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In Focus Introduction: Modes of Visual Production

The concepts of image and infrastructure initially appear to be opposed to each other. Images in their technological reproduction and circulation take on a spectral, immaterial quality. Infrastructure, by contrast, is the "stuff you can kick."[1] Images are visible. Infrastructures often operate in a state of "concealment."[2] In John Durham Peters's words, infrastructures "sacrifice their own visibility in the act of making something else appear."[3] A package appears on your doorstep as if by magic. Behind that illusion, a globe-encircling chain of container ships, warehouses, highways, delivery routes, and the people who populate them disappears. An image appears on your screen, and vast relays of cables and data centers seem to recede. The infrastructural turn in media studies has brought these once unseen infrastructures into focus. Today, media studies—a field oriented toward the study of visual, textual, and sonic material—offers the tools by which we can see images and infrastructure at once.

1. Lisa Parks, "'Stuff You Can Kick': Toward a Theory of Media Infrastructures," in *Between Humanities and the Digital*, ed. Patrik Svensson and David Theo Goldberg (MIT Press, 2015), 355–374.
2. Lisa Parks, "Technostruggles and the Satellite Dish: A Populist Approach to Infrastructure," in *Cultural Technologies: The Shaping of Culture in Media and Society*, ed. Göran Bolin (Routledge, 2012), 66.
3. John Durham Peters, *The Marvelous Clouds: Toward a Philosophy of Elemental Media* (University of Chicago Press, 2015), 34.

This In Focus dossier, which emerged out of the conversations at a particularly generative roundtable at SCMS 2022 (held virtually), addresses the relationship between media infrastructures and visual media.[4] What, we ask, do images and infrastructure have to say to each other? Can visual analysis and infrastructural analysis coexist? Is it possible to analyze an image so as to reconstruct the infrastructural forces that produced it or that lie outside its borders? And to what extent do images contribute to infrastructures by supporting or demonstrating systems that are otherwise too vast or abstract to fully grasp? The contributions to this dossier represent a variety of responses to these questions, drawing on border studies, environmental media studies, game studies, the history of computing, labor history, and film history. Together, these contributions provide a state-of-the-field snapshot of methods and concepts used to study and parse these interrelations. But before we go any further, a tentative sketch of this state is in order.

The mainstream of cinema and media studies once centered on the history and theory of film and television—the identities of these media, their cultural roles, their histories of production and reception, their political and psychic effects—as well as the analysis and interpretation of cinematic and televisual texts. Recently, our field has expanded its scope still further, to the analysis of logistics, environments, and large-scale technical systems outside of those traditionally associated with media production or reception.[5] In the past decade, scholars in our field have published groundbreaking research on undersea cables, data centers, satellites, salt, semiconductor manufacturing, supply chain management, atmospheric control, and ecological systems.[6] We see this shift as an apt response to a period of ecological and politico-economic upheaval, one in which mass movements repeatedly demand we address the structural—from systemic violence to infrastructural neglect. In this context, media studies' turn toward infrastructure reveals how large-scale technical systems mediate not only data flows but also the social, the aesthetic, and the geopolitical.

As we broaden our understanding of what constitutes media, our field productively reconsiders its proper objects and methodological tools. Cinema and media studies brings a set of unique strengths to the study of

4. We are especially thankful to Richard Grusin, Liam Cole Young, Yuriko Furuhata, and Lisa Han for their insights during that discussion.

5. Axel Volmar and Kyle Stine, eds., *Media Infrastructures and the Politics of Digital Time: Essays on Hardwired Temporalities* (Amsterdam University Press, 2021); and Matthew Hockenberry, Nicole Starosielski, and Susan Zieger, eds., *Assembly Codes: The Logistics of Media* (Duke University Press, 2021).

6. Nicole Starosielski, *The Undersea Network* (Duke University Press, 2015); Mél Hogan, "The Data Center Industrial Complex," in *Saturation: An Elemental Politics*, ed. Melody Jue and Rafico Ruiz (Duke University Press, 2021), 283–305; Lisa Parks, *Cultures in Orbit: Satellites and the Televisual* (Duke University Press, 2005); Liam Cole Young, "Salt: Fragments from the History of a Medium," *Theory, Culture & Society* 37, no. 6 (November 2020): 135–158, https://doi.org/10.1177 /0263276420915992; Lisa Nakamura, "Indigenous Circuits: Navajo Women and the Racialization of Early Electronic Manufacture," *American Quarterly* 66, no. 4 (December 2014): 919–941, https://doi.org/10.1353/aq.2014.0070; Miriam Posner, "See No Evil," *Logic* 4 (2018), https://logicmag.io/scale/see-no-evil/; Yuriko Furuhata, *Climatic Media: Transpacific Experiments in Atmospheric Control* (Duke University Press, 2022); Mal Ahern, "Climate Control, Modernism, and Mass Production," *Discourse* 45, no. 1 (2023): 3–32; and Peters, *Marvelous Clouds*.

infrastructure. Historians and theorists of film, television, video games, and visual culture arrive already prepared to encounter large technical systems by way of subfields such as industry studies, production studies, and platform studies.

One of the most fundamental tools of our field is that of close textual and/or visual analysis. But within large technical systems, it can be difficult to even locate individual media objects to analyze. To borrow a phrase from Tung-Hui Hu, studying media infrastructure can at times feel "a little like asking what a film is about, and looking into the most direct source of the image—the projector beam—to find out."[7] Perhaps one reason infrastructural thinking has found such a fruitful home in cinema and media studies is that our objects have always demanded this sort of double vision, a gaze that moves back and forth between the cinematic image and its originating machinery. In expanding our purview to other kinds of infrastructure, we encounter new challenges: apparatus that do not produce images and images whose material conditions of production are entirely obscure. While the ideal vantage point would allow us to see both a technical structure and the images it sustains, security protocols often force scholars to adopt an "outside-in" approach to media infrastructure, such as analyzing a National Security Agency (NSA) data center's water usage as a proxy for its size when one is forbidden from peering into its servers.[8] Digital storage and transmission necessarily obscure media's content. To discover the material conditions governing a specific data center or electronics factory is hard enough; to explain how these material conditions impact the visual appearance of the images our servers and screens transmit and instantiate is still more difficult. Indeed, the ideologies of digital media may insist that such variances make no difference, that the magic of binary code enables virtually noiseless transmission.[9]

Ranging from considerations of images as infrastructures (Ruíz and Woods) to infrastructures of images (Dhaliwal and Malazita) and reflections on infrastructures of image dissemination (Ahern and Stine), the six contributions to this dossier provide some possible directions for reckoning with these vital methodological questions.

Derek Woods and Diana Flores Ruíz examine something vital to the fabric of our disciplinary knowledge: the promise that images offer a persuasive, if not indexical, truth.[10] The conventional rhetoric of visibility insists that adequate

7. Tung-Hui Hu, *A Prehistory of the Cloud* (MIT Press, 2016).

8. Mél Hogan, "Data Flows and Water Woes: The Utah Data Center," *Big Data & Society* 2, no. 2 (2015), https://doi.org/10.1177/2053951715592429. See also Anne Pasek, Cindy Kaiying Lin, Zane Griffin, Talley Cooper, and Jordan B. Kinder, *Digital Energetics* (University of Minnesota Press, 2023).

9. For three divergent examples of possible refutations of this presumption, see Neta Alexander, "Rage Against the Machine: Buffering, Noise, and Perpetual Anxiety in the Age of Connected Viewing," *Cinema Journal* 56, no. 2 (2017): 1–24, https://doi.org/10.1353/cj.2017.0000; Matthew G. Kirschenbaum, *Mechanisms: New Media and the Forensic Imagination* (MIT Press, 2007); and Paul Dourish, *The Stuff of Bits: An Essay on the Materialities of Information* (MIT Press, 2017).

10. W. J. T. Mitchell, *What Do Pictures Want? The Lives and Loves of Images* (University of Chicago Press, 2005); and Bill Nichols, *Representing Reality: Issues and Concepts in Documentary* (Indiana University Press, 1991).

and accurate representation can change hearts and minds. We might harbor hope that accurate representations (of devastating climatic conditions or racializing border regimes) will yield an ideological or material transformation. Woods and Ruíz explore the *failure* of such evidentiary images to generate conclusive knowledge or political action. Through the concept of "infrastructural integrity," Ruíz reveals how photographic evidence of the physical abuse of migrants by guards at the US-Mexico border did not inspire justice-seeking intervention, but rather served to bolster the popular sense that the border is secure, whatever the human cost of that security may be. Woods offers an account of the "model image" of the global climate that fails to solicit meaningful political action but displays the power of globe-encircling sensing apparatus, large-scale computation, and visualization software. In both cases, the failure of these images to offer certainty or provoke political action evokes recent failures of representative politics to transform or fix violent and dangerous infrastructures infrastructures.

Brian Larkin has argued infrastructure has a "poetics" and a "political address."[11] Just as the poetic serves, in structural linguistics, as a demonstration of language itself, infrastructural projects often exceed their stated purpose and serve to express the state, industrial, or institutional powers that built them. For Ruíz and Woods, images let us envision and imagine infrastructures; they are part of what Lisa Parks calls the "infrastructural imaginary."[12] Indeed, images are *themselves* infrastructural in that they enforce the beliefs and practices that keep infrastructure working.

James Malazita and Ranjodh Singh Dhaliwal describe the technical infrastructure of contemporary digital images by combining economic and technical analysis. Digital images are traditionally understood as products of both hardware and software: hardware consisting of graphics processing units determines the speed, power, and resolution of a graphics system, while software specifics determine what kinds of virtual objects are created and how they are manipulated.[13] Dhaliwal and Malazita show how this hardware/software divide was generated and maintained and how it is currently being restructured and even erased for the sake of profit. Using Epic Games's new rendering system as a case study, Malazita distinguishes the traditional graphics system, which renders images by calculating the positions of virtual objects in space, from a new form of topological rendering and just-in-time calculation. He argues that these so-called technological advances support the proprietary development of games for exclusionary, profit-making platforms. Dhaliwal explains how the evolution of custom chipsets that integrate hardware and software functions furthers the vertical integration and monopolization of the tech industry. In his case study, Google mobilizes

11. Brian Larkin, "The Politics and Poetics of Infrastructure," *Annual Review of Anthropology* 42, no. 1 (2013): 327–343, https://doi.org/10.1146/annurev-anthro-092412 -155522. See also Ranjodh Singh Dhaliwal, "On Addressability, or What Even Is Computation?," *Critical Inquiry* 49, no. 1 (Autumn 2022): 1–27, https://doi.org/10 .1086/721167.
12. Lisa Parks, "'Stuff You Can Kick,'" 355.
13. Jacob Gaboury, *Image Objects: An Archaeology of Computer Graphics* (MIT Press, 2021).

media historical discourse on the camera's racism to portray its innovations as technical solutions to aesthetic problems.

In both cases, the entanglement of hardware and software means that to buy into one company's software is also to buy into its hardware, and vice versa. Technical integration, in computing terms, becomes synonymous with vertical integration, in industrial-financial terms. In this sense, the production and circulation of digital images recall the vertical integration of the Hollywood film studios. The integration of production studios and film exhibition circuits was eventually reversed through the legal decision to force theaters to divest of their chains.[14] This was only possible because the production and projection of film prints is a two-stage process. The standardization of 35mm sprocket size and dimensions early in Hollywood's classical era ensured that movies and their display equipment were, for the most part, cross-compatible.[15] The current integration of software and hardware—of game and platform—cannot be similarly addressed by established legal and social frameworks because it integrates previously separate functions in a way that makes them physically indivisible.[16] These political and economic infrastructural maneuvers accelerate the concentration of capital and information flow, and they have a clear impact on how games and photographs look today.

Accordingly, Mal Ahern and Kyle Stine return to the proverbial scene of the crime by arguing that the study of film history *is* in fact the study of large-scale infrastructure. From its very beginning, Stine argues, film history has engaged questions of distribution, corporate organization, and government-capital relations. The field has also long prioritized questions of the human-machine and social-machine interface that currently drive much of the most advanced research in infrastructure studies. Media studies' infrastructural turn, Stine concludes, should be understood as a *return* rather than an entirely new methodological formation. Arguing that the mass production of images is a part of media infrastructure, Ahern tells the story of a 1940s strike in Hollywood film laboratories, where the technicians who developed and processed motion picture film controlled a crucial chokepoint in film's distribution apparatus. The subsequent decades saw multiple efforts across media industries—laboratories, printing, motion picture projection, and broadcasting—to automate the mass production of images and sounds. What emerges is an alternative genealogy of digital convergence, one where technological progress and infrastructural efficiency are simply other names for the deskilling and automation of image-reproduction labor for the sake of corporate control. Both Ahern and Stine look into the past to

14. Paul McDonald, Emily Carman, Eric Hoyt, and Philip Drake, eds., *Hollywood and the Law* (BFI Publishing, 2015); and Peter Labuza, "When a Handshake Meant Something: The Rise of Entertainment Law in Post-*Paramount* Hollywood," *JCMS: Journal of Cinema and Media Studies* 60, no. 4 (2021): 61–84.

15. Novelty widescreen formats such as Fox Grandeur were the exceptions that proved the rule of cross-compatibility. See Janet Staiger, "The Hollywood Mode of Production to 1930," in David Bordwell, Janet Staiger, and Kristin Thompson, *The Classical Hollywood Cinema: Film Style and Mode of Production to 1960* (Routledge, 1988), 88–244; and Luci Marzola, *Engineering Hollywood: Technology, Technicians, and the Science of Building the Studio System* (Oxford University Press, 2021).

16. Gerardo Con Díaz, *Software Rights: How Patent Law Transformed Software Development in America* (Yale University Press, 2019).

describe how questions of images and infrastructures predate digital media (and digital media studies) and how the study of film history should directly inform our understanding of digital media infrastructure. So much of what made cinema visible took place not in the familiar spheres of production and reception but in those infrastructures that connected them.

Looking closely at photographic, cinematic, televisual, and digital images inspires research into the changing social and technical conditions that make those images possible. The parenthetical play in this dossier's title reflects its contributors' shared commitment to consider at once the *infra*, the technologies and labor practices that are media's connective tissue, and the *structural*, the political, economic, and social conditions of production. The editors of this dossier, in their respective contributions to it, imagine the infrastructure-image relationship as part of the base-superstructure relations described by Marxist theory. Visual phenomena, such as changes in screen resolution or graphics rendering, can be traced to technical and infrastructural changes, which in turn can only be explained through rich descriptions of economic and political power. The same can be said of changes in patterns of image circulation, reception, and interpretation. We therefore suggest that the attempt to think of images and infrastructures together is an attempt to grasp media's political economy as a totality. All the contributions to this dossier make clear that infrastructural shifts are inextricably linked to both the appearance of images themselves and questions of political and economic power. For media studies, understanding these links grows ever more difficult and ever more necessary.

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