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Media Infrastructure and Historical Materialism

Most readers do not consider Theodor Adorno and Max Horkheimer to be theorists of infrastructure. Yet in the 1947 volume *Dialectic of Enlightenment*, they describe mass media, that sector of production they call the culture industry, as ideology itself: ideology that has taken on an infrastructural form.[1] Their chapter on the culture industry is best known in our field for its assertion that capitalist cultural production homogenizes both art and experience, yielding works so predictable as to eventually blunt the senses and sensibility of all who regularly consume them. This critique has long structured the field's understanding of mass media and capitalism. Within media studies, Marxism was for many decades synonymous with debates about the ideological nature of film form and content, the relative agency of artists within the capitalist system, the media's power to interpolate subjects, and viewers' power to contest and change meaning.[2] These discussions focused largely on moments of creation and of consumption.

1. Max Horkheimer and Theodor W. Adorno, *Dialectic of Enlightenment: Philosophical Fragments*, ed. Gunzelin Schmid Noerr, trans. Edmund Jephcott (Stanford University Press, 2002).
2. See Philip Rosen, ed., *Narrative, Apparatus, Ideology: A Film Theory Reader* (Columbia University Press, 1986). Other Marxian approaches to the question of spectatorship appear in Stuart Hall, "Encoding and Decoding in the Television Discourse," in *Essential Essays, Volume 1: Foundations of Cultural Studies*, ed. David Morley (Duke University Press, 2019), 257–276; and Miriam Hansen, *Babel and Babylon: Spectatorship in American Silent Film* (Harvard University Press, 1991).

By contrast, media studies' infrastructural turn emphasizes stages of production between creator and consumer: material processes of mass production, circulation, dissemination, and logistical management. It is my belief that this broadening of our field gives us the chance to reassess the legacy of Marxist analysis within our discipline. Infrastructure studies powerfully augments the study of media and capitalism because it opens onto a materialist analysis of technology and labor at every level. Much of the recent research on media industries and infrastructure already understands these sectors in relation to capitalist accumulation and state power, and since 2000, media studies has also turned increasingly to the question of labor, particularly in relation to emergent technologies.[3] The study of media infrastructure is, in many ways, already the study of media's political economy.

We stand to gain much by making this explicit. For one, we can link the sorts of thick descriptions of labor, technology, and infrastructure I have just described with our field's rich traditions of Marxist critique. In what follows, I offer one such linkage, arguing that the twinned study of ideology and political economy reveals new aspects of both. Adorno and Horkheimer wrote *Dialectic of Enlightenment* as Hollywood roiled with labor unrest. Here, I read their text alongside these struggles and vice versa. In so doing, I suggest a potential through line leading from the 1940s to the emergence of digital media: Already present in Adorno and Horkheimer's conceptualization of the culture industry is the idea that part of mass media's ideological effect lay in its imagery of infrastructural control.

"The Culture Industry: Enlightenment as Mass Deception" is about infrastructure; I assert this in a spirit of play and speculation. It is striking, as John David Rhodes notes, that the chapter begins "with only a nominal reference to the entertainment media" and moves speedily to descriptions of city planning and architecture.[4] Film content figures surprisingly little in the text. Where it does, the authors describe not films but formulas, a fact that speaks to their focus on industrial infrastructure. "The regression of enlightenment to ideology," Adorno and Horkheimer write, is best illustrated by the radio and film industries, for there "enlightenment consists primarily in the calculation of effects and in the technology of production and dissemination."[5] This "calculation of effects" yielded products and audiences so predictable as to form a basis for projected profit and production plans. Equally ideological was the system of "technological production and dissemination"; here, "the specific content of the ideology is exhausted in the idolization of the existing order and of the power by which the technology is controlled."[6] Corporate owners of film and broadcast media in the United States promised ever-widening access and constant technological improvement. The owners

3. See Tiziana Terranova, *Network Cultures: Politics for the Information Age* (Pluto Press, 2004); Jonathan Beller, *The Cinematic Mode of Production: Attention Economy and the Society of the Spectacle* (University of Chicago Press, 2006); and John Thornton Caldwell, *Specworld: Folds, Faults, and Fractures in Embedded Creator Industries* (University of California Press, 2023).
4. John David Rhodes, *The Spectacle of Property: The House in American Film* (University of Minnesota Press, 2017), 58.
5. Horkheimer and Adorno, *Dialectic of Enlightenment*, xviii–xix.
6. Horkheimer and Adorno, xix.

of mass media did not "conceal" but "bluntly" displayed their power over it; while sometimes praising liberal values such as freedom of expression, they portrayed their grasp on mass media technology as total.[7] Control over media technology was in turn idolized as a feat of engineering and business prowess. Adorno and Horkheimer therefore describe media technology *itself* as ideological. This is not simply because mass media's one-to-many address disseminated uniformity; the fact that it did so is anything but surprising. Rather, the logistical management of sounds, images, and words for mass distribution embodied postwar capitalist ideology, putting economic power on display and presenting a fantasy of total technological control.

One way of understanding ideology is to consider it a picture of reality—one that, like any picture, simplifies a world full of relations too elaborate for the mind to hold. Louis Althusser describes ideology as a subject's "imaginary relationship to its real conditions of existence."[8] The culture industry, according to Adorno and Horkheimer, displays as triumph capital's control over visual and sonic mass production. But what real, material conditions does this ideological image hide? Infrastructural thinking urges us to look to the material preconditions by which images multiply and travel from production centers to diffuse sites of reception. Mass media's technical infrastructure is not only a series of machines. It is also the people who make those machines run.

If Adorno and Horkheimer, exiled in Los Angeles during the 1940s, had looked ten miles to their east, toward contemporaneous labor struggles in Hollywood, they might have noticed the challenge a small group of image reproduction workers issued to mass media's ideology of control. In 1944, an FBI surveillance committee alleged that Communists were in the process of infiltrating all nine of Hollywood's major film laboratories. The laboratory technicians' Local 683 of IATSE (the International Alliance of Theatrical Stage Employees) had "jurisdiction and control of a narrow but important field, that of the employees who handle developing and processing of film."[9] According to one FBI informant, it had long been "the contention of the Communist Party that if it could control the workers in this Department, the industry would be at their mercy."[10]

Striking workers soon proved the industry was indeed vulnerable to their control. In October 1946, the laboratory technicians of Local 683 defied their parent union and went out on strike in solidarity with the Conference of Studio Unions (CSU), a group of independent locals that issued a challenge to the powerful, studio-friendly IATSE. Production ground to a halt when laboratories stopped work and producers were unable to view daily rushes.[11] Dozens of film releases were delayed or limited because labora-

7.   Horkheimer and Adorno, 95.
8.   Louis Althusser, *Lenin and Philosophy*, trans. Ben Brewster (Monthly Review Press, 1971), 109.
9.   Communist Infiltration-Motion Picture Industry (COMPIC), "1944 Field Report," FBI File 100–HQ-138754, number 100-138754, Serial 157x1, 4.
10. COMPIC, 5.
11. Gerald Horne, *Class Struggle in Hollywood, 1930–1950: Moguls, Mobsters, Stars, Reds, & Trade Unionists* (University of Texas Press, 2001), 205–206.

tories lacked experienced workers to produce sufficient release prints.[12] Studios were forced to fill theaters with reissues of classic films, drawing complaints from some critics and industry publications.[13] Particularly hard hit was Technicolor, as the proprietary nature of its process meant its Hollywood plant was the only place in the country able to create dye transfer prints. Executives threatened to fly footage to the London plant for processing, but British laboratory workers refused to scab on their American confreres.[14] By one account, Technicolor was "completely shut down" for part of November 1946.[15]

"It really was a crisis," reflected IATSE president Roy Brewer in his 1951 testimony before the US House of Representatives Committee on Un-American Activities.[16] A virulent anti-Communist, Brewer maintained that the progressive leadership of Local 683 was part of a Communist plot to seize control of Hollywood's means of production. "That is the way we followed out the strike," Brewer told Congress, "and I assure you that if we had not analyzed it accurately we would have lost the strike and they would have had control."[17] When asked to elaborate on what he meant by "control," Brewer noted the capacity of militant unions to "cause very great financial loss" by holding up the production or distribution of a product that "requires a very great investment."[18] More curiously, he referred to an incident in 1945 in which CSU members threatened to stop work on a film whose star the organization had deemed anti-labor.[19] "That resolution had significance to me," Brewer stated, "because I could see what it would have meant."[20] It would have meant that below-the-line workers could issue a direct political challenge to film stars and executives—that the struggle over film content involved not only artist and executive but every level of labor. "The effort to infiltrate and control labor unions was a part of the total plan," Brewer insisted, a plan to ultimately "control the content of films."[21] And when it came to the capacity to disrupt production completely, Brewer was clear: "The very key spot in the motion-picture industry is the laboratory technicians."[22]

The Hollywood strikes proved that, within mass media's vast infrastructure, the physical reproduction of images was a vulnerable but strategic chokepoint. Pro-corporate actors subsequently used these chokepoints to their advantage. Brewer himself later supported Hollywood's effort to

12. Mike Nielsen and Gene Mailes, *Hollywood's Other Blacklist: Union Struggles in the Studio System* (British Film Institute, 1995), 152–153.

13. Eric Hoyt, *Hollywood Vault: From Libraries Before Home Video* (University of California Press, 2014), 139.

14. "Film Technicians 683 Daily Bulletin," December 26, 1946, box 1, Hollywood Studio Strikes Collection, Charles Young Research Library, UCLA.

15. Horne, *Class Struggle in Hollywood*, 205.

16. *Hearings Before the Committee on Un-American Activities*, 82nd Congress of the US House of Representatives, First Session (US Government Printing Office, 1951), 515 (hereafter cited as *HUAC Hearings*).

17. *HUAC Hearings*, 504.

18. *HUAC Hearings*, 504.

19. *HUAC Hearings*, 504.

20. *HUAC Hearings*, 488.

21. *HUAC Hearings*, 477.

22. *HUAC Hearings*, 515.

suppress the release of the 1954 film *Salt of the Earth* (Herbert J. Biberman) by ordering IATSE lab technicians and projectionists—the latter being the final chokepoint in cinema's distribution infrastructure—to refuse to handle it.[23] Control of the image required control of labor.

Adorno and Horkheimer proposed that mid-twentieth-century capitalist ideology found material embodiment in the mass media: a for-profit celebration of the technological control over images and sounds. The Hollywood laboratory workers challenged this image of mass media by insisting that labor had the power to support or subvert corporate ends. They threatened to reveal mass media's secret: that its technology had *not* developed to the point that owners possessed full control of the means of production. Film's highly mechanized reproduction and distribution infrastructure still required the work of skilled human hands.

The techno-optimist ideology Adorno and Horkheimer described in "The Culture Industry" endured for decades, justifying the technological subsumption of entire fields of media labor. Starting in the 1940s, new techniques of numerical and computational control promised to remove laboratory technicians, projectionists, printers, and broadcast workers from mass media's distribution infrastructure. In April 1947, for instance, Technicolor's research department began to discuss the possibility of developing "fully automatic lighting and register control from punched cards" in the hope that computer control might replace the skilled judgment of those laboratory workers trained to adjust the density and alignment of a Technicolor print's translucent color layers.[24] Though the proposal in question failed, the timing of its appearance at the tail end of the laboratory strikes suggests its motivation. Punched-card programs promised an alternative to unruly workers: a different means of control.

The next four decades saw a cascade of management-led pushes to automate the work of reproducing images, texts, and sounds. Film laboratories, for one, used photoelectric cells to gauge density and punched tape to adjust exposure.[25] In exhibition, automatic reel changes introduced the "unmanned" projection booth and paved the way for digital projection.[26] Computer-controlled switching of recordings for broadcast transformed television and radio broadcasting.[27] Printing, particularly of newspapers, saw the most visible struggles over media automation. Starting in the early 1940s,

23. A group of rogue laboratory technicians in Chicago, which included then-lab technician Haskell Wexler, managed to get the film printed. James J. Lorence, *The Suppression of Salt of the Earth: How Hollywood, Big Labor, and Politicians Blacklisted a Movie in Cold War America* (University of New Mexico Press, 1999), 3, 113.

24. John M. Andreas to L. M. Dearing, "Matrix Printer Register Devices," Technicolor Motion Picture Corporation Inter-Office Correspondence, April 16, 1947, box 148, folder 21, John M. Andreas Collection, George Eastman Museum.

25. Genevieve Yue, *Girl Head: Feminism and Film Materiality* (Fordham University Press, 2021); and John Powers, *Technology and the Making of Experimental Film Culture* (Oxford University Press, 2023).

26. Richard Wallace and Jon Burrows, *Reel Change: A History of British Cinema from the Projection Box* (Indiana University Press, 2022).

27. Andy Kelleher Stuhl, "Radio Automation: Sonic Control in American Broadcasting," in *The Routledge Companion to Radio and Podcast Studies*, ed. Mia Lindgren and Jason Loviglio (Routledge, 2022), 459–468.

computerized typesetting and photocomposition techniques threatened to make the crafts of composition, photoengraving, and presswork obsolete.[28] Printers controlled the last step of production, giving them enormous power over the flow of information.[29] Returning from a walkout in 1973, *Washington Post* pressmen physically scratched the paper's front page printing plate so as to "obliterate the first sentence of the article on the labor dispute, which said that edition of the *Post* was printed without the help of union printers." The incident, *Washington Post* journalist Bob Kaiser wrote in 1977, "strengthened the company's conviction that it had lost control" over production and further encouraged computerization.[30]

Corporations described this as technological progress. Automation, executives claimed, would increase access, personalize content, and offer ever more perfect image and sound. The ideologies Adorno and Horkheimer indict in "The Culture Industry" remain intact decades later, offering an upside-down image of the real conflicts driving technological change. New forms of digital automation threaten still more kinds of media labor, with the same froth about technological progress. Privately owned, black-boxed platforms claim to facilitate effortless and near-instantaneous content production and dissemination, while critics point urgently to the human labor powering these platforms.[31] Shaoling Ma has argued that a "Marxist media theory" adequate to our present moment should, among other tasks, develop a materialist account of modern media's just-in-time connectivity and its role in global capitalism's mode of production.[32]

In this context, it is worth reassessing our narratives of digital media's emergence. Recent work in media studies has taught us that digital networks arrived on the scene already entangled with centuries of communications infrastructure.[33] But it is also worth noting that computation infiltrated mass media's production and distribution infrastructure long before the emergence of "new media."[34] Analog media production incorporated punched tape and computerized controls into some processes as early as the late 1940s, and it often did so in order to destroy labor power and capture

28. J. Dakota Brown, *Typography, Automation, and the Division of Labor: A Brief History* (Other Forms, 2019), https://www.jdakotabrown.net/writing/automation-pamphlet-2019.

29. Elizabeth MacIver Neiva, "Chain Building: The Consolidation of the American Newspaper Industry, 1953–1980," *Business History Review* 70, no. 1 (Spring 1996): 4–9, https://doi.org/10.2307/3117218.

30. Robert G. Kaiser, "The Strike at *The Washington Post*," *Washington Post*, February 29, 1976, G3.

31. Lilly Irani, "The Cultural Work of Microwork," *New Media & Society* 17, no. 5 (2015): 720–739, https://doi.org/10.1177/1461444813511926; and Sarah T. Roberts, *Behind the Screen: Content Moderation in the Shadows of Social Media* (Yale University Press, 2019).

32. Shaoling Ma, "Asia in Loops: Marxist Media Theory," paper presented at the Society for Cinema and Media Studies conference, Chicago, Illinois, April 2025.

33. Nicole Starosielski, *The Undersea Network* (Duke University Press, 2015); and Tung-Hui Hu, *A Prehistory of the Cloud* (MIT Press, 2015).

34. Computing, moreover, has often relied on cinematic and photographic media. Kyle Stine, "The Coupling of Cinematics and Kinematics," *Grey Room* 56 (2014): 34–57, https://doi.org/10.1162/GREY_a_00149.

key "vectors" of information flow.[35] The material conditions of visual mass production at mid-century thus explain not what the digital is, but *why* digital media came to be. Its decentralized modes of distribution have further concentrated economic power and left human beings powerless to stop the reproduction of images.

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35. See James Malazita's contribution to this In Focus dossier: James Malazita, "Rendered Topological: Virtual Geometry as Vectoralism in the Unreal Engine," *JCMS: Journal of Cinema and Media Studies* 65, no. 1 (Fall 2025).