea cables, documents the spread of communications networks that support much of our media exchange.[37] These histories have tracked the systemic and large-scale development of network infrastructure, figuring its relationships with the deployment of political, social, and economic power.

An understanding of historical networks offers much to network studies and media studies, and indeed, scholars have already begun to make such links. The networking of the world began much earlier than is usually assumed, observes Armand Mattelart – he argues that today's networks have been shaped by Enlightenment ideals, early industrial development, and the development of nationalism.[38] Robert Pike and Dwayne Winseck also historicize our global networks: they reveal a period of early globalization in the nineteenth century in which many of the policies shaping contemporary global media were first enacted.[39] Closer to the present, critical histories of computer networks, from Janet Abbate's *Inventing the Internet* to Thomas Streeter's *The Net Effect: Romanticism, Capitalism, and the Internet*, expose the sets of struggles that have helped to develop the Internet as a historically specific network.[40]

As Richard John cautioned in his keynote presentation at the "Network Archaeology" conference, network archaeology must be careful not to simply read these systems backward through the lens of the present, which might lead to the anachronistic conflation of theories of twenty-first century digital networks with the actual development of earlier technologies. Contrary to the work in network science that observes how a network's value increases as it expands, in the nineteenth century, John shows, "telegraph and telephone network builders only gradually became aware of the relationship between network size and network value; indeed in some instances they had cause to doubt that any relationship existed."[41] While network archaeologists might read network histories productively in relation to today's systems, it is nonetheless important to retain the historical specificity of individual networked interactions and iterations, rather than elide historical differences in the interest of master narratives.

Network archaeology, drawing from the free-ranging methodology of media archaeology, also offers new approaches to network history. For example, the essays

in the section *Archaeologies of the Node* each focus on a single node as it extends and changes over time. Lisa Gitelman's essay points us to the counter-intuitive uses of the telephone pole and encourages us to think about "holding networks by the wrong end." Brian Jacobson and Veronica Paredes also undertake site-specific research, at Gaumont's film studios and the cinema marquee, respectively, in order to expose the web of intermedial currents and infrastructural systems that anchor particular nodes. Shannon Mattern, taking the city as her focus, suggests that we might gain critical perspective from using other senses, such as hearing, in studying networked infrastructure. Rather than subsuming local activities into narratives that track larger scale cultural shifts, node-focused methodologies can reveal processes of producing connection in the absence of a remaining material artifact and might foreground subjugated histories – whether of the re-used cinema theater or the telephone pole – that typically fall outside the narratives of telecommunications history. Network archaeology can also train our attention on the use of particular protocols, codes, and rules that govern exchange, as well as the industries and institutions that profit from historically specific sets of exchanges. Adrian Johns's essay is one example of this: he examines the relationship between the information defense industry and the late-modern entrenchment of techno-scientific networks, illustrating the importance of the history of piracy in understanding these interactions.

These narratives about communication, transport, and computer networks comprise one genealogy of the kind of work we highlight in this issue. A second genealogy comes from research that uses network science and actor-network theory to make sense of historical social arrangements and assemblages, extending beyond the infrastructural networks that typically constitute the focus of technological historians. For example, in their paper "Networks and History," Peter Bearman, James Moody, and Robert Faris use network analysis to decode and interpret historical narratives of revolution acquired from a Chinese village. They not only embrace the idea that networks can be used to analyze historical change, but argue that traditional historical narration that follows linear paths of key events is in actuality "the result of multiple sources operating through multiple pathways at multiple levels of observation."[42] In proposing "ANTi-History," an adaptation of actor-network theory to organizational historiography, Gabrielle Durepos and Albert J. Mills have a similar aim: to reveal the multiplicity of possible pasts and actors that

have led to an organization's construction.[43] Such formulations parallel the desire of the media archaeologist to displace simple linear narratives of historical change with more complex networks of interconnection and exchange.[44]

Fig. 3: Emily Erikson and Peter Bearman have used network imaging tools to trace diachronic shifts in trade and exchange. [45]

Given the interdisciplinary nature of network archaeology, which draws on the nomadic, disciplinary peregrinations of media archaeology, new methods for historical research could be developed through an engagement with this literature and with network studies more broadly. Just as historical studies of material communications networks can broaden our understanding of contemporary networked media, network theory might also re-shape the ways that we understand media in history. It is this that Alan Liu points to when he suggests that we "treat the past as a network."[46] John Shiga's essay in this volume represents such an approach: he draws from actor-network theory to better understand scientist John C. Lilly's explorations of human-animal communication. Network archaeology

becomes a potential site for collaborations between different disciplines and for the development of hybrid approaches – a place for the interconnection of network scientists, historians of telecommunications, and media archaeologists.

The Politics of Network Archaeology

Arguably, media archaeology has fed on the sublimated politics of methodological difference from traditional, dominant forms of media analysis; for example, the "anarchaeology" posited by Zielinski or the "bestial" media archaeology proclaimed in Parikka's examination of insect media can be seen as methodologically radical (going "against the grain") compared to the traditional historical narratives constructed by media historians. In many ways, media archaeology is the avant-garde of media studies, carrying with it the joys of the "new" even though it posits itself as a critique of the new. While network archaeology inevitably shares this same exuberance to critique the new while cultivating the creation of the new, the study of networks is arguably most advanced in fields of criminal tracking, counter-network operations, and the commodification of networked connections. As Anna Munster and Geert Lovink remind us, "It is not surprising that the impetus for network mapping arrives today from the social sciences, on the one hand and from the analysis, tracking and tracing of crime, on the other. We ought also to be suspicious about the pervasive Will to Network Mapping."47 We hope that network archaeology retains this suspicion, and that the work tracing the diachronic developments of networks remains cognizant of the political ramifications of theorizing such structures in an era where they can leverage containment as much as emancipation and "democratization."

In the turbulence of this situation, network archaeologists could contribute to the critique of networks and the theorization of what Munster and Lovink call distributed aesthetics. John Cayley's article in this special issue reminds us that we write from and within network structures that condition this writing, and we must be acutely aware of how our our actions often disappear into forms of networked control. Kris Paulsen's article traces the dynamics of this struggle in an earlier distributed form: the radical production and organization of guerrilla videotape networks that sought to displace the power and control of traditional, hegemonic television networks. While network archaeology is certainly invested in the analysis

of how networks have changed throughout history, such research can contribute to our understanding of contemporary networks, critiquing their use to control while extending their capacities to configure open futures. The overlapping domains between essays included in this issue provide a place and a moment through which to question network ideologies and to further contest, as we also propose, an already contestable term.

Conclusion

We do not intend to create a new field of study or discipline under the rubric of network archaeology that differs essentially from media archaeology, but we wish to contribute to the heteroglossia of media archaeology, adding a harmonious "polylogue" to the chorus of what media archaeology might become.[49] Network archaeology can help us to see the ways that networked processes, practices, and technologies have left traces in the connective tissue between mediated sites. It can draw attention to a history of connection, focusing on residues or traces of relationships in the absence of media technologies, ranging from the architectures in which connection occurred (a park); a material index of connection (a ticket); and protocols for exchange (a timetable). As it brings together various kinds of networks in a range of historical contexts – from the networks of radio loudspeakers, to the circulation of videotapes in the 1970s, to the posting of flyers on telephone poles – these essays encourage a comparative study that neither assumes networks are uniform across history nor occupy a singular relationship to media practices. Interconnecting network studies, network science, media archaeology, and histories of networked technologies, we hope that these inquiries will cumulatively offer a more complex understanding of the relationship between networked histories and presents.

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- 10. Echoing this sentiment, Adrian Mackenzie argues, "While it exhorts attention to relations, network theorizing can deanimate relations in favor of a purified form of networked stasis. Much network theorizing expects networks to have well-defined links and to afford unmitigated flow between distinct nodes. While pure flow might sometimes occur when a lot of aligning and linking work is done, very often it does not. Network flows are actually quite difficult to manage and to theorize." Adrian Mackenzie, *Wirelessness: Radical Empiricism in Network Cultures* (Cambridge: MIT Press, 2010), 9.
- 11. Gilles Deleuze and Felix Guattari, *A Thousand Plateaus: Capitalism and Schizophrenia*, trans. Brian Massumi (Minneapolis: University of Minnesota Press, 1987), 21.
- 12. Alexander R. Galloway, *Protocol: How Control Exists After Decentralization* (Cambridge: MIT Press, 2004), 33-34.
- 13. Carmen Leccardi, "New Temporal Perspectives in the 'High-Speed Society,'" in Robert Hassan and Ronald Purser, eds. *24/7: Time and Temporality in the Network Society* (Stanford: Stanford University Press, 2007), 27.

- 14. Paul Virilio, "Speed and Information: Cyberspace Alarm!" *CTheory* (August 27, 1995): http://www.ctheory.net/articles.aspx?id=72.
- 15. Barbara Adam, "Forward," in Robert Hassan and Ronald Purser, eds.. *24/7: Time and Temporality in the Network Society* (Stanford: Stanford University Press, 2007), xi. Wendy Chun has argued that network temporality is structured by crises, moments that demand a response in real time. Wendy Hui Kyong Chun, "Crisis, Crisis, Crisis, or Sovereignty and Networks," *Theory, Culture & Society* 28 (2011): 91-112.
- 16. Alexander R. Galloway, "Are Some Things Unrepresentable?" *Theory, Culture & Society* 28, no. 7- 8 (2011): 84-102; Anna Munster, *An Aesthesia of Networks: Conjunctive Experience in Art and Technology* (Cambridge: MIT Press, 2013), 3.
- 17. Tony Sampson, *Virality: Contagion Theory in the Age of Networks* (Minneapolis: University of Minnesota Press, 2012), 16.
- 18. Andrew Blum, *Tubes: A Journey to the Center of the Internet* (New York: Harper Collins, 2012), 21.
- 19. Randall Mesdon, published in Andrew Blum, "Netscapes: Tracing the Journey of a Single Bit," *Wired* 17.12.
- 20. We might also look to recent network visualizations that do include history. For example, see a recent visualization of the trade of small arms and ammunition around the globe (link: http://workshop.chromeexperiments.com/projects /armsglobe/) which not only includes a sliding timeline at the bottom (enabling users to see the historical changes in this network), but also depicts the directionality of goods via moving illuminated dots. Munster, *An Aesthesia of Networks*. Patrick Jagoda, "Between: Network Aesthetics and Network Games." Paper Presented at the 2013 Society for Cinema and Media Studies Conference, March 2013.
- 21. Kittler, "The City Is a Medium."
- 22. Vivian Sobchack, "Afterword: Media Archaeology and Re-presencing the Past," in Erkki Huhtamo and Jussi Parikka, eds. *Media Archaeology: Approaches, Applications, and Implications* (Berkeley: University of California Press, 2011), 323.
- 23. Erkki Huhtamo and Jussi Parikka, eds. *Media Archaeology: Approaches, Applications, and Implications* (Berkeley: University of California Press, 2011), 3.
- 24. As Espen Aarseth has argued, "the computer is not a medium, but a flexible material technology that will accommodate many very different media." Espen Aarseth, "Genre Trouble: Narrativism and the Art of Simulation." In *First Person: New Media as Story, Performance, and Game* , ed. Noah Wardrip-Fruin and Pat Harrigan (Cambridge, MA: MIT press),

- 46.
- 25. Alan Liu, "Remembering Networks: Agrippa, RoSE, and Network Archaeology," Network Archaeology Conference, Miami University, Oxford OH, April 21, 2012.
- 26. Alan Liu, "Remembering Networks."
- 27. Erkki Huhtamo and Jussi Parikka, eds. *Media Archaeology: Approaches, Applications, and Implications* (Berkeley: University of California Press, 2011), 3.
- 28. Huhtamo and Parikka, *Media Archaeology*, 33.
- 29. Michael Foucault, *The Archaeology of Knowledge*, trans. A.M. Sheridan Smith (New York: Pantheon, 1972), 23.
- 30. Even Foucault's later articulation of the concept of a *dispositif* – a concept that Siegfried Zielinski draws upon to map his archaeological work *Audiovisions: Cinema and Television as Entr'actes in History* – is framed in terms of mapping networks. As Foucault related in an interview from 1977: "What I'm trying to single out with this term [*dispositif*] is, first and foremost, a thoroughly heterogeneous set consisting of discourses, institutions, architectural forms, regulatory decisions, laws, administrative measures, scientific statements, philosophical, moral, and philanthropic propositions […] The apparatus itself is the network [*le réseau*] that can be established between these elements" (quoted in Agamben). Giorgio Agamben, *What is an Apparatus?*, trans. David Kishik and Stefan Pedatella (Stanford: Stanford University Press, 2009), 2, 7. Siegfried Zielinksi, *Audiovisions: Cinema and Televisions as Entr'actes in History* (Amsterdam: The University of Amsterdam, 1999).
- 31. Friedrich A. Kittler, *Discourse Network 1800/1990*, trans. Michael Metteer and Chris Cullens (Stanford: Stanford University Press, 1990), 369.
- 32. Kittler, "The City Is a Medium," 722.
- 33. In addition to Kittler's influence on foregrounding the importance of technical media in terms of the storage, processing, and transmission of cultural data, our invocation of the network archaeologist's potential investigation of technical infrastructures, network protocols, and mathematical network theory is indebted to Wolfgang Ernst's conceptualization of "media archeaography." His emphasis on the agency of technical systems calls attention to the fact that media archaeologists often analyze "the nondiscursive infrastructure and (hidden) programs of media" and such analysis "requires competence in informatics (mathematical logic, technique, and control)." Both Rory Solomon and Liam Young's essays in this special issue draw on Ernst's productive insights. See, Wolfgang Ernst, "Media Archaeography" in Erkki Huhtamo and Jussi Parikka, eds. *Media Archaeology: Approaches, Applications, and Implications* (Berkeley:

- University of California Press, 2011), 242. See also Jussi Parikka, "Operative Media Archaeology: Wolfgang Ernst's Materialist Media Diagrammatics," *Theory, Culture & Society* 28(5) (2011), 52-74.
- 34. Alexander R. Galloway, "Networks," in *Critical Terms for Media Studies*, eds. W.J.T. Mitchell and Mark B.N. Hansen (Chicago, University of Chicago Press, 2010), 282.
- 35. Thomas Parke Hughes, *Networks of Power: Electrification in Western Society, 1880-1930* (Baltimore, Johns Hopkins University Press, 1993).
- 36. Daniel R. Headrick, *The Tentacles of Progress: Technology Transfer in the Age of Imperialism, 1850 – 1940* (New York: Oxford University Press, 1988), 145.
- 37. See for example, Bernard Finn and Daqing Yang, eds.. *Communications Under the Seas: The Evolving Cable Network and its Implications* (Cambridge: MIT Press, 2009); Daniel R. Headrick, *The Invisible Weapon: Telecommunications and International Politics, 1851-1945* (Oxford: Oxford University Press, 1991); Jill Hills, *Telecommunications and Empire* (Urbana: University of Illinois Press, 2007); David Paul Nickles, *Under the Wire: How the Telegraph Changed Democracy* (Cambridge: Harvard University Press, 2003); Jonathan Reed Winkler, *Nexus: Strategic Communications and American Security in World War I* (Cambridge: Harvard University Press, 2008).
- 38. Armand Mattelart, *Networking the World: 1794-2000* (Minneapolis: University of Minnesota Press, 2000). See also Mark Wigley, "Network Fever," *Grey Room* 4 (Summer 2001): 82-122, for an analysis of the history of network logic, and recent German approaches, including *Netzwerke: Eine Kulturtechnik der Moderne*, eds. Jürgen Barkhoff, Hartmut Böhme, and Jeanne Riou (Cologne: Böhlau, 2004); Sebastian Gießmann, *Netze und Netzwerke: Archäologie einer Kulturtechnik 1740–1840* (Bielefeld: transcript, 2006); Erhard Schüttpelz, "Ein absoluter Begriff. Zur Geneaologie und Karriere des Netzwerkkonzepts," in *Vernetzte Steuerung: Soziale Prozesse im Zeitalter technischer Netzwerke*, ed. Stefan Kaufmann (Zurich: Chronos 2007), 25–46.
- 39. They too suggest that a recourse to the past might help to intervene in contemporary networks: "The parallel between the crisis of globalization historically and the trends today, along with the efforts to legitimate imperialism in both periods, suggests that we are well advised to shine the light of historical knowledge on the issues of our own times." Robert Pike and Dwayne Winseck, *Communication and Empire: Media, Markets, and Globalization*, 1860-1930, (Durham: Duke University Press, 2007), 3.
- 40. Thomas Streeter, *The Net Effect: Romanticism, Capitalism, and the Internet* (New York: New York University Press, 2011); Stephanie Ricker

- Schulte, *Cached: Decoding the Internet in Global Popular Culture* (New York: New York University Press, 2013); Roy Rosenzweig, "Wizards, Bureaucrats, Warriors, and Hackers: Writing the History of the Internet," *The American Historical Review* 103, no. 5 (1998): 1530-1552.
- 41. Richard R. John, *Network Nation: Inventing American Telecommunications* (Cambridge: Harvard University Press, 2010), 9.
- 42. Peter Bearman, James Moody, and Robert Faris, "Networks and History," *Complexity* 8(1) (September/October 2002): 71.
- 43. They comment that even though "the concepts of 'past' and 'history' appear regularly" in application of actor network theory (ANT) to historical cases, "their mention and use is often unreflexive and unproblematized." Gabrielle Durepos and Albert J. Mills, "Actor-Network Theory, ANTi-History and Critical Organizational Historiography," *Organization* 19 (2012): 705.
- 44. Another example of this is the Six Degrees of Francis Bacon Project, an attempt to excavate the "early modern social network," http://sixdegreesoffrancisbacon.com/.
- 45. Emily Erikson and Peter Bearman, "Malfeasance and the Foundations for Global Trade: The Structure of English Trade in the East Indies, 1601–1833," *American Journal of Sociology* 112(1) (July 2006): 195-230.
- 46. Liu, "Remembering Networks."
- 47. Anna Munster and Geert Lovink, "Theses on Distributed Aesthetics. Or, What a Network is Not," *The Fiberculture Journal* 5 (2005).
- 48. Munster and Lovink, "Theses on Distributed Aesthetics."
- 49. Huhtamo and Parikka, *Media Archaeology*, 2-3.