



THE SOAPBOX

The Infrastructural Turn in Historical Scholarship

Mary Bridges 

Johns Hopkins School of Advanced International Studies, Washington, DC, USA

This essay argues that historical scholarship has taken an infrastructural turn in recent years. “Infrastructure” serves not just as a popular keyword in monographs and journal articles; it reflects a new approach to research that has permeated the field. An infrastructural approach offers a framework for historians to understand the power of traditional structures like the state and the economy in ways that accommodate transnational interconnections, technology, and the stubborn materiality of the phenomena under study. This essay analyzes why scholars have embraced the term recently, and it outlines the basic components of an infrastructural orientation. It concludes by considering the blind spots of an infrastructural approach, as well as directions for future scholarship.

“Infrastructure” has shifted from being technocratic jargon to becoming a promising new framework for historians to understand and analyze change over time. Usage of the term has skyrocketed in the last five decades. In 1970, the word “infrastructure” appeared in 1.5 percent of history dissertations. By 2021, that number had increased to nearly 40 percent (Figure 1).¹ It is not hard to see the word’s appeal. “Infrastructure” sounds rigorous, architectural, and important. For a discipline such as history, which often delves into the details of forgotten eras, infrastructure’s crisp and tactile connotations can provide a gratifying contrast amid a sea of academic jargon.

This essay argues that the increasing use of “infrastructure” reflects more than just historians’ embrace of trendy new vocabulary; instead, infrastructure provides a powerful conceptual framework for understanding historical change and analyzing interconnections. Before making the case that the discipline of history is experiencing an “infrastructural turn,” it is worth tracking the term’s growing prominence. “Infrastructure” now appears prominently in conference announcements, workshops, and symposia. H-Announce features more than 150 recent infrastructure-related events, from a symposium on educational history to a call for papers about sustainability.² The October 2023 issue of the journal *Radical History Review* will address

I am indebted to numerous friends, mentors, and writers for sharpening my thinking in this essay, and I owe special thanks to Michael Falcone, John Handel, Edwin Bridges, David Pinzur, Peter Shulman, Kenneth Lipartito, Richard John, Paula Vedoveli, Sarah Dixon, Bill Wilson, the editors of *Modern American History*, and two anonymous reviewers for their contributions and input.

¹Author’s analysis of data collected from ProQuest Dissertations & Theses Global database, using “history” as “subject heading (all).” Boolean search terms were “infrastructure AND mainsubject(history)” with date restrictions applied to individual years within sample. See Figure 1.

²H-Announce data, as of December 2022. See, for example, “CfP »19th Symposium of School Museums and Collections of Educational History: Exploring Collections on Educational History«,” H-Announce, H-Net, updated Dec. 9, 2022 <https://networks.h-net.org/node/73374/announcements/11979762/cfp-»19th-symposium-school-museums-and-collections-educational> (accessed Dec. 14, 2022); and “Call for Papers: Sustainability Journal,” H-Announce, H-Net, updated Dec. 12, 2022, <https://networks.h-net.org/node/73374/announcements/11987874/call-papers-sustainability-journal> (accessed Dec. 14, 2022).

© The Author(s), 2023. Published by Cambridge University Press. This is an Open Access article, distributed under the terms of the Creative Commons Attribution licence (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted re-use, distribution and reproduction, provided the original article is properly cited.

Dissertations Referencing "Infrastructure" (per Proquest Data)

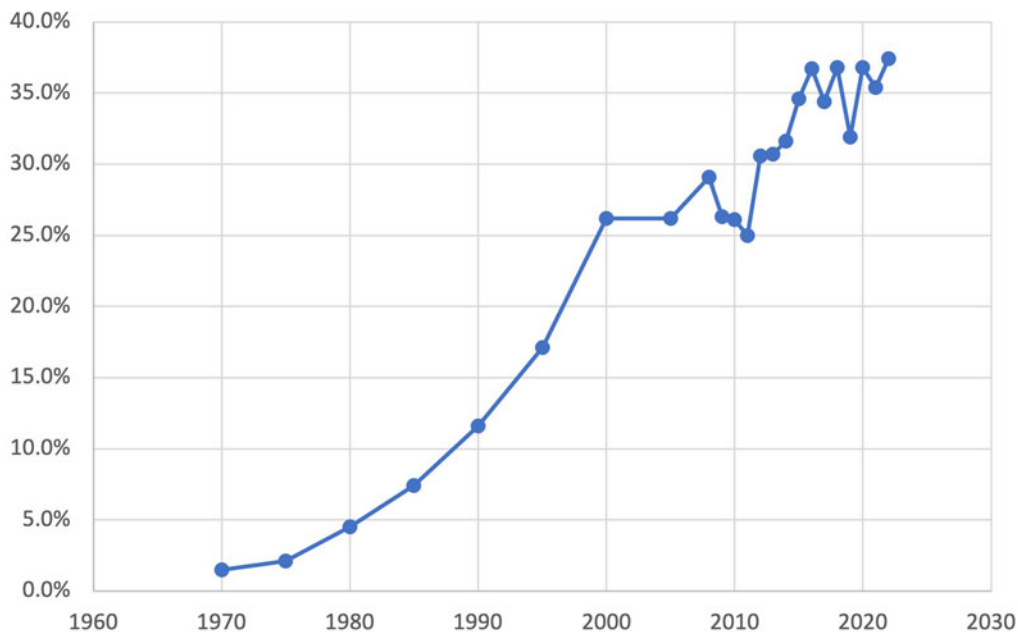


Figure 1. History dissertations referencing “Infrastructure,” from ProQuest, 1970–2021.

the “Political Lives of Infrastructure.”³ References to the term “infrastructure” in the broader historical literature have increased from less than 1 percent of articles in 1970 to more than 10 percent in 2021, as captured by the digital library JSTOR’s history-related journals.⁴ By contrast, terms like “government” and “diplomatic” have seen relatively little change in historians’ usage.⁵

This article argues that the term’s popularity reflects a shift in what historians analyze and how we conduct that analysis. An infrastructure-oriented approach allows historians to study traditional power structures like the state and the economy in ways that prioritize technology, interconnections across geographies and scales, and the materiality of the phenomena under study. As such, it provides a timely and important way to understand long-term connections, hidden power dynamics, and the durability of systems. The article proceeds first by considering the definition of infrastructure. Second, it outlines the basic components of an infrastructural analysis. Third, it considers the reasons for scholars’ recent embrace of the concept. And finally, it asks: what are the blind spots of an infrastructural approach?

³“The Political Lives of Infrastructure (Call for Proposals) - Radical History Review,” H-Announce, H-Net, updated Feb. 14, 2022, <https://networks.h-net.org/node/73374/announcements/9558611/roads-peace-infrastructures-peace-and-conflict> (accessed Jun. 22, 2022).

⁴Author’s calculations. Supporting data analysis from the platform Constellate aligns with these trends: analysis based on Constellate data shows that references to “infrastructure” in history-related journal articles increased from 0.3 percent in 1970 to 8 percent in 2021.

⁵References to “government” have remained largely in the 30–35 percent range over the same time period, while references to “diplomatic” have hovered around 6 percent.

Meanings: Narrow v. Expansive Infrastructure

What is infrastructure? This question has drawn attention from both scholars and policy makers in recent years. A clear sign that we should be cautious about definitions comes from the widespread appeal of the term. Who does not like infrastructure? It was the theme for a recent special issue of the left-leaning journal *Jacobin* and a recurring promise in Donald Trump's presidential campaign.⁶ Leaders ranging from Vladimir Putin to Bernie Sanders have championed its importance.⁷ Any word that can accommodate such diverse political agendas seems primed for skeptical inquiry.

When narrowly framed, infrastructure focuses on physical and technological constructions, such as roads, bridges, and communications networks. Historians have long examined infrastructure in this context, as Alfred Chandler's 1977 study of railroads and Thomas Hughes's 1983 analysis of electrification reveal.⁸ These seminal works were followed by a flurry of scholarship in the 1980s and 1990s that examined large technological and built-environment projects. Monographs analyzed telecommunications systems, news networks, and air-traffic control, among other large-scale systems.⁹ In these works, infrastructure described the object of study—the proper noun or phenomenon under investigation.¹⁰ Studies of infrastructure-as-object continue to be a rich vein of historical inquiry, ranging from recent studies of the Pan-American Highway to the imperial dynamics of U.S. mining.¹¹

In recent years, a wide range of historians have embraced of “infrastructure,” less to describe large-scale construction projects and more to explain interconnections among phenomena. Invocations of “infrastructure” have ranged from an analysis of twentieth-century tourism networks to a study of the “ecclesiastical infrastructure” of the Habsburg Empire in the late sixteenth century.¹² Such usages show scholars' broadening of infrastructure's application beyond a single phenomenon or construction to consider the material interconnections and frameworks of cultural, political, and economic power that shaped the object of study.¹³

⁶“Infrastructure,” *Jacobin*, Spring 2022, <https://jacobin.com/issue/infrastructure>; and “Remarks by President Trump on the Rebuilding of America's Infrastructure: Faster, Better, Stronger,” Trump White House, updated Jul. 15, 2020, <https://trumpwhitehouse.archives.gov/briefings-statements/remarks-president-trump-rebuilding-america-infrastructure-faster-better-stronger-atlanta-ga/>.

⁷“Jobs and an Economy for All,” BernieSanders.com, <https://berniesanders.com/issues/jobs-for-all/> (accessed Jun. 30, 2022); and Yana Wojciechowska, “Russia to Step Up Its Efforts in Infrastructure Development,” *Port News*, May 22, 2022, <https://en.portnews.ru/comments/3182/>.

⁸Alfred D. Chandler, Jr., *The Visible Hand: The Managerial Revolution in American Business* (Cambridge, MA, 1977); and Thomas Parker Hughes, *Networks of Power: Electrification in Western Society, 1880–1930* (Baltimore, 1983).

⁹See, for example, Kenneth Lipartito, *The Bell System and Regional Business: The Telephone in the South, 1877–1920* (Baltimore, 1989); Richard R. John, *Spreading the News: The American Postal System from Franklin to Morse* (Cambridge, MA, 1995); and Renate Mayntz and Thomas P. Hughes, eds., *The Development of Large Technical Systems* (Frankfurt, Germany, 1988).

¹⁰Other recent works along these lines include Marc Levinson, *The Box: How the Shipping Container Made the World Smaller and the World Economy Bigger* (Princeton, NJ, 2006); and Richard R. John, *Network Nation: Inventing American Telecommunications* (Cambridge, MA, 2010).

¹¹See, for example, Eric Rutkow, *The Longest Line on the Map: The United States, the Pan-American Highway, and the Quest to Link the Americas* (New York, 2019); Megan Black, *The Global Interior: Mineral Frontiers and American Power* (Cambridge, MA, 2018); David Schley, *Steam City: Railroads, Urban Space, and Corporate Capitalism in Nineteenth-Century Baltimore* (Chicago, 2021); and Jo Guldi, *Roads to Power: Britain Invents the Infrastructure State* (Cambridge, MA, 2012).

¹²See, for example, Sarah Lemmen, “The Formation of Global Tourism from an East-Central European Perspective,” *The Hungarian Historical Review* 7, no. 2 (2018): 348–74; and Steven Thiry, “Rites of Reversion: Ceremonial Memory and Community in the Funeral Services for Philip II in the Netherlands (1598),” *Renaissance Quarterly* 71, no. 4 (2018): 1391–429.

¹³Keller Easterling, “Histories of Things That Don't Happen and Shouldn't Always Work,” *Social Research* 83, no. 3 (Fall 2016): 625–644.

This expansion of infrastructure's usage has historical precedent: the term followed a similar trajectory in its movement from French- to English-language media in the twentieth century. The print life of "infrastructure" dates back to French engineering journals of the nineteenth century, according to historian Peter Shulman.¹⁴ A French textbook from the late 1890s defined infrastructure as the embankments, tunnels, bridges, and viaducts necessary to establish a suitable foundation for a rail bed (see [Figure 2](#)).¹⁵ To French engineers, the term referred not to the track work, engines, or car equipment, but rather to the supporting entities and objects that enabled a train to move.

The term entered English-language media several decades later, and pioneering news stories that mentioned "infrastructure" tended to comment on the term's wonkiness and foreignness.¹⁶ An India-based British newspaper reported in 1950 that Winston Churchill rejected the term "infrastructure" and its usage by rival politicians: "Knowing well that there was no such word, Mr. Churchill ... said he must reserve his comments till he had consulted a dictionary."¹⁷ U.S. newspapers adopted the term more broadly in the 1950s amid negotiations about improving NATO's military preparedness to fight communism. U.S. newspapers reported that the "horrible new term"—infrastructure—was originally a French word to describe a range of military installations.¹⁸ Some writers described "infrastructure" as technocratic jargon designed to distract public attention from focusing on who would eventually pay for extensive defense capabilities, from supply depots to new communications lines.¹⁹

Even as reporters expressed ambivalence about "infrastructure," the term caught on in the 1950s and 1960s. Its vagueness likely enhanced politicians' usage of the word: officials in the Kennedy, Johnson, and Nixon administrations used "infrastructure" to describe everything from development projects in India to domestic organized crime syndicates.²⁰ The term began to replace "civil works" and "public works" to describe first order-phenomena such as dams and sewage systems. It also became popular to denote a broad range of political and social structures—"the things that make structures work," analogous to the bridges and embankments that undergirded French rail networks.²¹

Its jump to historical scholarship lagged by several decades, but "infrastructure" became increasingly popular among historians in the late 1970s and 1980s. More recently, historians have used the term to characterize relationships among interrelated actors, forces, and institutions.²² Its appeal to historians is, in many ways, unsurprising, given the field's longstanding interest in how structure affects history.²³ But what does "infrastructure" offer that structure did not previously enable? What good is a term that promises to look *infra*—"below," or more foundational than structure itself? Thus far, historians have not critically analyzed the term in great depth, but sociologists and urbanists have written extensively about infrastructure

¹⁴Peter A Shulman, "What Infrastructure Really Means," *The Atlantic*, Jul. 13, 2021, <https://www.theatlantic.com/ideas/archive/2021/07/what-does-infrastructure-mean/619419/>. See, for example, H. Varroy, *Note sur les Chemin de Fer Départementaux* (Paris, 1866), <https://catalog.hathitrust.org/Record/100951996>.

¹⁵Auguste Moreau, *Traité des chemins de fer* (Paris, 1897–1898), 6, <http://ark.bnf.fr/ark:/12148/cb30976282j>. Cited by Shulman, "What Infrastructure Really Means."

¹⁶"The Far East Air Mail," *South China Morning Post* (Hong Kong), Dec. 2, 1930, 13.

¹⁷"Current Topics," *The Times of India* (Mumbai, India), May 1, 1950, 6.

¹⁸"Infrastructure?," *The Washington Post*, Feb. 28, 1952, 14; Shulman, "What Infrastructure Really Means."

¹⁹"Infrastructure?"; Theodore H. White, "Europe Still Dawdles Building Its Defenses," *The Providence Sunday Journal*, Jul. 8, 1951, 3. See also Pie Dufour, "Gobbledygook Going Strong Once Again," *New Orleans States*, Oct. 19, 1951, 11.

²⁰Shulman, "What Infrastructure Really Means."

²¹*Ibid.*

²²"Infrastructure" appears as a term in dissertations and theses in Proquest's database throughout the 1970s and 1980s; however, the first uses of "infrastructure" as a subject term in history emerge in the mid-1990s.

²³See, for example, William H. Sewell, *Logics of History: Social Theory and Social Transformation* (Chicago, 2005).

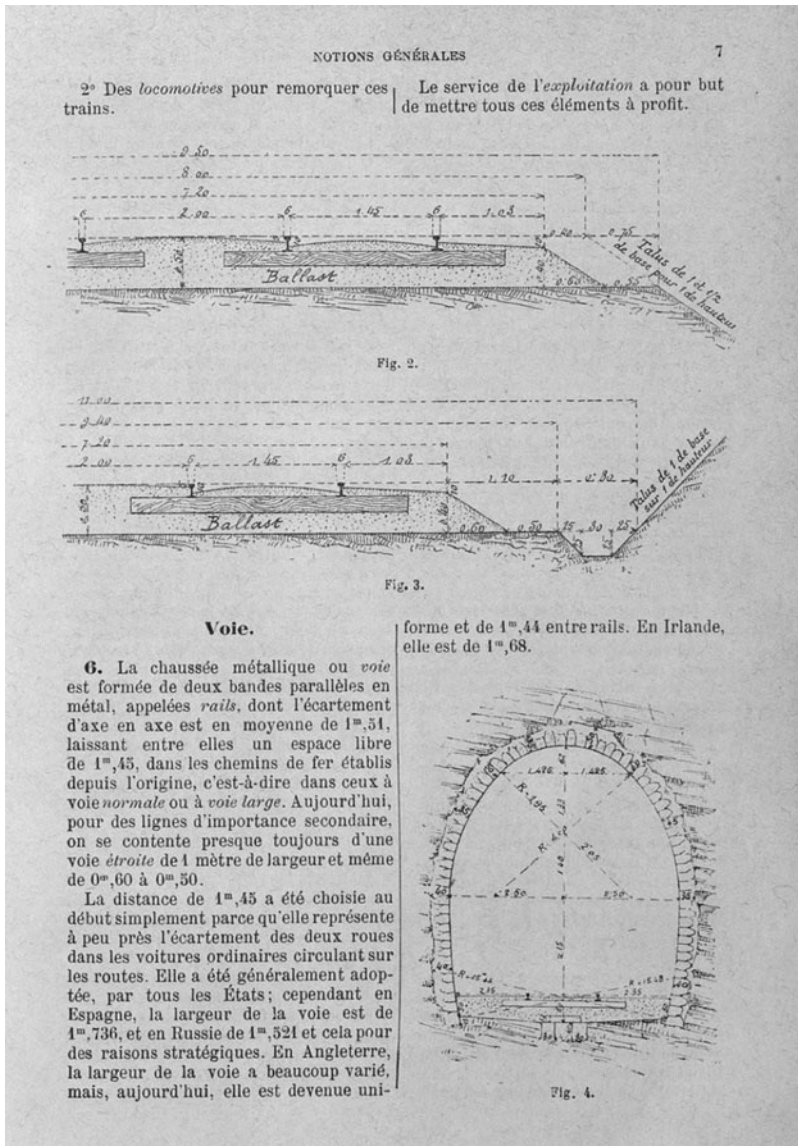


Figure 2. "Cuttings and Tunnels," *Traité Des Chemins De Fer (1897-1898)*, Bibliothèque nationale de France.

as a conceptual framework and form of governance. Drawing on their work can illuminate historians' usage of the term.

Infrastructure has been a particularly formative concept in economic sociology, where scholars have applied infrastructural approaches to understanding capitalism and the data-oriented, financialized dimensions of modern life.²⁴ Economic sociologists have long been interested in understanding economic activities within the context of social and political relations.²⁵

²⁴See, for example, Michel Callon, *The Laws of the Markets* (Oxford, UK, 1998); Donald A. MacKenzie, *An Engine, Not a Camera: How Financial Models Shape Markets* (Cambridge, MA, 2006); Juan Pablo Pardo-Guerra, "Making Markets: Infrastructures, Engineers and the Moral Technologies of Finance," (2014), <https://pardoguerra.files.wordpress.com/2014/11/141124-making-markets2.pdf>; Donald MacKenzie, "A Material Political Economy: Automated Trading Desk and Price Prediction in High-Frequency Trading," *Social Studies of Science* 47, no. 2 (Apr. 2016): 172-94; and Juan Pablo Pardo-Guerra, *Automating Finance: Infrastructures, Engineers, and the Making of Electronic Markets* (Cambridge, UK, 2019).

²⁵Richard Swedberg, *Principles of Economic Sociology* (Princeton, NJ, 2008), 1.

Particularly since the 1990s and 2000s, the “social studies of finance” have tended to combine two central threads.²⁶ First, the field tends to embed economic forces within social and political constructs—a tradition associated with Karl Polanyi and classical economic sociology. Second, the scholarship emphasizes the materiality of technologies, hardwiring, and physical structures that shape the development of political economy and social relations.²⁷ This scholarship has aligned with growing interest in understanding finance, its hardwiring, and its increasingly conspicuous role in modern society.

The rise of economic sociology has accompanied a related movement in U.S. and global history to explore the origins and variations of capitalism.²⁸ Indeed, some of the most robust uses of infrastructural approaches in historical scholarship have appeared in studies of political economy, finance, and capitalism. Infrastructure provides an intuitive way to emphasize that markets are not timeless, inevitable byproducts of human culture, but are instead conglomerations of material constructions, technologies, laws, labor dynamics, and social relationships.²⁹ Recent works in this vein include Destin Jenkins’s analysis of how the postwar municipal bond market contributed to racial inequality and urban disparities in San Francisco.³⁰ Another infrastructurally minded study examines how New Englanders supported the “plantation infrastructure” of West Indies enslavement in the eighteenth century.³¹ In these works, infrastructures establish the “conditions of possibility” for how people behave and how events transpire within them.³² As such, infrastructures exert power: they shape the choices available to participants. Moreover, they do so without *overtly* exerting pressure or coercion.³³

A signature feature of infrastructures is their invisibility or hiddenness: infrastructures are often subterranean, obscured, or taken for granted by people who operate within them.³⁴ That obscurity makes them a rich subject for inquiry after all, historians have long been interested in revealing underappreciated connections, dynamics, and actors as drivers of change. “Infrastructures remain

²⁶MacKenzie, “A Material Political Economy,” 173; Karin Knorr Cetina and Alex Preda, *The Sociology of Financial Markets* (Oxford, UK, 2005); Karin Knorr Cetina, “Ten Things You Always Wanted to Know about Economic Sociology,” *European Electronic Newsletter* 6, no. 2 (2005): 21–4; and Paul N. Edwards et al., “Introduction: An Agenda for Infrastructure Studies,” *Journal of the Association for Information Systems* 10, no. 5 (May 2009): 364–74.

²⁷Karl Polanyi, *The Great Transformation: The Political and Economic Origins of Our Time* (New York, 1980); Callon, *The Laws of the Markets*; Swedberg, *Principles of Economic Sociology*, 32–49; David Pinzur, “Infrastructural Power: Discretion and the Dynamics of Infrastructure in Action,” *Journal of Cultural Economy* 14, no. 6 (2021): 645–6; and Benjamin Braun and Kai Koddenbrock, “The Three Phases of Financial Power: Leverage, Infrastructure, and Enforcement,” in *Capital Claims: Power and Global Finance*, ed. Benjamin Braun and Kai Koddenbrock (London, 2022), 1–30.

²⁸See, for example, Sven Beckert and Christine Desan, “Introduction,” in *American Capitalism: New Histories*, ed. Sven Beckert and Christine Desan (New York, 2018), 1–34; Michael Zakim and Gary Kornblith, eds., *Capitalism Takes Command: The Social Transformation of Nineteenth-Century America* (Chicago, 2012); Kenneth Lipartito, “Reassembling the Economic: New Departures in Historical Materialism,” *The American Historical Review* 121, no. 1 (Feb. 2016): 101–39; Seth Rockman, “What Makes the History of Capitalism Newsworthy?,” *Journal of the Early Republic* 34, no. 3 (2014): 439–66; and Paul A. Kramer, “Embedding Capital: Political-Economic History, the United States, and the World,” *The Journal of the Gilded Age and Progressive Era* 15, no. 3 (Jul. 2016): 331–62.

²⁹David Pinzur, “Infrastructure, Ontology and Meaning: The Endogenous Development of Economic Ideas,” *Social Studies of Science* 51, no. 6 (Apr 22 2021): 915.

³⁰Destin Jenkins, *The Bonds of Inequality: Debt and the Making of the American City* (Chicago, 2021).

³¹Eric Kimball, “‘What Have We to Do with Slavery?’: New Englanders and the Slave Economies of the West Indies,” in *Slavery’s Capitalism: A New History of American Economic Development*, ed. Sven Beckert and Seth Rockman (Philadelphia, 2016), 181–94.

³²Patrick Joyce, *The Rule of Freedom: Liberalism and the Modern City* (London, 2003), 12.

³³Johannes Petry, “From National Marketplaces to Global Providers of Financial Infrastructures: Exchanges, Infrastructures and Structural Power in Global Finance,” *New Political Economy* 26, no. 4 (2021): 584.

³⁴Susan Leigh Star and Geoffrey C. Bowker, “How to Infrastructure,” in *Handbook of New Media: Social Shaping and Consequences of ICTs*, ed. Leah A. Lievrouw and Sonia Livingstone (London, 2002), 151–162.

below the visible surface of transactions, yet produce ‘world-ordering arrangements,’” notes sociologist David Pinzur.³⁵ Architecture scholar Keller Easterling calls infrastructure the “hidden substrate”—the space where the rules of everyday life are set.³⁶ In a world where the average U.S. adult checks a smartphone 344 times per day, it is little surprise that contemporary historians are primed to appreciate infrastructures of information, technology, and communications as structuring forces of change over time.³⁷

Importantly, infrastructure also raises questions about sovereignty and state power. Traditionally, U.S. historians’ engagement with infrastructure has been clustered around two main time periods: first, the expansion of U.S. empire in the nineteenth and twentieth centuries; and second, New Deal-era construction and public works initiatives. In both periods, state power constituted a primary force of historical change. In the context of imperial history, scholars have drawn our attention to the way in which infrastructure building strengthened the state—both in the U.S. West and in overseas imperial expansion.³⁸ Infrastructure building offered a means to control populations, such as by organizing foreign workers and foreign landscapes, as well as to partner with private corporations, as in the construction of rail networks in the Philippines, for example (see Figure 3).³⁹ Meanwhile, New Deal historians have drawn attention to the role of the state in large-scale changes of land—and its associated legal and labor-related upheavals—from hydropower to road paving initiatives.⁴⁰ The attention to state power is more than just an accidental feature of these historical moments; instead, infrastructure inherently raises questions about large-scale investments, laws, and enforcement systems that shape people’s lives—questions central to state sovereignty.⁴¹

³⁵Pinzur, “Infrastructural Power,” 646.

³⁶Keller Easterling, *Extrastatecraft: The Power of Infrastructure Space* (London, 2014), 11.

³⁷“2022 Cell Phone Usage Statistics: How Obsessed Are We?,” Reviews.org, updated Jan. 24, 2022, <https://www.reviews.org/mobile/cell-phone-addiction/> (accessed Jul. 2, 2022).

³⁸See, for example, Richard White, *Railroaded: The Transcontinentals and the Making of Modern America* (New York, 2012); Noam Maggor, *Brahmin Capitalism: Frontiers of Wealth and Populism in America’s First Gilded Age* (Cambridge, MA, 2017); Richard R. John, “Recasting the Information Infrastructure for the Industrial Age,” in *A Nation Transformed by Information: How Information Has Shaped the United States from Colonial Times to the Present*, eds. Alfred D. Chandler, Jr. and James W. Cortada (Oxford, UK, 2000), 55–105; Peter A. Shulman, “Technology and US Foreign Relations in the Nineteenth Century,” in *The Cambridge History of America and the World*, eds. Kristin Hoganson and Jay Sexton (Cambridge, UK, 2022), 337–360; and John M. Hart, *Empire and Revolution: The Americans in Mexico since the Civil War* (Berkeley, CA, 2002).

³⁹See, for example, Jamie L. Pietruska, “Hurricanes, Crops, and Capital: The Meteorological Infrastructure of American Empire in the West Indies,” *The Journal of the Gilded Age and Progressive Era* 15, no. 4 (Oct. 2016): 418–45; Julie Greene, *The Canal Builders: Making America’s Empire at the Panama Canal* (New York, 2010); Julian Go, “The Chains of Empire: State Building and ‘Political Education’ in Puerto Rico and the Philippines,” in *The American Colonial State in the Philippines: Global Perspectives*, eds. Julian Go and Anne L. Foster (Durham, NC, 2003), 182–216; Colin D. Moore, “State Building Through Partnership: Delegation, Public-Private Partnerships, and the Political Development of American Imperialism, 1898–1916,” *Studies in American Political Development* 25, no. 1 (2011): 27–55; and Justin F. Jackson, “The Work of Empire: The U.S. Army and the Making of American Colonialisms in Cuba and the Philippines, 1898–1913” (PhD diss., Columbia University, 2014).

⁴⁰For instance, see Steve Fraser and Gary Gerstle, *The Rise and Fall of the New Deal Order: 1930–1980* (Princeton, NJ, 1989); and Jason Scott Smith, *Building New Deal Liberalism: The Political Economy of Public Works, 1933–1956* (Cambridge, UK, 2006).

⁴¹See also Stefan Link and Noam Maggor, “The United States as a Developing Nation: Revisiting the Peculiarities of American History,” *Past & Present* 246, no. 1 (2020): 294–95. Indeed, sociologist Michael Mann, who offered an early conceptualization of “infrastructural power” in the 1980s, described it as a particular form of state control that differed from “despotic power” by working through civil society rather than over it. Michael Mann, *The Sources of Social Power, Vol II: The Rise of Classes and Nation-States, 1760–1914* (Cambridge, UK, 1993); Michael Mann, “The Autonomous Power of the State: Its Origins, Mechanisms and Results,” *European Journal of Sociology* 25, no. 2 (1984): 185–213; and Michael Mann, “Infrastructural Power Revisited,” *Studies in Comparative International Development* 43, nos. 3–4 (Dec. 2008), <https://doi.org/10.1007/s12116-008-9027-7>. See also Craig Calhoun, “The

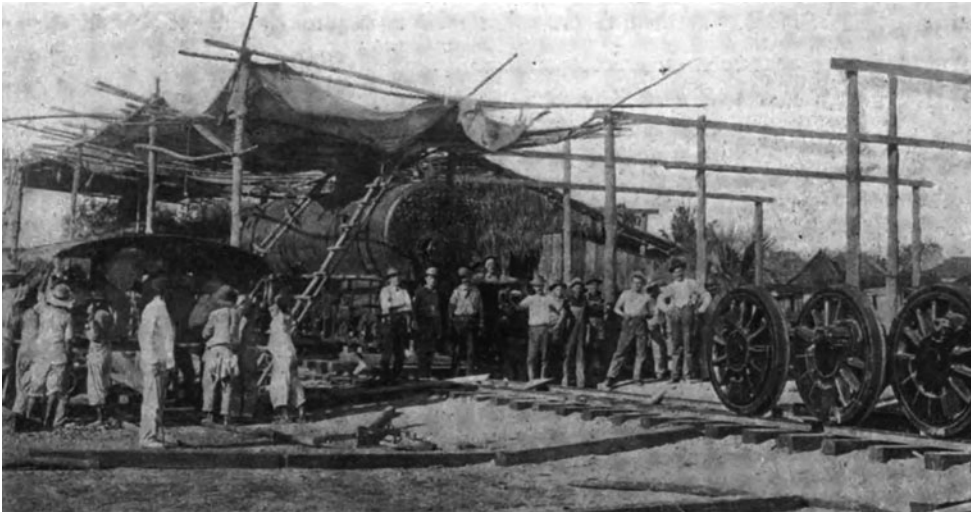


Figure 3. Workers grading land for construction of Philippine railway. From “Philippine Railroad Building with Filipino Builders,” *The Railroad Gazette* 43, no. 11 (Sept 13 1907): 299, <https://hdl.handle.net/2027/nyp.33433057089660>.

A recurring debate within the discipline of history involves how historians balance state versus nonstate power: do historians need to widen their frame beyond the nation-state to include diverse nonstate actors, or is it time to “bring the state back in?” One iteration of this debate occurred several decades ago by questioning whether politics should be the top priority of historical analysis.⁴² More recently, scholars of U.S. foreign relations have debated the primacy of state versus nonstate actors, following several historians’ calls to recenter the U.S. state and domestic policy making in analyzing the nation’s role in twentieth-century geopolitics.⁴³

Infrastructure offers a useful way to bypass the debate about state versus nonstate power because an infrastructural approach allows a scholar to calibrate the importance of each based on the phenomenon under study. Infrastructure studies tend to emphasize financial power dynamics, regulatory authorities, and the central role of government actors, while also loosening the analytical framing to allow for extrastate forces that impact the phenomena at hand.⁴⁴ In this approach, the state remains a central actor; nonetheless, infrastructure studies make space for other actors, institutions, and material forces to play a similarly pivotal role. Indeed, infrastructural approaches provide a way for scholars to adjust their emphasis on state versus nonstate factors, based on the relative importance of each in creating the assemblage under study.

Likewise, infrastructure studies offer a new vantage on another longstanding debate among historians: the question of history-from-below versus histories of elite power. Throughout the twentieth century, various scholars have called for amplifying the voices of disenfranchised

Infrastructure of Modernity: Indirect Social Relationships, Information Technology, and Social Integration,” in *Social Change and Modernity*, eds. Hans Haferkamp and Neil J. Smelser (Berkeley, CA, 1992), 214.

⁴²For instance, see Stephen D. Krasner, *Defending the National Interest: Raw Materials Investments and U.S. Foreign Policy* (Princeton, NJ, 1978); Peter B. Evans, Dietrich Rueschemeyer, and Theda Skocpol, *Bringing the State Back In* (Cambridge, UK, 1985); and Timothy Mitchell, “The Limits of the State: Beyond Statist Approaches and Their Critics,” *The American Political Science Review* 85, no. 1 (Mar. 1991): 77–96.

⁴³Daniel Bessner and Fredrik Logevall, “Recentering the United States in the Historiography of American Foreign Relations,” *Texas National Security Review* 3, no. 2 (Spring 2020): 38–55; and “H-Diplo Roundtable XXI-42 on Bessner and Logevall, ‘Recentering the United States in the Historiography of American Foreign Relations,’” (May 25, 2020), <https://hdiplo.org/to/RT21-42>.

⁴⁴Easterling, *Extrastatecraft*, 15.

groups—voices that are often erased or elided in traditional archives and colonial structures.⁴⁵ More recently, several historians have called for re-energizing “history from below” in a post-colonial, digital era by highlighting the construction of racial difference and inequality.⁴⁶

Infrastructure studies offer an alternative to the binary division between history-from-below versus studies of elite power. An infrastructural approach attunes scholars to the middle layers and substrates wherein technology, material, regulation, and labor interact. Its attention to in-between spaces—history in the middle—can help reveal the large-scale impacts of small, day-to-day processes, such as the accumulation of capital, the building of coalitions, and the diffusion of ideas and technologies. Infrastructures create the space for racial, social, and economic inequalities to grow and become enduring. For example, as Destin Jenkins’s work has shown, the borrowing practices for building municipal infrastructure shaped the way in which low-income groups and communities of color were excluded from the benefits of San Francisco’s economic growth.⁴⁷ This analysis demonstrates what an infrastructural approach offers that earlier generations of scholarship might have overlooked. While previous scholars have shown patterns of segregation and fracturing in modern cities, Jenkins’s usage of infrastructure-as-methodology connects urban splintering to the history of investing practices that enabled certain visions of the city’s future to take shape over others.⁴⁸ Infrastructure offers a theoretical framing for understanding how structural inequalities—particularly racial inequality, gender inequities, and economic disparities—have emerged, evolved, and become enduring over time.

Another feature of infrastructure-based approaches is to challenge the chronological organization of traditional histories, which are often defined by elections, wars, and economic crises. Rather than focus on “punctuating events,” infrastructure-oriented studies look beyond “the binaries of wars and the chest-beating Westphalian sovereignty of nations,” according to Easterling.⁴⁹ One potential risk of this reordering is to obscure moments of rupture. As Patrick Joyce advises readers in his infrastructure history of London, “Readers may find a certain lack of ‘conflict’ in the book.”⁵⁰ His study of infrastructure—the “political economy of the sewer and pipe”—is not without resistance, oppression, and change, he notes.⁵¹ Instead, resistance manifests in unexpected ways, rather than in explicit debates about politics.

Historians’ recent uptake of infrastructural approaches has shed light on the middle layers of social relations and often unseen systems of knowledge and power. Studies have examined bookkeeping systems of Gilded Age commerce, messenger boys’ labor networks, and the

⁴⁵For instance, see John Arnold, Matthew Hilton, and Jan Rüger, “The Challenges of History,” in *History after Hobsbawm: Writing the Past for the Twenty-first Century*, ed. John Arnold, Matthew Hilton, and Jan Rüger (Oxford, 2018), 3–16; E. P. Thompson, *The Making of the English Working Class* (New York, 1964); E. P. Thompson, “History from Below,” *Times Literary Supplement*, Apr 7, 1966; and Carl Grey Martin and Modhumita Roy, “Narrative Resistance: A Conversation with Historian Marcus Rediker,” *Workplace: A Journal for Academic Labor* 30 (2018), <https://ices.library.ubc.ca/index.php/workplace/article/view/186381>.

⁴⁶See, for example, James W. Cook, “The Kids Are All Right: On the ‘Turning’ of Cultural History,” *The American Historical Review* 117, no. 3 (2012): 759–61; Lawrence W. Levine, *Black Culture and Black Consciousness: Afro-American Folk Thought from Slavery to Freedom* rev. ed. (Oxford, UK, 2007); Tim Hitchcock, “A New History from Below,” Review of Essex Pauper Letters 1731–1837, Thomas Sokoll, *History Workshop Journal*, no. 57 (Spring 2004): 294–8; and “Historyonics: A New History from Below,” updated Apr. 2, 2010, <http://historyonics.blogspot.com/2010/04/new-history-from-below.html> (accessed Jul. 2, 2022).

⁴⁷Jenkins, *The Bonds of Inequality*.

⁴⁸For urban studies and sociological approaches, see, for example, Stephen Graham and Simon Marvin, eds., *Splintering Urbanism: Networked Infrastructures, Technological Mobilities and the Urban Condition* (London, 2001); and Elizabeth Shove and Frank Trentmann, *Infrastructures in Practice: The Dynamics of Demand in Networked Societies* (Milton, UK, 2018).

⁴⁹Easterling, “Histories of Things That Don’t Happen,” 634.

⁵⁰Joyce, *The Rule of Freedom*, 7.

⁵¹*Ibid.*, 12.

transmission of railroad engineering expertise, among other themes.⁵² Such studies focus on actors and operating systems that might escape notice in either top-down or bottom-up approaches. Such history-from-the-middle is less about analyzing specific events and more about revealing the structuring forces that have enabled wars, elections, and other traditional “punctuating” moments. As such, an infrastructural approach can examine elite power and systems, while also considering how those systems interacted with marginalized groups.

Components: Building Blocks of an Infrastructural Approach

Rather than providing a rigid template for infrastructure-as-methodology, this section identifies several core features of infrastructurally oriented scholarship. Its goal is to differentiate an infrastructural approach from other methods, as well as to provide a foundation for improving the approach. First, infrastructure-based analyses tend to foreground materiality, information, and technology within larger systems of power relations.⁵³ Historians have long examined material networks, so this interest does not distinguish infrastructural analysis as unique. However, the foregrounding of such considerations raises an open question for the field: is materiality a prerequisite for infrastructural studies? Is it necessary for infrastructurally-minded scholarship to emphasize the tactile dimensions of an operating system? Narrow insistence on materiality—a strict constructionist approach to infrastructure—evokes recent U.S. Congressional debates about federal infrastructure spending. Some politicians supported a narrow interpretation of infrastructure, which confined its definition to public works such as highways and ports and excluded programs like childcare or green energy.⁵⁴ Others advocated a more expansive conceptualization that would allow infrastructure funding to improve family care and electronic vehicles, among other priorities.

More useful than establishing narrow, materialist parameters for infrastructure is to adopt a function-oriented approach. Such an approach encourages scholars to map interconnections across different scales, actors, and media to understand how these pieces function as part of a coherent system. Vanessa Ogle’s recent “Global Capitalist Infrastructure and U.S. Power” is a useful example.⁵⁵ The essay describes an overlapping set of treaties, bilateral agreements, regulatory systems, and business practices that governed economic development in the postwar era. Ogle’s essay references material objects such as tin and rubber, as well as gold reserves; however, the argument has less to do with the built environment or tactile objects and more to do with an interplay of institutions, laws, and understandings. Ogle’s work exemplifies the way in which infrastructural approaches help explain late-twentieth-century capitalism by appreciating its reliance on national laws, business customs, and multinational treaties. In this context, infrastructure represents more of a functional than a material category. Thus, even though

⁵²See, for example, Michael Zakim, “Paperwork,” *Raritan* 33, no. 4 (Spring 2014); John Handel, “The Infrastructures of Finance: The London Stock Exchange and the Politics of Market Structure in Modern Britain, 1801–1914” (PhD diss., University of California, Berkeley, 2021); Josh Lauer, *Creditworthy: A History of Consumer Surveillance and Financial Identity in America* (New York, 2017); Liat Natanel Spiro, “Drawing Capital: Depiction, Machine Tools, and the Political Economy of Industrial Knowledge, 1824–1914” (PhD diss., Harvard University, 2019); and Jonathan Reed Winkler, *Nexus: Strategic Communications and American Security in World War I* (Cambridge, MA, 2013).

⁵³Paul N. Edwards, “Infrastructure and Modernity: Force, Time, and Social Organization in the History of Sociotechnical Systems,” in *Modernity and Technology*, eds. Philip Brey, Andrew Feenberg, and Thomas J. Misa (Cambridge, MA, 2003), 188.

⁵⁴See, for example, “This Week” *Transcript 4-4-21: Lt. Gen. Russel Honoré (Ret.), Sen. Roy Blunt, Sec. Pete Buttigieg*, ABC News, Apr 4, 2021, <https://abcnews.go.com/Politics/week-transcript-21-lt-gen-russel-honor-ret/story?id=76856995>.

⁵⁵Vanessa Ogle, “Global Capitalist Infrastructure and U.S. Power,” in *The Cambridge History of America and the World: Volume 4: 1945 to the Present*, eds. David C. Engerman, Max Paul Friedman, and Melani McAlister (Cambridge, UK, 2022), 31–54.

infrastructure studies tend to emphasize materiality, focusing on the built environment or physical objects is not a prerequisite for adopting an infrastructural approach.

Second, infrastructural approaches often emphasize the latent potential or disposition of a system, which may or may not have been part of the system's original design. A disposition describes the "character or propensity of an organization that results from all its activity," notes Easterling.⁵⁶ "A ball at the top of an inclined plane possesses a disposition ... even without rolling down the incline, the ball is actively doing something by occupying its position."⁵⁷ Analyzing the disposition of an infrastructure—and revealing its innate propensities—are among the most important contributions that historians can offer.

An elegant example of how historians can reveal latent dispositions of infrastructure is Stefan Link's recent study of Fordism in a global context. The monograph does not rely on infrastructure as an explicit methodology; nonetheless, *Forging Global Fordism* uses many of its tools. The book examines the way in which Fordist approaches took hold in the Soviet Union and Germany, as compared to the United States. The countries' different ideological contexts and political economies enabled manufacturing systems that carried different dispositions in each nation. In its original form, Michigan-based Fordism contained a strong Midwestern populist bent; however, when applied overseas, different elements of Fordism could be modified and recombined to support communism, fascism, or mass consumption.⁵⁸ Link's attention to the different dispositions of Fordism reveals the way in which infrastructures can support different political agendas and enable markedly different outcomes.

Finally, infrastructure studies expose power dynamics that are often hidden from superficial analysis. Infrastructures "act like laws," notes Paul Edwards. "They create both opportunities and limits; they promote some interests at the expense of others."⁵⁹ Infrastructures do not need to initiate wars, sign treaties, or move money to do so. Instead, their very existence shapes a landscape of possibility that benefits some and imposes limitations on others. As such, infrastructures exert power by changing "the range of choices open to others, without apparently putting pressure directly on them to take one decision or to make one choice rather than other."⁶⁰ Craig Robertson's recent history of the filing cabinet exemplifies how infrastructural approaches can reveal power dynamics in unlikely places. His analysis shows that filing cabinets supported a larger "infrastructure of twentieth-century government and capitalism."⁶¹ Robertson highlights the gendered and hierarchical dimensions of new office technologies. The work demonstrates that power dynamics lie at the heart of an infrastructural approach, even if those dynamics remained hidden from surface-level analysis.

Racial inequality, gender dynamics, economic imbalance, and national differences are among the power relations that can emerge from an infrastructural approach. Here again, the orientation to power does not distinguish infrastructure-based studies from other scholarly approaches. However, where it prompts historians to find these relationships—in structures and the spaces beneath and between them—and how it encourages scholars to understand causation differentiates the approach from other "turns" in historical scholarship.

⁵⁶Easterling, *Extrastatecraft*, 21.

⁵⁷*Ibid.*, 72.

⁵⁸Stefan Link, *Forging Global Fordism: Nazi Germany, Soviet Russia, and the Contest over the Industrial Order* (Princeton, NJ, 2020).

⁵⁹Edwards, "Infrastructure and Modernity," 191.

⁶⁰Susan Strange's framing of structural power in *States and Market* (1988) does not explicitly rely on "infrastructure" in its definition; nonetheless, she depicts structural power as operating through a "four-faceted plastic pyramid"—a definition that aligns with an infrastructural conception. Susan Strange, *States and Markets* (London, 1988), 31.

⁶¹Craig Robertson, *The Filing Cabinet: A Vertical History of Information* (Minneapolis, 2021).

Causes: Scholarly Uptake

If infrastructure has been in the U.S. lexicon since the 1950s, why has its popularity spiked among historians in recent decades? What explains its conspicuous presence—and utility—for today’s historians? I argue that there are two key drivers for the increase in historians’ embrace of infrastructure: ambivalence about “globalization” and scholars’ growing reliance on internet technologies.

First, an infrastructural approach complicates an understanding of globalization based on “flows.” It does so by offering a systematic way to analyze cross-border, multinational connections while also emphasizing the material challenges and work required to maintain such connections. Its insistence on materiality and structure avoids some of the pitfalls of globalization analyses of the 1990s and 2000s. Scholarship from this era often referred to global “flows” to characterize the movement of people, money, goods, technologies, diseases, and other forces, but the works offered few formal guidelines for understanding the limits of mobility and interconnection. In a 1995 essay, Michael Geyer and Charles Bright issued a call to understand world history in an “age of globality.” Such history needed to recover “the multiplicity of the world’s pasts ... because, in a global age, the world’s pasts are all simultaneously present, colliding, interacting, and intermixing.”⁶² Themes such as migration, diasporas, capital flows, technology transfers, and imperial interconnection became major preoccupations in this generation of globalization 1.0 studies.⁶³

“Flows” were a leitmotif of this historical scholarship, even though the literature was more than a simplistic assertion that “the world is flat.” Scholars often noted that “flows” often perpetuated conflict, inequality, and resistance.⁶⁴ Nonetheless, the scholarship tended to emphasize interconnection and contact.⁶⁵ More recently, this framing of globalization-as-flows has encountered pushback. Critics have argued that the approach overlooked the friction of global interconnection, as well as the racism, ecological destruction, and North–South power imbalances that it often perpetuated.⁶⁶ “Infrastructure” provides a second-generation approach for understanding interconnection without overlooking structural inequality, stasis, friction, and unevenness.

Another less-studied driver for the recent uptake of infrastructure is the internet itself—the medium by which historians increasingly conduct research, encounter historical actors, and build communities. We can appreciate how information technology affects our perspectives as historians through an analogy to commodities trading of the late nineteenth century. Sociologist David Pinzur has compared the operation of two U.S. commodities exchanges: the Chicago Board of Trade and the New Orleans Cotton Exchange. Pinzur demonstrates that the Illinois- and Louisiana-based exchanges had different information infrastructures. In Chicago, prices were gathered centrally and distributed widely. The New Orleans exchange,

⁶²Michael Geyer and Charles Bright, “World History in a Global Age,” *The American Historical Review* 100, no. 4 (Oct. 1995): 1042.

⁶³For instance, see Emily S. Rosenberg, *A World Connecting, 1870–1945* (Cambridge, MA, 2012); Daniel Rodgers, “Cultures in Motion: An Introduction,” in *Cultures in Motion*, ed. Daniel T. Rodgers, Bhavani Raman, and Helmut Reimitz (Princeton, NJ, 2013); and C. A. Bayly et al., “AHR Conversation: On Transnational History,” *The American Historical Review* 111, no. 5 (Dec. 2006): 1441–64.

⁶⁴Charles Bright and Michael Geyer, “Where in the World Is America? The History of the United States in the Global Age,” in *Rethinking American History in a Global Age*, ed. Thomas Bender (Berkeley, CA, 2002), 65.

⁶⁵Paul A. Kramer, “How Did the World Become Global? Transnational History, Beyond Connection,” *Reviews in American History* 49, no. 1 (Mar. 2021): 119–41.

⁶⁶See, for example, Augustine Sedgewick, “Against Flows,” *History of the Present* 4, no. 2 (Fall 2014): 143–70; David Bell, “This Is What Happens When Historians Overuse the Idea of the Network,” *The New Republic*, Oct. 25, 2013, <http://www.newrepublic.com/article/114709/world-connecting-reviewed-historians-overuse-network-metaphor>; Lasse Heerten, “Mooring Mobilities, Fixing Flows: Towards a Global Urban History of Port Cities in the Age of Steam,” *Journal of Historical Sociology* 34, no. 2 (Jun. 2021): 350–74; and Kramer, “How Did the World Become Global?”

by contrast, distributed prices unreliably and unevenly. These different infrastructures—the protocols and telegraph technologies by which traders received price and crop information—shaped the character, prestige, and functioning of each exchange, as well as the perspectives of traders who operated within each system.⁶⁷ Chicago-based traders tended to denounce claims that their activities were speculative, because they understood the futures market to be tethered to the spot market for real, material goods. Meanwhile, New Orleans traders tended to see the futures market as a risky but necessary counterbalance against the inherent volatility of commodities trading. As Pinzur shows, the different information ecosystems shaped how traders understood their work.

Should not this insight—that information ecosystems shape the views of those operating within them—also apply to us, as historians in the 2020s? Fifty years ago, historians conducted research in a different information infrastructure—one defined by large-scale, physical archives and print sources. Accessing records about the U.S. government, for example, typically has required historians to visit campuses of the National Archives and Records Administration (NARA), where we use its finding aids and consult NARA staff to locate documents. This reliance on NARA puts historians in direct contact with the institutional power of the U.S. government, in addition to heightening our awareness of its limits. The sprawling building in College Park, Maryland; and the atrium cafeteria showcase its \$425 million annual operating budget and the state power required to maintain it.⁶⁸ Likewise, obsolete finding aids, staffing shortages, and limited digitization highlight our awareness of the institution's constraints. In both cases, the institution-ness of NARA shapes historians' research context.

Today, a growing share of historians' information infrastructure is digital. Even before the COVID-19 pandemic, scholars had embraced online platforms, from HathiTrust to JSTOR, as vital research tools. During pandemic lockdowns, these tools became lifelines for historical research. Recently, academics have engaged in vibrant and important debates about digitization—such as the decline of print sources, new manifestations of inequality, the rise of digital humanities, the existential crises of traditional libraries and archives, and other such issues.⁶⁹ A related, and less explored angle of digitization involves the connection between historians' information technologies—where and how our research takes place—and the types of questions that we ask.

Accessing documents through HathiTrust, Google, and other major databases immerses historians in a different research ecosystem than that of traditional archival research. Digital research recasts the centrality of brick-and-mortar archives, the visibility of human labor, and the materiality of books as physical objects. Sometimes, online searches yield surprises—small perforations in the digital veil that hides most of the human labor of internet research. A ripped page, the shadow of a paper clip, or perhaps a rogue finger of the person scanning might serve as reminders of traditional archiving practices and brick-and-mortar institutions (see Figure 4).⁷⁰ But for the most part, evidence of the research infrastructure asserts itself in terms of bandwidth, software tools, and wifi signal strength. In this world, the traditional

⁶⁷Pinzur, "Infrastructural Power."

⁶⁸"Summary of the FY 2023 Request: Fiscal Year 2023 Budget Request," National Archives and Records Administration, updated Mar. 28, 2022, <https://www.archives.gov/files/about/plans-reports/performance-budget/2023-nara-congressional-justification.pdf> (accessed Dec. 14, 2022).

⁶⁹See, for example, Adam Crymble, *Technology and the Historian: Transformations in the Digital Age* (Champaign, IL, 2021); Ian Milligan, *History in the Age of Abundance? How the Web Is Transforming Historical Research* (Montreal, 2019); and Daniel J. Story et al., "History's Future in the Age of the Internet," *The American Historical Review* 125, no. 4 (Oct. 2020): 1337–46.

⁷⁰Artist Andrew Norman Wilson created an art exhibit, *ScanOps*, based on "Google Books accidents," such as distortions and the hands of workers. "ScanOps," 2012, accessed Feb. 14, 2023, <http://www.andrewnormanwilson.com/ScanOps.html>; and "Is That a Hand? Glitches Reveal Google Books' Human Scanners," *Wired*, Feb. 7, 2019, <https://www.wired.com/story/google-books-glitches-gallery/>. There is also a tumblr blog devoted to the art of these scanning irregularities: "The Art of Google Books (Tumblr)," (Blog, nd, <https://theartofgooglebooks.tumblr.com>).

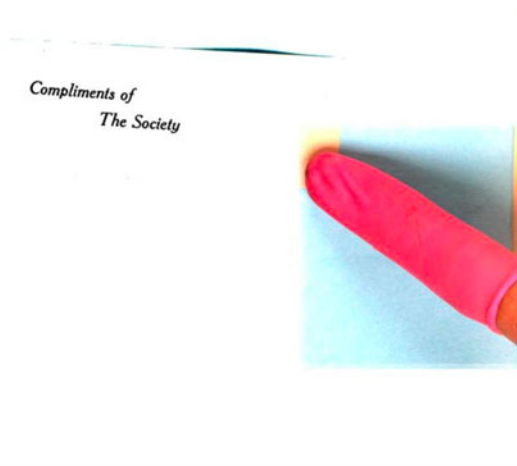


Figure 4. Finger in Google Books scan. Source: Charles K. Wead, James Bryce, and Milton Updegraff, *Simon Newcomb: Memorial Addresses*, vol. 25 (Washington, 1910). https://www.google.com/books/edition/Simon_Newcomb/1QtBAAAAAAJ?hl=en&gbpv=0.

institutions that held archival sources—such as state and municipal governments, presidential archives, and corporations—are less imposing features than the infrastructures that transmit their data and the communications networks that grant us access.

As I developed this article, subcontractors working for Google Fiber cut trenches in front of my house and throughout my neighborhood. The workers—armed with cement mixers, trenchers, and backhoes—slipped small orange tubes into shallow tracks that had been cut into our street by excavators (see [Figure 5](#)). Afterward, more workers came behind with trucks that “blew” fiber through our neighborhood.⁷¹ As the micro-trenching machines carved the narrow grooves into our street, I immediately wondered whether my research would be faster. Doesn’t it follow that, in this digital information environment, we as historians see infrastructure in our firmament? Doesn’t it follow that 40 percent of history dissertations would reference infrastructure?

Blind Spots: What Is Obscured?

An infrastructure-based approach allows historians to fuse materiality, state power, technology, culture, global interconnection, and information systems—to mention just a few features—into the same conceptual framework. It enables historians to see change from below and above by focusing on what happens in the middle layers. It neither rejects nor reifies the power of the state. In this framing, the “infrastructural turn” sounds like a Goldilocks of historical methodologies. However, what does it obscure? Being thoughtful about embracing the approach requires recognizing its blind spots.

Infrastructure pioneers such as Joyce and Easterling have already identified a potential shortcoming: infrastructure studies tend to subvert traditional chronologies by de-prioritizing war, rupture, natural disasters, and other sudden changes. A “history of things that do not happen” will focus less on a monumental election, for example, than on the informational apparatus, electoral framework, and fundraising networks that enabled the election. Nonetheless, bringing an infrastructural approach to traditional “punctuating events” can still offer new insights on major ruptures and defining events. For example, in terms of analyzing war, Nicholas Lambert’s *Planning Armageddon* helps us re-understand the great-power

⁷¹For background about this process, see “How My Austin Neighborhood Broke Google Fiber and What They Will Do Next,” Medium.com, updated Aug. 3, 2017, https://medium.com/@TIRIAS_Research/how-my-austin-neighborhood-broke-google-fiber-5675b52f6a60 (accessed Jun. 29, 2022); and “The Benefits of Blown Fibre Optics,” Network3, <https://www.network3.co.uk/news-and-resources/The-Benefits-of-Blown-Fibre> (accessed Jun. 29, 2022).



Figure 5. Google Fiber casing, author's image (2022).

conflict of World War I through the lens of shipping, commodities trading, and material, financial, and political infrastructures.⁷² Earl Hess's recent *Civil War Supply and Strategy* re-examines the Civil War through the lens of logistics and supply chain analysis.⁷³ In other words, infrastructure studies are not necessarily bad at war and rupture; they just take a different tack on traditional approaches to military conflict and armed resistance.

In fact, there is a long history of resistance movements that have recognized the importance of infrastructure by trying to destroy it. Oil pipelines have been the target of insurgent attacks on multiple continents, from the Palestinian resistance against the British Mandate in the 1930s to Nigerian activists challenging multinational oil corporations in the 2000s.⁷⁴ Even the most timeless of infrastructures—time itself—has been the target of suspected insurgent activity. In 1894, anarchist Martien Bourdin took explosives to Greenwich Park in London. In that park, the gate clock of the Royal Observatory displayed Greenwich Mean Time. Some historians have speculated that Bourdin's target was neither the park nor the observatory, but rather the clock itself, as an effort to reject centralized control over time.⁷⁵ An infrastructural approach to resistance would involve examining both the formation of resistance movements, as well as the material, legal, political, and cultural frameworks that made the infrastructure a worthy target in the first place.

Perhaps the greatest oversight of an infrastructural approach relates to its disinterest in the sensations and lived experiences of the people it affects. An infrastructural approach does not prioritize the texture of exploitation experienced by enslaved African women in the U.S. South in the early nineteenth century. Nor does it capture the ties of loyalty and the nuances in the relationships of a French family across three centuries, as does Emma Rothschild's recent *An*

⁷²Lambert does not push the term "infrastructure" as a central analytic of the text. Nonetheless, as he notes, "The focus of our interest is upon Britain's domination, before the war, of the industries that were the infrastructure of international exchange." Nicholas A. Lambert, *Planning Armageddon: British Economic Warfare and the First World War* (Cambridge, MA, 2012), 23.

⁷³Earl J. Hess, *Civil War Supply and Strategy: Feeding Men and Moving Armies* (Baton Rouge, LA, 2020).

⁷⁴Andreas Malm, *How to Blow Up a Pipeline: Learning to Fight in a World on Fire* (London, 2021).

⁷⁵Rebekah Higgitt, "The Real Story of the Secret Agent and the Greenwich Observatory Bombing," *The Guardian*, Aug. 5, 2016, <https://www.theguardian.com/science/the-h-word/2016/aug/05/secret-agent-greenwich-observatory-bombing-of-1894>. For more on time as an infrastructure, see Vanessa Ogle, *The Global Transformation of Time, 1870–1950* (Cambridge, MA, 2015).

Infinite History: The Story of a Family in France over Three Centuries.⁷⁶ Nonetheless, infrastructure does not preclude such attention. In fact, the approach might enlighten the lived experiences of categories of workers, buyers, traders, and builders that traditional histories have overlooked. For example, Peter Hudson's 2017 *Bankers and Empire* considers the financial infrastructure of U.S. imperial power in the Caribbean through the lens of U.S. banking. His attention to middle managers and "rogue bankers" in U.S. branches overseas highlights the biographies of financiers that have gone overlooked in studies of the "great white men" of finance.⁷⁷ Likewise, recent scholarship on mining, engineering, and geology has shed light on the lived experiences of a middle layer of transnational expert-technocrats who previously lurked in scholarly shadows.⁷⁸

An infrastructural approach might not tell us much about memory, taste, or the experience of incarceration, for example, but it can provide new insights about the assemblage of investments, political alliances, and preconditions that shaped those lived experiences. Future generations of historians will undoubtedly have more to offer on infrastructure's blind spots, but in the meantime, the field has much to gain from the insights of infrastructure-oriented analysis.

As infrastructure continues to influence the work of emerging scholars, future studies could push its insights farther by investigating several key themes. One major question for the field is: what happens when infrastructures collide? Thus far, historians' analyses have tended to focus on individual infrastructures—from commodities exchanges to Habsburg ecclesiastical networks. Analyzing infrastructures in conflict could go a long way toward explaining why some systems prevail over others and what shapes great-power conflicts. Scholarship analyzing the infrastructural encounters between multinational capitalism and Chinese economic development, for example, could help reveal why some infrastructures succeed and others capitulate. Relatedly, why do some infrastructures expand to subsume others? Additional research could clarify how a new system such as Amazon.com not only subverted traditional book publishing but became "critical infrastructure" in computing, national security, and even healthcare.⁷⁹ Studying infrastructural encounters and "imperial" infrastructural rivalry could reveal the relative importance of state power, economic forces, and ideologies—among other factors—in affecting the durability of a system.

Another frontier in infrastructure studies involves surprise, creativity, and innovation. It is easy to overstate the power of an infrastructure to determine outcomes, but what about the converse? Are there ecosystems that are particularly nimble at generating rupture or changing themselves? Are there infrastructures that support people's agency, even when individuals challenge traditional hierarchies? The tension between coercion and liberty has long been a feature of U.S. history.⁸⁰ Future scholarship could explore whether infrastructures inherently exert control, or if infrastructures could enable different forms of liberation.

Infrastructure studies also provide a way to focus scholars' attention on the environment, landscape, and ecology, not as one-off considerations but as integral features of the phenomenon under study. In an era when climate change has become a daily news item, it is unsurprising that historians' attention to the environment and to the impacts of large-scale

⁷⁶Emma Rothschild, *An Infinite History: The Story of a Family in France over Three Centuries* (Princeton, NJ, 2021).

⁷⁷Peter James Hudson, *Bankers and Empire: How Wall Street Colonized the Caribbean* (Chicago, 2017), 13.

⁷⁸See, for example, Andrew Offenburger, *Frontiers in the Gilded Age: Adventure, Capitalism, and Dispossession from Southern Africa to the U.S.–Mexican Borderlands, 1880–1917* (New Haven, CT, 2019); Black, *The Global Interior*; and Spiro, "Drawing Capital."

⁷⁹Liam Tung, "Apple, Microsoft and Amazon Chiefs to Meet Biden over Critical Infrastructure Cyber Attacks," *ZDNet*, Aug. 24, 2021, <https://www.zdnet.com/article/apple-microsoft-and-amazon-chiefs-to-meet-biden-over-critical-infrastructure-cyber-attacks/>.

⁸⁰Gary Gerstle, *Liberty and Coercion: The Paradox of American Government from the Founding to the Present* (Princeton, NJ, 2015).

technological assemblages has intensified. Historically, environmental analyses were often siloed within free-standing white papers, news stories, or scholarly studies. Such practices reinforced a common economic practice to understand environmental impacts as “externalities” divorced from the core project itself. Infrastructurally minded history offers a way to fuse considerations about the built environment, ecology, and landscape as enmeshed with the power dynamics and history of a phenomenon under study. This method can help historians who traditionally have not self-identified as environmental scholars imbue their analysis with greater ecological awareness and understandings of sustainability.

Scholars could also go farther to interrogate the politics of visibility in infrastructure. Whether an infrastructure is noticeable often depends on how functional that infrastructure is. For example, societies commonly take for granted infrastructures that operate smoothly, consistently, and discretely, such as sanitation systems or electrical grids in affluent communities. By contrast, these same infrastructures become more obtrusive in developing countries plagued by blackouts and water scarcity. The visibility of infrastructures is related to global income inequalities and has implications for the politics they inspire.⁸¹ Different conceptualizations of infrastructure could expand how scholars understand their evolution and staying power. How does the hiddenness or visibility of an infrastructure affect building coalitions and mobilizing resistance, for example?

Infrastructure resistance is itself is another topic worthy of greater scholarly exploration. Episodes of infrastructure sabotage have a long and vibrant history, but more nuanced forms of insurgency warrant greater study. After all, infrastructural power does not always lend itself to overt sabotage. Easterling has suggested that today’s activists should embrace a more diverse and eclectic portfolio of techniques to challenge modern infrastructures—techniques such as “mimicry, comedy, remote control, meaninglessness, misdirection, distraction, hacking, or entrepreneurialism.”⁸² Likewise, infrastructural analyses of resistance could extend beyond overt moments of standoff and instead consider more nuanced strategies of opposition. Rather than focusing on “weapons of the weak,” infrastructure studies might showcase insurgency in the interstices—or mutiny on the mezzanine.⁸³ Historians can shed light on the varieties of resistance by analyzing power relations within infrastructures as well as case studies of such opposition.

In today’s world, basic knowledge creation has become an infrastructural undertaking. Researching the human body took shape as the Human Genome Project—a \$3 billion initiative that involved twenty universities worldwide and lasted thirteen years.⁸⁴ Understanding the universe has taken shape as the International Space Station, a multidecade initiative that relies on numerous treaties and has launched nine inhabited space stations. Understanding basic matter has manifest as European Council for Nuclear Research (CERN), a particle physics lab that spans national borders and connects more than 12,000 scientists from seventy countries.⁸⁵ These sprawling, resource-intensive projects remind us of the need to reinvent methodologies and rethink traditional models of institutional power.

As we move farther into an infrastructural era of knowledge creation, historians are increasingly using today’s analytical tools and questions to understand our shared past. This movement is timely and important. And it has more ground to cover. Embracing an infrastructural approach can help historians stay nimble in analyzing behemoth institutions and forces, from capitalism to the state. It can help us stay grounded, vivid, and tactile in analyzing the role

⁸¹Edwards, “Infrastructure and Modernity,” 188.

⁸²Easterling, *Extrastatecraft*, 213.

⁸³This framing is inspired by James C. Scott, *Weapons of the Weak: Everyday Forms of Peasant Resistance* (New Haven, CT, 1985).

⁸⁴“Who Was Involved in the Human Genome Project?,” YourGenome.org, <https://www.yourgenome.org/stories/who-was-involved-in-the-human-genome-project/> (accessed Dec. 2, 2022).

⁸⁵“Our People,” CERN, <https://home.cern/about/who-we-are/our-people> (accessed Dec. 3, 2022).

of epistemologies, technology, and environmental change. Future scholars will undoubtedly have more to say on the blind spots of an infrastructural approach. But in the meantime, the field has urgent progress to make. An added benefit is that infrastructure studies emphasize durability and fixity. Given this, an infrastructural approach might finally give historians a break from “turning” and allow us to dig in.

Mary Bridges is a historian of the twentieth-century United States, with an emphasis on the linkages between U.S. foreign relations and business history. Her book, “Branching Out: Banking, Credit, and the Globalizing US Economy, 1900s–1930s,” forthcoming with Princeton University Press, argues that U.S. multinational banks provided a crucial infrastructure of both global capitalism and U.S. empire in the early twentieth century. Bridges is a postdoctoral fellow at Johns Hopkins University with the Ax:son Johnson Institute for Statecraft and Diplomacy.