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From Information Theory to French Theory: Jakobson, Lévi-Strauss, and the Cybernetic Apparatus

Bernard Dionysius Geoghegan

In his 1962 masterpiece of structural analysis, *The Savage Mind,* Claude Lévi-Strauss set about overturning the centuries-old belief that European scientific and technical reasoning, by dint of its rational and well-ordered procedures, was superior to "primitive thought." Lévi-Strauss did not appeal for paternalistic tolerance towards subaltern cultures, however, nor did he tout the situated or local character of native knowledge. Instead, he celebrated the great genius of the savage mind to have long ago recognized and understood what Western scientists working in the field of information theory had only recently discovered: the world is organized into a discrete series of signals and messages that invite our recognition and interpretation.[1] In treating animals, plants, and other aspects of the natural world as a system of obscure signs, the savage mind had discovered "prin-

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Translations, unless otherwise noted, are my own.

1. See Claude Lévi-Strauss, *The Savage Mind* (Chicago, 1962); hereafter abbreviated *SM.* Throughout the book, Lévi-Strauss developed the premise that primitive cultures comprised a system of codes, messages, and relays. See in particular pp. 267–69.

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ciples of interpretation whose heuristic value and accordance with reality have been revealed to us [Westerners] only recently through very recent inventions: telecommunications, computers, and electron microscopes" (*SM,* p. 268).[2] Lévi-Strauss explained that after centuries of division between civilized and savage man, the tools of the former had at last verified the intuitions of the latter. "The entire process of human knowledge," he declared, "thus assumes the character of a closed system" (*SM,* p. 269).

Any information theorist who stumbled upon Lévi-Strauss's assertions would have likely responded with astonishment. At the time, information theory was a subfield of communication engineering dedicated to the study of how improved encryption codes enabled more efficient and error-resistant data transmission. Associations with digital computing and cybernetics brought wider renown and interest in information theory, but, apart from a few emerging applications in satellite communications, it was an area of mostly hypothetical inquiry for a small and specialized community of engineers.[3] How is it that the father of French structuralism came to celebrate the instruments and techniques of digital media as agents of a grand reconciliation between Western and primitive cultures?

The answer to this question involves an investigation into the history of media, technology, global science, and the assembly of what I term the *cybernetic apparatus.* With the term *apparatus* I have two interrelated phenomena in mind. First, from the 1940s through the early 1960s, Lévi-Strauss and his collaborator, the Russian linguist Roman Jakobson, hailed the potential of recently developed media instruments and techniques to validate structural research and modernize the human sciences.[4] In this regard,

2. See Lévi-Strauss, *La Pensée sauvage* (Paris, 1962), p. 356.

3. See James L. Massey, "Deep-Space Communications and Coding: A Marriage Made in Heaven," in *Advanced Methods for Satellite and Deep Space Communications: Proceedings of an International Seminar Organized by Deutsche Forschungsanstalt für Luft- und Raumfahrt (DLR), Bonn, Germany, September 1992,* ed. Joachim Hagenauer (Berlin, 1992), pp. 1–17.

4. I am using the more Continental term *human sciences* (French: *les sciences humaines*; German: *Geisteswissenschaften*) rather than *humanities and social sciences* to more precisely designate the historically specific epistemological formation that interested Roman Jakobson, Lévi-Strauss, and their patrons at the Rockefeller Foundation and MIT. The term *human*

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the cybernetic apparatus refers to instruments and techniques—including mathematical procedures, diagrammatic strategies, and technologies—that acted as material aids or guides to research. Second, I refer to how the politics of knowledge enabled these material instruments and techniques to morph into ostensibly immaterial ideals that furnished researchers with procedures for investigations unhindered by historical, political, or disciplinary difference.[5] This transmutation enabled the strategic alliance of researchers and institutions across disciplinary, political, and national borders—the instrumentalization of research communities—by reference to the quasitranscendental powers of cybernetic instruments.[6] This paper seeks to explain how the blurring of these potentially distinct types of apparatus—an instrument on the one hand, a strategic convention of heterogeneous actors on the other—enabled the construction of the cybernetic apparatus. The resulting history offers a repertoire of sources, methods, and perspectives for recognizing how this apparatus yoked together the development of "French" theory, media studies, informatics, and global science. The appeal of poststructural theories within the United States during the 1980s and 1990s owes much to this neglected history. Considering recent university-level efforts to reconceive the humanities in light of digital media, this revisionist history may prove timely.

By invoking the term *apparatus,* I am adapting recent translations of what Michel Foucault referred to as *dispositif.*[7] This term has caused no

sciences and its French and German equivalents also provides a useful reminder of how humane, spiritual, and scientific aspects of research are interwoven.

5. On the ideological development of cybernetics as a "neutral" conceptual framework for unifying research across disciplines, see Steve Heims, *The Cybernetics Group* (Cambridge, Mass., 1991); Geof Bowker, "How to Be Universal: Some Cybernetic Strategies, 1943–70," *Social Studies of Science* 23 (Feb. 1993): 107–27; Slava Gerovitch, *From Newspeak to Cyberspeak: A History of Soviet Cybernetics* (Cambridge, Mass., 2002); and Michael Hagner, "Vom Aufstieg und Fall der Kybernetik als Universalwissenschaft," in *Die Transformation des Humanen: Beiträge zur Kulturgeschichte der Kybernetik*, ed. Hagner and Erich Hörl (Frankfurt am Main, 2008), pp. 38–71.

6. On the strategic aspects of cybernetics, particularly its covert militarism, see Peter Galison, "The Ontology of the Enemy: Norbert Wiener and the Cybernetic Vision," *Critical Inquiry* 21 (Autumn 1994): 228–66; Paul N. Edwards, *The Closed World: Computers and the Politics of Discourse in Cold War America* (Cambridge, Mass., 1996); and Jennifer S. Light, *From Warfare to Welfare: Defense Intellectuals and Urban Problems in Cold War America* (Baltimore, 2003), pp. 55–91.

7. Michel Foucault's most lengthy discussion of the *dispositif*, a chapter entitled "Le Dispositif de sexualité," can be found in *Histoire de la sexualité 1: La Volonté de Sa*voir (France, 1976), pp. 99–173. See volume 1 of Foucault, *The History of Sexuality,* trans. Robert Hurley, 3 vols. (New York, 1978), pp. 77–131. Recent translators have preferred the term *apparatus.* See discussions of security apparatuses in Foucault, *Security, Territory, Population: Lectures at the Collège de France 1977–1978,* trans. Graham Burchell, ed. Michael Senellart (New York, 2007),

small amount of vexation for translators, as the term may be rendered in English as mechanism, device, deployment, or even disposition. According to Foucault himself, *dispositif* designated a strategic system of relations established among a heterogeneous ensemble. Institutions, architecture, scientific and moral statements, and instruments were among elements that, in response to an urgent need, might be organized into an apparatus.[8] Positing the existence of such a *dispositif* provided a rubric to examine the strategies that forge relations among difference and shape forms of knowledge.

The English term *apparatus* conflates *dispositif* with another French term, *appareil*, which may connote an instrument or tool. Rather than rendering these twists and turns of translation transparent, I would prefer to exploit them to thematize an aforementioned ambiguity characteristic not only of the cybernetic apparatus but of much media-related inquiry and commentary: that is, the ability of material instruments *(appareils)* to transform into epistemological figures that coordinate, suspend, or rationalize difference *(dispositifs)*. This conceptual movement was already evident in the passage by Lévi-Strauss cited above: in one breath Lévi-Strauss celebrates the power of new instruments—telecommunications, computers, electronics—to reveal the organization of the world in discrete signals, and in the next he celebrates these instruments and their ability to organize a "closed system" of transcultural and transdisciplinary human knowledge. Film theorists, historians of the book, and other scholars of media history are familiar with this tendency of media *appareils* to transform into *dispositifs* that seemingly reorganize or rationalize knowledge.[9]

It might be objected that these two terms deserve distinct demarcation; however this conjunction of distinct phenomena within a single English term—*apparatus*—poetically realizes that peculiar disunity-in-unity that characterizes Foucault's use of the term *dispositif*. Moreover, this exploitation of semantic dislocation thematizes a kind of productive terminological slippage between languages and disciplines that was the condition

pp. 6–23. See also Foucault, "The Confession of the Flesh," *Power/Knowledge: Selected Interviews and Other Writings 1972–1977*, trans. Colin Gordon et al., ed. Gordon (New York, 1980), esp. pp. 194–98, and the enlightening discussion of this term in Frank Kessler, "Notes on Dispositif" (2006), www.let.uu.nl/~Frank.Kessler/personal/notes%20on%20dispositif.pdf.

8. See Foucault, "The Confession of the Flesh," pp. 194–98.

9. For the classic account of this problem in film studies, see Jean-Louis Baudry, "Ideological Effects of the Basic Cinematographic Apparatus," in *Narrative, Apparatus, Ideology: A Film Theory Reader*, trans. Alan Williams, ed. Philip Rosen (New York, 1986), pp. 286–98. On the construction of "fixity" in printed books as a condition or property of rational, scientific knowledge, see Adrian Johns, *The Nature of the Book: Print and Knowledge in the Making* (Chicago, 1998), pp. 628–37.

of possibility for the cybernetic apparatus. I believe that recognizing this conceptual blurring and providing an account of it as a strategy of knowledge contributes towards the development of a more comprehensive account of what a *dispositif* is by focusing inquiry upon what *dispositifs* do.[10]

The concept of a cybernetic apparatus also resolves two difficulties facing recent studies on cybernetics and the human sciences. First, most of these texts have focused on cybernetic or informational discourse. As a result, a vast apparatus of scientific production, including instruments, laboratories, and institutional arrangements, disappears from the historical picture and is replaced by hermeneutics and language.[11] The second, related problem concerns the thorny problems of influence and conceptual coherence. Historiographers have often stumbled or leaped over the gap between natural scientists' and human scientists' respective understandings of cybernetics. More cautious scholars have inventoried insurmountable contradictions between cybernetics as it was invoked by engineers and human scientists respectively,[12] while scholars of a more synthetic mindset have run roughshod over these distinctions to argue that the dissemination of cybernetic terminology across the disciplines in the 1950s and 1960s marked the global consolidation of knowledge within a

10. In this regard, the present paper extends and reframes analyses undertaken in Gilles Deleuze, "What Is a 'Dispositif'?" *Michel Foucault, Philosopher*, trans. and ed. Timothy Armstrong (New York, 1992), pp. 159–68, and Giorgio Agamben, *"What Is an Apparatus?" and Other Essays*, trans. David Kishik and Stefan Pedatella (Stanford, Calif., 2009), pp. 1–24.

11. See John Johnston, *The Allure of Machinic Life: Cybernetics, Artificial Life, and the New AI* (Cambridge, Mass., 2008), pp. 65–103; and Lydia H. Liu, "The Cybernetic Unconscious: Rethinking Lacan, Poe, and French Theory," *Critical Inquiry* 36 (Winter 2010): 288–320. Both brilliantly explicate Lacan's commentaries on cybernetics in "The Seminar on 'The Purloined Letter,'" but speculate widely on the origins of Lacan's commentaries rather than directly discuss the well-known cybernetic automata built by Claude Shannon and David Hagelbarger, which inspired Lacan's comments. This neglect of concrete instruments *(appareils)* is complemented by largely overlooking the concrete strategic, historical, and institutional arrangements *(dispositifs)* that introduced Lacan to cybernetics: that is, research programs funded by the CIA and the Rockefeller Foundation (discussed below). Such omissions of instruments and institutional arrangements are typical of a more general tendency in literary studies and philosophy to reduce technologies to figures of writing. On this tendency, see Mark Hansen, *Embodying Technesis: Technology beyond Writing* (Ann Arbor, Mich., 2000). For a notable exception to this tendency within the historiography of cybernetics, see Lily E. Kay, *Who Wrote the Book of Life? A History of the Genetic Code* (Stanford, Calif., 2000), esp. pp. 294–325.

12. See Ronan Le Roux, "Lévi-Strauss, une réception paradoxale de la cybernétique," *L'Homme* 189 (Jan.–Mar. 2009): 165–90. See also Jürgen Van de Walle, "Roman Jakobson, Cybernetics and Information Theory: A Critical Assessment," *Folia Linguistica Historica* 29 (Dec. 2008): 87–123. For a scrupulous and comparative account of Lévi-Strauss's structural anthropology and cybernetics, see Christopher Johnson, *Claude Lévi-Strauss: The Formative Years* (New York, 2003), esp. pp. 93–97. I owe a special debt of gratitude to Johnson for not only his text but also his helpful suggestions for my own.

unified cybernetic or informational paradigm.[13] The underlying difficulty confronting both of these approaches—the focus on discourse and the search for regularity (or lack thereof)—stems from an underlying quest for unity or identity within the language and material of cybernetics. However, as recent literature in media studies, the history of science, and literary studies has shown, it was disunity and heterogeneity—discursive, conceptual, material, artifactual, ideological—that constituted cybernetics's peculiar strength and attraction in diverse contexts.[14] What is needed, then, is a method that designates this diversity as an ensemble of differences without reducing those differences to any master trope (for example, situatedness, the literary, the corporeal, the discursive).

An inquiry into the cybernetic apparatus, rather than establishing consistency among material or meanings, examines how such heterogeneities came to operate together. Without resorting to a homogeneous scientific or economic base, a heterogeneous variety of projects, materials, and sites can be allied with one another, even as their disparate agendas may continue to be pursued with relative autonomy. The historiographical research question, then, shifts from what cybernetics is to what strategies and needs organized its articulation and what characterized the knowledge that resulted from this alliance.

13. See in particular Jérôme Segal, *Le Zéro et le un: Histoire de la notion scientifique d'information au 20e siécle* (Paris, 2003), and Céline Lafontaine, *L'Empire cybernétique: Des machines à penser à la pensée machine* (Paris, 2004). Whereas the former celebrates the consolidation of global knowledge around the figure of information, the latter decries it as evidence of global oppression.

14. This expansive literature can only be selectively represented here. On diversities internal to cybernetics itself, see Ronald Kline, "Where Are the Cyborgs in Cybernetics?" *Social Studies of Science* 39 (June 2009): 331–62 and "The Disunity of Cybernetics," unpublished talk; and Claus Pias, "Zeit der Kybernetik," in *Cybernetics - Kybernetik 2: The Macy-Conferences 1946–1953,* ed. Claus Pias, 2 vols. (Berlin, 2004), 2:9–41. On the diverse definitions of information and shifting problematics within cybernetics, see N. Katherine Hayles, *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics* (Chicago, 1999), pp. 50–83 and 131–59, and regarding information specifically, see Hansen, *New Philosophy for New Media* (Cambridge, Mass., 2004), pp. 47–92. On the intersections of scientific, militaristic, and countercultural forces within cybernetics, see Fred Turner, *From Counterculture to Cyberculture: Stewart Brand, the Whole Earth Network, and the Rise of Digital Utopianism* (Chicago, 2006), and Andrew Pickering, *The Cybernetic Brain: Sketches of Another Future* (Chicago, 2010). On diverse origins and deployments of cybernetics, see David A. Mindell, *Between Human and Machine: Feedback, Control, and Computing before Cybernetics* (Baltimore, 2002); Philip Mirowski, *Machine Dreams: Economics Becomes a Cyborg Science* (Cambridge, 2002); Orit Halpern, "Dreams for Our Perceptual Present: Temporality, Storage, and Interactivity in Cybernetics," *Configurations* 13 (Spring 2005): 283–319; and Eden Medina, *Cybernetic Revolutionaries: Technology and Politics in Allende's Chile* (forthcoming). The most comprehensive portraits of cybernetics' diversity can be found in two edited collections: *Die Transformation des Humanen* and Pias, *Cybernetics - Kybernetik 2.*

The Rockefeller Foundation, Media Theory, and a "World-Wide Fraternity of Scientists"

Jakobson's and Lévi-Strauss's interest in cybernetics and information theory developed during the course of their association with the Rockefeller Foundation, a benefactor of science and a strong promoter of research in cybernetics and media studies. Officers at the Rockefeller Foundation saw these areas of research as intertwined aspects of a program for world-wide scientific reform based on the cultivation of expert-driven rational solutions to social and political problems.[15] These programs aimed at substituting partisan political conflict with calm scientific reflection founded upon impartial instruments and techniques. As Warren Weaver, director of the foundation's Natural Sciences Division, explained in a 1933 memorandum entitled "The Benefits from Science—The Foundation Program,"

> there is no more effective enemy of passion and prejudice than the calm temper of the scientific mind. It is claimed by slow absorption into the intellectual habits of large groups of individuals, science is a leading influence in the development of a factual outlook, of a healthy and flexible skepticism, and of objectivity and tolerance in the appraisal of evidence. . . . [In addition], there is the contribution to international friendliness and understanding that results from a world-wide fraternity of scientists with their unifying bond of impersonal and unselfish interest and understanding.[16]

Weaver's vision of science found its origins in Robert Boyle's seventeenth-century ideal of science as an honorable practice carried out among gentlemen who, equipped with the proper experimental and technical means, produced truths in peaceful retreat from the contentious public sphere.[17] However, whereas Boyle turned towards judgment, witness, and eloquence as the source of an impersonal bond among scientists, the Rockefeller Foundation followed a wider trend in nineteenth- and twentieth- century liberalism that embraced the rationality and orderli-

15. See Mark Dowie, *American Foundations: An Investigative History* (Cambridge, Mass, 2001), esp. pp. 27–28, 56–57, and 107, and Edward H. Berman, *The Ideology of Philanthropy: The Influence of the Carnegie, Ford, and Rockefeller Foundations on American Foreign Policy* (Albany, N.Y., 1983), pp. 11–40.

16. Warren Weaver, "The Benefits from Science—Science and Foundation Program—The Proposed Program," 27 Jan. 1933, Rockefeller Foundation Collection, record group 3.1, series 915, box 1, folder 6, Rockefeller Archive Center (RAC), Sleepy Hollow, New York.

17. See Steven Shapin and Simon Schaffer, *Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life* (Princeton, N. J., 1985).

ness of modern technologies as the guarantors of reason.[18] Officers referred to legal systems, the mass media, governments, social welfare, and hygiene services as varying types of "social technology" and likened social scientists to engineers whose task it was to identify and develop mechanisms for their control.[19] Rockefeller social science substituted political strife and class difference, as well as the scientist's powers of judgment and witnessing, with technologies of control.[20]

In 1936 the Rockefeller Foundation officers introduced this focus on impersonal scientific methods and technological instruments into its programs for research in the human sciences. Support for research in philology, exegesis, and hermeneutics was suspended in favor of applied research associated with mass communications and mechanical reproduction.[21] President Raymond Fosdick explained,

> there is undoubted value for scholars in a dictionary of Indo-European synonyms and in an exegetical commentary on the fourth book of Virgil's Aeneid . . . but . . . in this mechanized age, something more than this is needed, some method by which the esthetic and spiritual meanings of human life can be interpreted over wider areas.[22]

Within the framework of Rockefeller-funded programs researchers, including I. A. Richards, Paul Lazarsfeld, Theodor Adorno, and Siegfried Kracauer, founded archives of cinema and photography, developed techniques of content analysis for interpreting broadcasts, deployed microphotography technologies at American and European libraries, and developed proposals to educate the public by film and radio. These pro-

18. I owe this insight to John P. McCormick, *Carl Schmitt's Critique of Liberalism: Against Politics as Technology* (New York, 1997). McCormick's account of Schmitt's political writings has inestimable value for historians of media, science, and technology and will hopefully facilitate a wider engagement with Schmitt's work.

19. On social technology, see, for example, "Social Technology," 1927, in "Program and Policy—Reports—Pro 1–4—1914, 1927," record group 3.1, series 910, box 2, folder 10, RAC; and regarding the engineering metaphor, see Raymond Fosdick, *The Story of the Rockefeller Foundation* (New York, 1952), p. 194.

20. These programs were not always successful. Theodor Adorno's rancorous disputes with Paul Lazarsfeld over the administrative thrust of the Rockefeller-funded Princeton radio studies are an example of the difficulties uniting or bridging diverse methodologies and communities.

21. On the interweaving of the Rockefeller Foundation agendas in the natural and human sciences during this period, see Kay, *The Molecular Vision of Life: Caltech, the Rockefeller Foundation, and the Rise of the New Biology* (New York, 1993), pp. 22–57. On the Rockefeller-funded media research programs, see Brett Gary, "Communication Research, the Rockefeller Foundation, and Mobilization for the War on Words, 1938–1944," *Journal of Communication* 46 (Summer 1996): 124–48.

22. Raymond Fosdick, "President's Review," in *The Rockefeller Foundation Annual Report: 1936* (New York, 1937), p. 42.

grams assimilated European scientists displaced by World War II into an interdisciplinary scientific apparatus, which it was expected they would perpetuate and expand in their home countries after the war.[23] The focus on new media gadgetry often troubled their participants' intellectual sensibilities, as Fosdick both acknowledged and dismissed when he later commented, "foreign scholars in the humanities, as well as scholars here in the United States, occasionally show some impatience with what they think is the overemphasis of American students on the tools of research. . . . [But] where is the line that can be sharply drawn between technology and content?"[24]

The Ecole Libre and Instrumental Knowledge

Just a short distance from the New York-based institutes where Germanophone scholars undertook wartime communications research with the patronage of the Rockefeller Foundation, a community of Francophone researchers developed an alternative approach to the study of communications. Among them was the Hungarian semiotician Thomas Sebeok, the American linguist Charles Hockett, Lévi-Strauss, and their mentor Jakobson, with whom they studied at the Ecole Libre des Hautes Etudes (a Rockefeller-funded Francophone university-in-exile). They also variously contributed to *The Linguistic Circle of New York* or the journal *Word*, Jakobson's organs for the promotion of structural linguistics within the United States. Jakobson initiated them into a version of structural linguistics that he and his colleagues in the Prague Linguistic Circle had developed during the 1920s and 1930s. Their approach, based on the posthumously published lectures of Swiss linguist Ferdinand de Saussure,[25] defined language as a "tool of communication" and argued for a conception of language as a system of differentially distinguished sounds they termed phonemes.[26] Saussure had defined phonemes as bundles of "dis-

23. Regarding plans for scholars' return to Europe, see the records of a meeting between Rockefeller officers and Alvin Johnson of the New School for Social Research, 19 Sept. 1941, folder "Launching/Inauguration of the Ecole Libre," box 3 of the Ecole Libre Papers, New School for Social Research Library, New York City. For a more general overview of these programs' strategic design, see *The "Unacceptables": American Foundations and Refugee Scholars between the Two Wars and After,* ed. Giuliana Gemelli (Brussels, 2000).

24. Fosdick, *The Story of the Rockefeller Foundation* (New Brunswick, N.J., 1989), p. 245.

25. Subsequently, Jakobson revised lectures from one of his courses at the Ecole Libre and published them as Roman Jakobson, *Six Lectures on Sound and Meaning,* trans. Mepham (Cambridge, Mass., 1978). The introduction by Lévi-Strauss offers a vivid portrait of the setting and importance of this course for himself and the other auditors.

26. See ibid., esp. pp. 23–43. On language as a tool of communication, see Jakobson, "Efforts toward a Means-Ends Model of Language in Interwar Continental Linguistics," *On Language*, ed. Linda R. Waugh and Monique Monville-Burston (Cambridge, Mass., 1990), p. 58.

tinctive features" (vocalic, consonantal, nasal, strident, stressed, and so on) that differentially distinguished one phoneme from another. Jakobson adjoined to this approach an especial interest in studying phonemes in light of the purposefulness that guides language use. According to Jakobson, to offer a structural explanation of language demanded an account of how elementary patterns of oppositions among phonemes organized a system of language and shaped the genesis of meaning.

Jakobson's stay in New York enabled him to elaborate a fully technicist approach to language concretized and corroborated by the instruments of communications engineering. This amounted to both an extension and revision of structural linguistics, as it had developed in Europe. Already in the *Course in General Linguistics* (1916) Saussure had characterized the organs for the production of speech as a "vocal apparatus *[appareil]*" (fig. 1) and promoted the use of film to develop a scientific technique to study the articulations of sounds.[27] However, Saussure balanced these instrumental overtures with a sharp delineation between the apparatus for the production or study of speech and the material of speech itself. As Saussure put it in one lecture, the "vocal organs are as external to language *[la langue]* as the electrical apparatus which is used to tap out Morse code is external to that code."[28]

Jakobson, by contrast, elevated modern media technologies to an epistemological precondition of structural linguistics. In his celebrated course *Six Lectures on Sound and Meaning*, he declared that new research related to "telephony, radio, and the sound film . . . and the new precision apparatuses *[appareils]* this research has engendered" had trained researchers to recognize speech itself as an object of investigation.[29] By creating durable inscriptions of ephemeral sound, these instruments presented speech as a physical object appropriate for study in its own right. Jakobson supplemented these in-class pronouncements with extracurricular field trips: in 1944, members of the Linguistic Circle visited the AT&T auditorium in Manhattan for an exhibition of the Voder (voice operation demonstrator) by Bell Labs engineers. The Voder synthesized speech by breaking it down to a series of sounds that could be assembled into sentences via a phonetic keyboard (fig. 2). Reflecting the technological design of the instruments as well as the Labs' concerns with transmitting speech as packets of telephonic sound, these devices represented speech as discrete units distributed in time. Another Bell Labs engineer later came to the École Libre to demonstrate Bell Labs' "visible speech" studies, which mapped out speech

27. Ferdinand de Saussure, *Course in General Linguistics*, trans. Wade Baskin, ed. Charles Bally and Albert Sechehaye, (New York, 1959), p. 41.

28. Ibid., p. 18; trans. mod.

29. Jakobson, *Six Leçons sur le son et le sens* (Paris, 1976), p. 34.

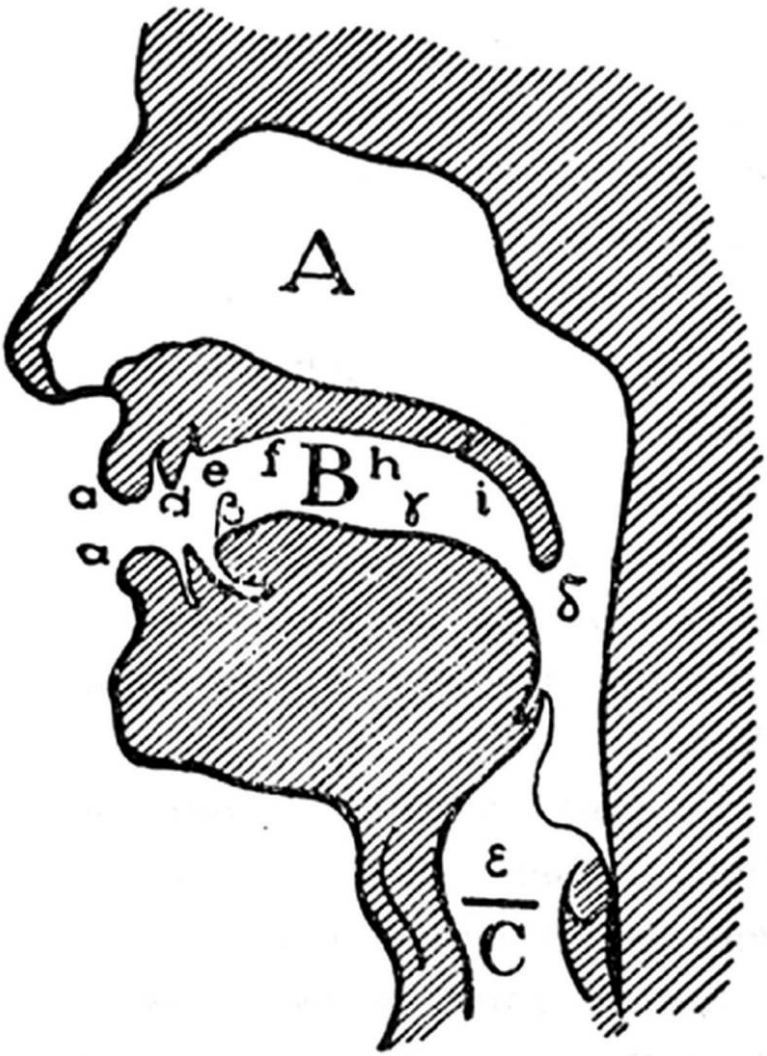

FIGURE 1. Diagram of "the Vocal Apparatus," Ferdinand de Saussure, *Cours de linguistique générale*, ed. Charles Bally and Albert Sechehaye (Paris, 1949), p. 67.

according to frequencies.[30] Jakobson argued that these devices validated Saussure's claim that language was composed of discrete and definable units.

30. See invitation cards and announcements for events held in 1944 and 1946 in Jakobson's file on the Linguistic Circle of New York, box 6, folder 74, Jakobson Papers (RJP), MIT Archives, Cambridge, Mass.

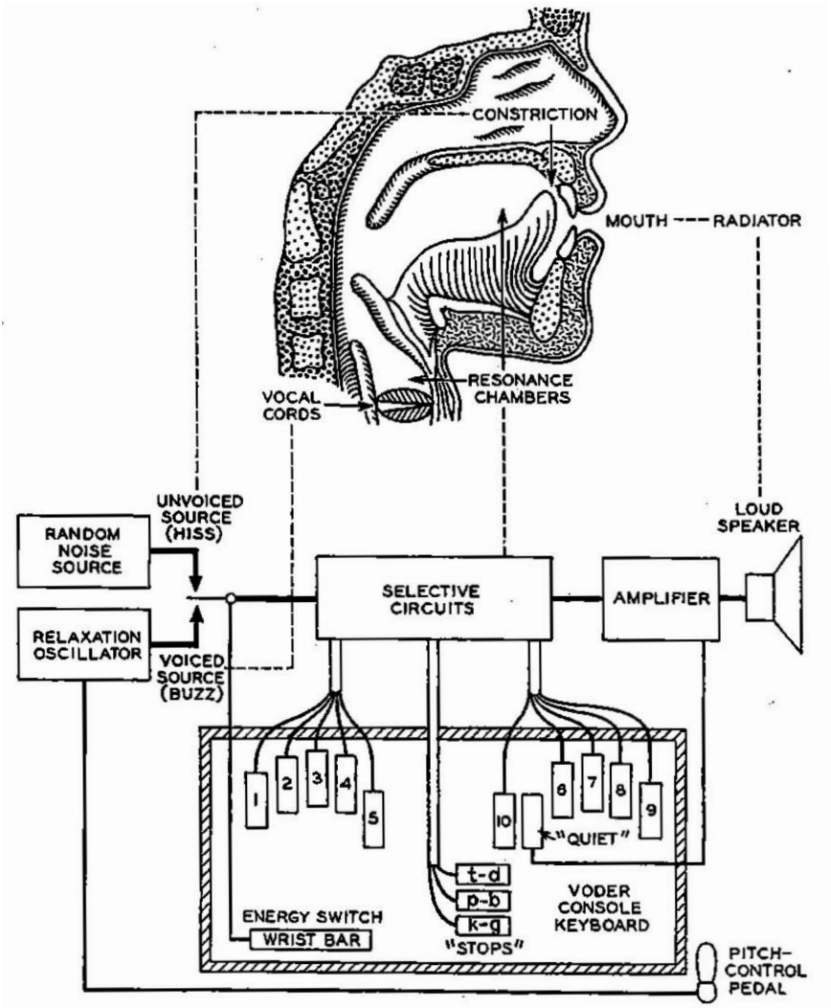

FIGURE 2. Reconceptualization of the vocal apparatus as a discrete series of instruments modeled on the Voder, from a pamphlet produced by the Bell Labs System for exhibitions of the Voder (box 6, folder 74, RJP).

Lévi-Strauss—who had contributed to wartime propaganda broadcasts and who was a neighbor of information theorist Claude Shannon in the early forties[31]—may have been the first to recognize the power of these

31. On his wartime propaganda work, see Stephen Rudy, "Jakobson et Lévi-Strauss à New York (1941–1945), and Those Infamous Cats," in *Claude Lévi-Strauss*, ed. Michel Izard (Paris, 2004), pp. 120–24. On Shannon as his neighbor, see Lévi-Strauss and Didier Eribon, *Conversations with Claude Lévi-Strauss*, trans. Paula Wissing (Chicago, 1991), p. 30.

instruments not only to provide durable and empirical inscriptions of sound but also to create formal models and objects for organizing research communities into a strategic apparatus. He later wrote:

> in the realization of apparatuses *[appareils]* to synthesize speech, such as the famous Voder (the predecessor of a line of more perfect apparatuses [dispositifs]), as well as in the theoretical form [*mise-en-forme,* literally "put-in-form"] of intellectual methods that regulate the work of communication theorists (first presented systematically by the engineer and mathematician Claude Shannon), one recognizes some of the great interpretive theories reached by linguistics. These include the recognition that communication between men rests upon the combination of ordered elements, that in each language the possibilities of combination are regulated by an ensemble of compatible and incompatible combinations, and finally, that the freedom of discourse, such as it is defined within the limits of its own rules, is restrained in time to certain probabilities.[32]

While he claimed to *recognize* the findings of structural linguistics within the instruments and theories of Bell Labs engineers, a conceptual movement in the other direction manifested itself; Lévi-Strauss and his colleagues came to argue that the durable instruments, inscriptions, and theoretical forms of telephone engineers revealed the essential nature of language. As these instruments and theories had regulated the work of engineers, they now transformed language itself into a technologically ordered series around which a new apparatus of human scientists could be convened.

Jakobson's Linguistic Input and Cybernetic Output

In a little-noticed policy change that had (and continues to have) seismic effects upon the configurations of media research and theory across the United States and Europe, after World War II the Rockefeller Foundation suspended its support for communications research devoted to mass media and mechanical reproduction in favor of research modeled on cybernetics and communication engineering. Textual, historical, and critical inquiries, such as those developed by Adorno and Kracauer, were put aside in favor of functionalist and ahistorical approaches that more closely resembled the structuralist approach developed by Jakobson and his colleagues. This funding shift took place during two reconfigurations at the Rockefeller Foundation. The first change concerned personnel; following

32. Lévi-Strauss, "Introduction: Les Mathématiques de l'homme," *Bulletin International des Sciences Sociales* 6, no. 4 (1954): 644.

the war, the administration of the foundation came to be dominated by personnel with experience in telecommunications research. In 1948, Chester Barnard, a former president of the New Jersey Bell Telephone Company, succeeded Raymond Fosdick as president of the Rockefeller Foundation. Charles Fahs, a linguist who contributed towards wartime propaganda research, was appointed associate director of the Humanities Division in 1949 and full director in 1950. Weaver remained head of the natural sciences, but during the war he had supervised Shannon's and Wiener's seminal studies that founded mainstream information theory and cybernetics, respectively. Weaver devoted himself to promoting these fields after the war. The second change concerned agenda; as World War II receded and the cold war advanced, the officers at the Rockefeller Foundation sought to remake Weaver's "world-wide fraternity of scientists" in a pro-American and anti-Soviet mold. The foundation turned towards its exiled scholars to provide guidance. In 1948 Fahs invited Jakobson to prepare a survey of worldwide linguistics.[33] Jakobson enthusiastically agreed to take on the assignment and to travel Europe to gather findings. Sensitive to the emerging geopolitical arrangements and the special role science would play as an ambassador for American interests, Jakobson assured Fahs that his trip to Europe would be "a very important [opportunity] for informing the international scholarly world about the intensive American scientific activity."[34]

Following Jakobson's initial report, Fahs, Weaver, and other officers scheduled a meeting with Jakobson for 22 December, 1949 to discuss undertaking a larger study.[35] A week before the meeting, Weaver mailed Jakobson a copy of *The Mathematical Theory of Communication,* coauthored by Shannon and Weaver, which included proposals for the application of information theory to the human sciences. The book had an immediate impact on Jakobson's conceptions for future research. He responded that "as I continue to work on the problems of sound and meaning I realize still more the decisive influence of your and Shannon's book."[36] Jakobson introduced interdisciplinary collaborations, mediated by cybernetic instruments and techniques, into his research. "The basic thing," he explained in a letter to Fahs," "is the necessity of a common

33. Charles B. Fahs also enlisted Charles Hockett and Emile Benveniste in their global reevaluation of linguistics. Sebeok, meanwhile, accepted a position as a consultant to the US State Department. Lévi-Strauss accepted posts at the French Embassy and then UNESCO.

34. Jakobson, letter to Fahs, 9 Oct. 1948, box 6, folder 37, RJP.

35. For an excerpt of that report, see Jakobson, "Current Issues of General Linguistics," *On Language*, pp. 56–60.

36. Jakobson, letter to Weaver, 14 Feb. 1950. box 6, folder 37, RJP.

effort to uncover the essence of communication and the possibility of solving this problem by using the refined devices which different branches of science offer at the present time."[37] In a subsequent letter to Fahs he elaborated:

> I fully agree with W. Weaver that "one is now, perhaps for the first time, ready for a real theory of meaning," and of communication in general. The elaboration of this theory asks for an efficacious cooperation of linguists with representatives of several other fields such as mathematics, logic, communication engineering, acoustics, physiology, psychology and the social sciences. Of course when this great collective work will be fulfilled it will mean a new epoch indeed.[38]

Jakobson named Wiener, MIT's Research Laboratory of Electronics, and Harvard's Psycho-Acoustic Laboratory as collaborators on a new project to use Shannon's statistically based communication theory to analyze the distribution and frequency of phonemes in Russian.

The focus on Russian, specifically, transformed Jakobson's proposal from what one might term a nascent actor-network that enrolls various actors into a common program within what Foucault termed a *dispositif*, or an ensemble of relations strategically ordered to address an urgent problem. In this case, the Soviet threat provided that organizing problem. Jakobson predicted that his study would furnish American diplomats with instructive resources for understanding the Soviet mind, as well as useful educational materials for American students of Russian. He also anticipated scientific results that would rebuke Communist ideology on the international stage of science:

> An exhaustive description and analysis of present-day standard Russian, using all the achievements of the modern American and West European science of language and neighboring disciplines, would show to the international cultural world an achievement which Soviet Russian scholarship, terrorized by doctrinary purges and paralyzed by a narrow-minded unproductive official bias, is unable to accomplish. We consider this a dignified answer to the empty national self-congratulations of Moscow official science and to its furious attacks against the alleged impotent scholarship of the present-day West.[39]

37. Jakobson, letter to Fahs, 19 Dec. 1949, box 6, folder 37, RJP.
38. Jakobson, letter to Fahs, 22 Feb. 1950, box 6, folder 37, RJP.
39. Ibid.

By leveraging American and Western European (that is, non-Communist) scientific communities around emerging methods and instruments in cybernetics, Jakobson's study promised to meet a multitude of Rockefeller Foundation objectives, including the cultivation of a worldwide fraternity of scientists, the reform of the human sciences through media research and instruments, and the public humiliation of anticapitalist ideological forces.

The Rockefeller Foundation responded affirmatively to Jakobson's mixture of scientific universalism and partisan politics. In 1950 Jakobson received a $50,000 five-year grant under a new foundation humanities program in "Language, Logic, and Symbolism." An annual communiqué issued by the foundation explained that "such an analysis may facilitate the application to living languages of the mathematical theory of communication worked out by Mr. Claude E. Shannon and Mr. Warren Weaver."[40] Support for Jakobson was part of a broader program to overhaul funding priorities in favor of useful research modeled on the tools and techniques of experimental science. Justifying this new agenda in political terms, the report explained that in present world circumstances, "the ivory tower attitude [of detached and theoretical inquiry] would be as unreasonable as the iron curtain attitude is."[41]

The Emergence of Cybernetic Structuralism

Jakobson's grant inaugurated the convention and assembly of mechanisms for articulating a strategic convergence between what might be called second-wave structuralism (post-Prague, Saussurean, Francophone leaning, and non-Bloomfieldian), the emergent cybernetics movement, and anti-Soviet political agendas. These elements were not entirely foreign to one another; Jakobson's flight from Moscow following the Russian Revolution, his early interest in research at Bell Labs, and a passing acquaintance with Wiener may be seen as prologue. The grant from the Rockefeller Foundation, however, organized and intensified relations that, until then, had been left to chance. Once Jakobson put his research apparatus in place, the hallmarks of Rockefeller programs—technocratic and instrumental inquiry, transnational and transdisciplinary collaboration, anti-Soviet dispositions in the guise of rational inquiry—developed without the active interventions of the Rockefeller Foundation officers and took root within an axis of Harvard-MIT-European collaborations. The models and objects of knowledge resulting from these collaborations encoded, rationalized,

40. *The Rockefeller Foundation: Annual Report 1951* (New York, 1952), p. 78.
41. Ibid., p. 9.

reproduced, and expanded the terrain for future collaborations between linguists and engineers, which in turn generated additional models, objects, and collaborations.

Jakobson immediately promoted his new cybernetic endeavor among his colleagues in Europe. At his request Weaver dispatched copies of *The Mathematical Theory of Communication* to Lévi-Strauss and philosopher Alexandre Koyré, both in Paris, in early 1950.[42] In May of that same year Jakobson embarked on a three-month long Rockefeller-funded tour of Europe, during which time he met and consulted with linguists Charles Ogden, Donald Fry, Louis Hjelmslev, and A. W. de Groot, as well Lévi-Strauss and Jacques Lacan.[43] Jakobson almost certainly introduced both men to the most recent developments in cybernetics and information theory. Shortly thereafter both Frenchmen introduced commentaries on cybernetics and new mathematical methods into their scholarly writings.

Back in Cambridge, Massachusetts, Jakobson reached out to MIT's Research Laboratory of Electronics (RLE), where he enlisted linguist Morris Halle and engineer Colin Cherry as collaborators in his Rockefeller-funded initiative. Together they developed an information theoretical reinterpretation of phonemic distributions and distinctions, published as "Towards a Logical Description of Russian Phonemes" (1953).[44] Using binary measures derived from information theory the authors argued that 5.38 bits of information were necessary to distinguish one phoneme from another and that all other distinguishing features transmitted by natural language were redundant. In a 1952 presentation to a gathering of anthropologists and linguists attended by Lévi-Strauss, Hockett, and Sebeok, Jakobson observed that

> for the study of language in operation, linguistics has been strongly bulwarked by the impressive achievement of two conjoined disciplines—the mathematical theory of communication and information theory. . . . It is indeed symptomatic that there was almost not a single paper uninfluenced by the works of C. E. Shannon and W. Weaver, of N. Wiener and R. M. Fano. . . . We have involuntarily discussed in terms specifically theirs, of encoders, decoders, redundancy, etc.[45]

42. Weaver, letter to Jakobson, 24 Feb. 1950, box 6, folder 37, *RJP.* See also the correspondence between Jakobson and Weaver at the RAC.

43. "Preliminary Report on Roman Jakobson's European Trip," c. July 1950, Rockefeller Foundation Collection, record group 1.2, series 200R, box 370, folder 3323, RAC.

44. See E. Colin Cherry, Morris Halle, and Jakobson, "Toward the Logical Description of Languages in Their Phonemic Aspect," *Language* 29 (Jan.–Mar. 1953): 34–46.

45. Jakobson, "Results of a Joint Conference of Anthropologists and Linguists," in *Selected Writings II: Word and Language* (Paris, 1971), p. 556; hereafter abbreviated *RJ.*

He elaborated this observation into a program for education and research by claiming that "structural linguistics and the research of communication engineers converge in their destinations" (*RJ,* p. 556) and should provide conceptual material to improve one another. Anxious not only to borrow from the hard sciences but also to give back to them, Jakobson added that "communication theory seems to me a good school for present-day linguists, just as structural linguistics is a useful school for communication engineering" (*RJ,* p. 559). Wiener substantiated this claim with laudatory comments on Jakobson's work in *The Human Use of Human Beings: Cybernetics and Society.*[46]

Jakobson made quick advances within the MIT hierarchy. He developed plans with communication engineer Leo L. Beranek and linguist William Locke, both of the RLE, to develop a book series promoting communication engineering within the humanities and social sciences.[47] Later he accepted appointments to a visiting professorship at the RLE, an editorial position on the interdisciplinary journal *Information and Control*, and a seat on the steering committee of MIT's Center for Communications Sciences.[48] (MIT engineers Shannon, Fano, and Jerome Wiesner, as well as Noam Chomsky, held appointments on these boards contemporaneously with Jakobson.) In 1957 MIT President Julius Stratton wrote to Jakobson, then visiting distinguished professor, that "we share fully your conviction that the problems of communication and language will occupy a place of increasing importance in all modern science."[49] Jakobson returned the praise. As late as 1960 he assured MIT administrators that he was continuing to promote MIT researchers' work among colleagues such as Lacan and Lévi-Strauss, as well as supporting the cold war effort through anti-Soviet scholarly activities in Eastern Europe.[50]

Jakobson's efforts established a new and enduring approach towards the treatment of linguistic acts as the processing, storage, and transmission of data. The ephemeral synchronic dimension of speech—both the keystone to Saussure's critique of philological linguistics and uniquely resis-

46. See Norbert Wiener, *The Human Use of Human Beings: Cybernetics and Society* (Boston, 1950), pp. 187–93.

47. See box 50, folder 29, RJP.

48. For the invitation to join the MIT Faculty, see Stratton, letter to Jakobson, 28 Mar. 1957, box 3, folder 67, RJP. For the invitation to join the *Information and Control* editorial board, see Wiesner, letter to Jakobson, 29 May 1956, box 50, folder 29, RJP. For the invitation to join the Center for Communication Sciences, see Stratton, letter to Jakobson, 2 Dec. 1957, box 3, folder 63, RJP.

49. Stratton, letter to Jakobson, 28 Mar. 1957, box 3, folder 67, RJP.

50. See Jakobson, letter to Wiesner, 23 Nov. 1960, Jerome Wiesner Papers, box 9, folder 284, MIT Archives, Cambridge, Mass.

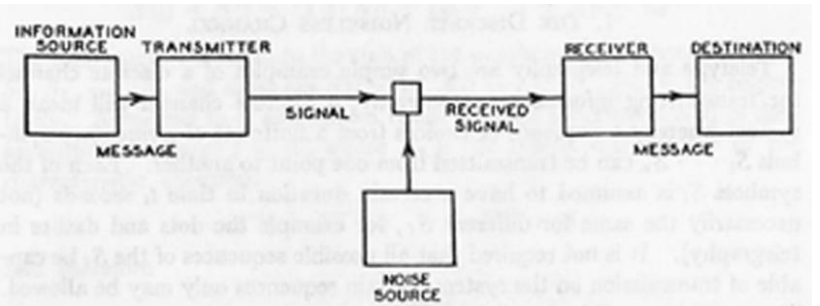

FIGURE 3. "Schematic Account of a Communication System" (1948), Shannon, "The Mathematical Theory of Communication," in *Claude Elwood Shannon: Collected Papers*, ed. N. J. A. Sloane and Aaron D. Wyner (New York, 1993), p. 7.

tant to experimental inquiry or empirical demonstration—received orderly, rational, and economic expression according to the methods of information theory. Jakobson condensed these efforts in his 1960 lecture "Linguistics and Poetics," which appropriated Shannon's schematic diagram of communications (fig. 3) to reconceptualize Saussure's linguistic categories. The resulting diagram (fig. 4) conceived of poetics according to a division of labor and conceptual distribution developed for the efficient management of engineers and instruments. In this regard Shannon's schema was what Deleuze, in his gloss on Foucault's account of diagrams, described as "a display of the relations between forces which constitute power."[51] Such forces were on display in *The Mathematical Theory of Communication*, where Shannon memorably declared that:

> The fundamental problem of communication is that of reproducing at one point either exactly or approximately a message selected at another point. Frequently the messages have *meaning*; that is they refer to or are correlated according to some system with certain physical or conceptual entities. These semantic aspects of communication are irrelevant to the engineering problem.[52]

Shannon defined "communication" and "information" as appropriate for the engineering of a technical system designed to relay data as economically as possible. By condensing these operations within a schematic series of activities, each specified according to equations characterizing its operations, Shannon's diagram mapped out a new series of functions that

51. Deleuze, *Foucault*, trans. and ed. Seán Hand (Minneapolis, 1988), p. 36.
52. Claude Shannon, *The Mathematical Theory of Communication* (1948; Urbana, 1964), p. 31.

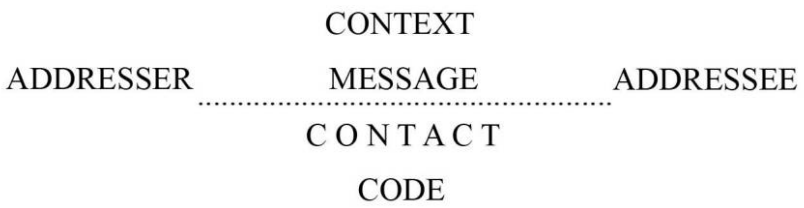

FIGURE 4. Outline of the "constitutive factors in any speech event" (1960), in Jakobson, "Closing Statement: Linguistics and Poetics," in *Style in Language*, ed. Thomas A. Sebeok (Cambridge, Mass., 1960), p. 353.

formed the basis for professional specialties and specialized instruments. The distributions of these tasks corresponded to the most efficient distribution of labor among humans and machines. The exclusion of "meaning" enabled Shannon to better specify the task of the American Telephone and Telegraph Company, namely, the reliable transformation of speech into a well-defined commodity for management, distribution, and reproduction. The power of Shannon's diagram rested on the ability to mobilize these relations of power and insert them into the tissue of other social assemblages.[53]

Once imported into linguistics, the diagrammatic strategies of communication engineering imposed an orderly set of distributions and series upon the unruly multiplicity of language-performances; thus, language itself became part of an economically distributed series of technical tasks within an assembly line of communications. Jakobson redefined Saussure's celebrated concepts of *la langue* (language-system) and *la parole* (speech or speech act) as "code" and "message." According to Jakobson's theory, speakers consulted the codes at their disposal and composed a message according to its rules; in particular instances, style might be expressed according subcodes. With Jakobson's proposals in place, a new type of knowledge of the human sciences could be produced: one emboldened by the methods of mathematics, refined and restricted by technological instruments, and empowered by the lavish resources and aspirations accumulating around engineering in postwar America. Linguists could join an apparatus of engineers in the laboratory, rub elbows and share ideas, and take part in wrenching language from the amorphous domain where Saussure left it and reinstall it within a modern scientific program.

Through this refashioning of linguistic acts as a technoeconomic matrix of production, Jakobson and his colleagues provided mechanisms for stra-

53. See Deleuze, *Foucault*, p. 37.

tegically conjoining linguistics, electronics, and economics.[54] Followers of this approach modeled on Bell Labs' industrial methods joined a worldwide fraternity of scientists that coincided with capitalist production itself. Jakobson colorfully illustrated this when he entered a Harvard lecture hall one day to discover that the economist Vassily Leontieff, who had just finished using the room, had left an economic diagram of production on the blackboard. As Jakobson's students moved to erase the board, he declared, "Stop, I will lecture with this scheme." As he explained, "the problems of output and input in linguistics and economics are exactly the same."[55]

Levi-Strauss's Initiation into Cybernetics

The first record of Lévi-Strauss's interest in cybernetics dates from Fahs's journal entries of September 1949. Fahs wrote of traveling to the Conference of Americanists "primarily to hear the paper of Levy-Strauss on the relevance of cybernetics to research in linguistics."[56] Just a few months earlier Lévi-Strauss had published *The Elementary Structures of Kinship* (1948), where he had argued that kinship relations were analogous to phonemic relations and, as such, also comprised a mode of communication.[57] An appendix by mathematician André Weil, also a former Rockefeller fellow, attempted to work out these relations algebraically. In the September lecture Lévi-Strauss turned towards cybernetics to generalize those results into a wider theory of structural relations.

Lévi-Strauss opened the talk by disputing Wiener's claim, made in *Cybernetics,* that social science lacked stable, reliable data sets for cybernetic analysis. Perhaps taking a cue from Shannon's recent statistical studies of English, Lévi-Strauss pointed toward written language as a counterexample.[58] He expanded this into his signature tripartite structural and cyber-

54. The most sweeping account of the realignment of knowledge and power along informatic lines is James R. Beniger, *The Control Revolution: Technological and Economic Origins of the Information Society* (Cambridge, 1986); in the context of semiotics, see Donna Haraway, "The High Cost of Information in Post-World War II Evolutionary Biology: Ergonomics, Semiotics, and the Sociobiology of Communications Systems," *Philosophical Forum* 13 (Winter/Spring 1981–82): 244–78.

55. Quoted in Slava Gerovitch, "Roman Jakobson und die Kybernetisierung der Linguistik in der Sowjetunion," in *Die Transformationen des Humanen,* pp. 243–44. I thank Gerovitch for furnishing me with the original English text. Gerovitch's text discusses in greater detail Jakobson's reconceptualization of Shannon's theory.

56. Fahs, entry for 8 Sept. 1949, diary, record group 2, series 500R, box 483, folder 3104, RAC. Lévi-Strauss occasionally changed the spelling of his name throughout his career; hence Fahs's spelling of the name as "Levy-Strauss" was, at the time, probably correct.

57. Lévi-Strauss, *The Elementary Structures of Kinship*, trans. James Harle Bell, James Richard von Sturmer, and Rodney Needham, ed. Needham (Boston, 1969), pp. 493–97.

58. See Fahs, diary, entry for 8 Sept. 1949.

netic rereading of linguistics, economics, and kinship. As Weaver had proposed in *Scientific American* two months earlier, Lévi-Strauss argued that engineering models of communications could be transposed onto all other fields of human activity, including linguistics, economic transactions, and the circulation of women within primitive systems of kinship. According to Lévi-Strauss these activities comprised systems of communication whose circulating elements—phonemes, goods, and wives—could, with the aid of computing machines, be mathematically analyzed for structural relations.[59]

After receiving *The Mathematical Theory of Communication* from Weaver and meeting with Jakobson in Paris in 1950, Lévi-Strauss fully embraced the analogies and alliances enabled by the cybernetic apparatus. Privately he and Lacan began consulting with a French mathematician interested in cybernetics.[60] Publicly he touted cybernetics's capacity to overcome the corrosive effects of historical delay, disciplinary difference, and political antinomy. His widely read introduction to the work of Marcel Mauss argued that Mauss's studies of gift-giving practices among primitives were in fact a form of communications research that, if treated by mathematicians trained in information theory and cybernetics, could become properly empirical studies.[61] As director of UNESCO's International Council of Social Sciences and informal leader of its International Research Office on the Social Implications of Technological Change,[62] Lévi-Strauss published articles and lectured widely on how cybernetic instruments and techniques could overcome the differences that divided scientific disciplines, ethnic groups, and the political sensibilities of capitalists and Communists.[63] In one essay published under the auspices of UNESCO he even proposed inserting passages from Wiener's *Cybernetics* into the UNESCO constitution.[64] Much like his 1949 lecture that suggested subjecting the circulation of women, economic goods, and language to

59. See ibid. The comment on computing machines is drawn from the published version of the talk. See Lévi-Strauss, "Language and the Analysis of Social Laws," *Structural Anthropology* (New York, 1976), pp. 57–58.

60. See Mai Wegener, "An der Straβenkreuzung, der Mathematiker Georges Théodule Guilbaud: Kybernetik und Strukturalismus," *Archiv für Mediengeschichte* 4 (Oct. 2004): 167–74, and Le Roux, "Psychanalyse et cybernétique: Les Machines de Lacan," *L'Evolution Psychiatrique* 72 (Apr.–Jun. 2007): 346–69.

61. See Lévi-Strauss, *Introduction to the Work of Marcel Mauss*, trans. Felicity Baker (London, 1987), pp. 42, 70 n. 13.

62. See Denis Bertholet, *Lévi-Strauss* (Paris, 2003), pp. 211–13, and Frederic C. Lane, entry for 23 Mar. 1954, diary, record group 2, series 500R, box 44, folder 297, RAC.

63. See Lévi-Strauss, "Les Mathématiques de l'homme," esp. pp. 650 and 653.

64. See Lévi-Strauss, "The Place of Anthropology in the Social Sciences," *Structural Anthropology*, p. 380 n. 10.

computational analysis, these propositions seemed targeted to extract the most contentious political issues in postwar France (gender, economic and technological modernization, relations in and with the Third World) from contentious public debate and reinscribe them within technical systems for expert determination.[65]

Lévi-Strauss undertook efforts to establish an RLE-style laboratory or center where natural and human scientists could begin collaborating, and he approached UNESCO and the Rockefeller Foundation for support.[66] Writing in a UNESCO journal, Lévi-Strauss announced that "for the first time in the history of the human sciences it becomes possible to mount experiments in the laboratory that would empirically verify hypotheses, as in the natural and exact sciences." He hailed the capacity of the Voder, translation machines, and other instruments to coordinate theory and practice across the disciplines. These instruments would not reduce the disciplines to identity but instead would coordinate their diversity: "biologists, linguists, economists, sociologies, psychologists, communication engineers, and mathematicians," as he put it, "find themselves in possession of a formidable conceptual apparatus *[appareil]* which constitutes a common language for them."[67]

Lévi-Strauss asked the French information theorist M. P. Schützenberger, who would later join MIT's Research Laboratory of Electronics, for assistance developing this new center. In November 1951, Schützenberger contacted Wiener about the project, writing,

> M. Levy-Strauss who is a very good ethnographist (he is further a personnal friend of André Weil) is trying to set up a center of research on the applications of the theory of communication to the study of musique and even mythologie etc. He has no personnal mathematical formation but he is really a sensible man and understands very well what cannot and what can [be done with] Cybernetics. I must say with some proudness that he put the thing more or less on my shoulders for he had heard that you trusted me.[68]

Lévi-Strauss's failure to establish such a center (probably for lack of funding) was the decisive factor in the direction of future research: starting

65. On the deployment of technical, scientific, and industrial figures and technology to manage political and social tension in postwar France, see Kristin Ross, *Fast Cars, Clean Bodies: Decolonization and the Reordering of French Culture* (Cambridge, Mass., 1995).

66. Norman S. Buchanan, entry for 17 Sept. 1949, diary, record group 2, series 500R, box 483, folder 3104, RAC.

67. Lévi-Strauss, "Introduction: Les Mathématiques de l'homme," pp. 644–45.

68. Schützenberger to Wiener, 10 Nov. 1951, folder 143, Norbert Wiener Papers, MIT Archives.

around 1955 his references to the promises of instruments were gradually replaced by an innovative poetics that itself comprised a mode of cybernetic experimentation and analysis.[69]

With Jakobson's help, Lévi-Strauss secured $2,000 for MIT's Center for International Study (CENIS), a center of cybernetic research covertly funded by the CIA, in order to organize an interdisciplinary seminar on cybernetics in Paris.[70] CENIS Director Max Millikan, formerly the Director of the CIA's Office of National Estimates, must have found in the project an impressive opportunity to cultivate the center's network of international researchers tilting toward American science: Lévi-Strauss promised that psychologist Jean Piaget, physicist Pierre Auger, mathematician Georges Théodule Guilbaud, Schützenberger, Lacan, and Benveniste would be among the participants and that the seminar would explore topics with a broad interdisciplinary pertinence including "kinship and group exchange," "structure of public opinion," "psychoanalysis considered as a process of communication," and "the study of myths as a special form of communications."[71]

In May 1953, Lévi-Strauss wrote to Jakobson to report on the seminar's progress. He reported that "for the moment we content ourselves with rambling and wandering about, in order to delimit a few problems and find a common language."[72] He thanked Jakobson for sending him a bibliography of recent literature on communication theory as well as the report on Russian phonemes prepared in collaboration with Halle and Cherry. As one might expect from a faithful student of Mauss, Lévi-Strauss responded with a gift of his own: a reanalysis of the Russian phoneme according to a binary system of his own invention (fig. 5). Lévi-Strauss had reclassified Russian phonemes according to an internal and self-referential system of positive and negative patterns. Along the horizontal axis he listed various sounds, along the vertical axis a set of either/or qualifications of those sounds (vocalic/consonantal, compact/non-compact, and so on), and within the chart a series of + and − signs indicated the presence or absence of that characteristic. With a modesty and deference that down-

69. On this point special thanks is due to Hans-Jörg Rheinberger, who reminded me that writing practices, too, can function as an experimental system.

70. Lenneberg, letter to Lévi-Strauss, 15 Jan. 1953, Nov. 1952, box 50, folder 29, RJP. For more on CENIS's CIA- and communications-related activities, see Light, *From Warfare to Welfare,* p. 166, and Alan A. Needell, "Project Troy and the Cold War Annexation of the Social Sciences," in *Universities and Empire: Money and Politics in the Social Sciences during the Cold War*, ed. Christopher Simpson (New York, 1998), pp. 3–38.

71. See Lévi-Strauss, letter to Millikan, 7 Jan. 1953, box 50, folder 29, RJP.

72. Lévi-Strauss, letter to Jakobson, 5 May, box 12, folder 45, RJP. There was no year present on the letter, but the contents suggest it was written in 1953. Original text in French.

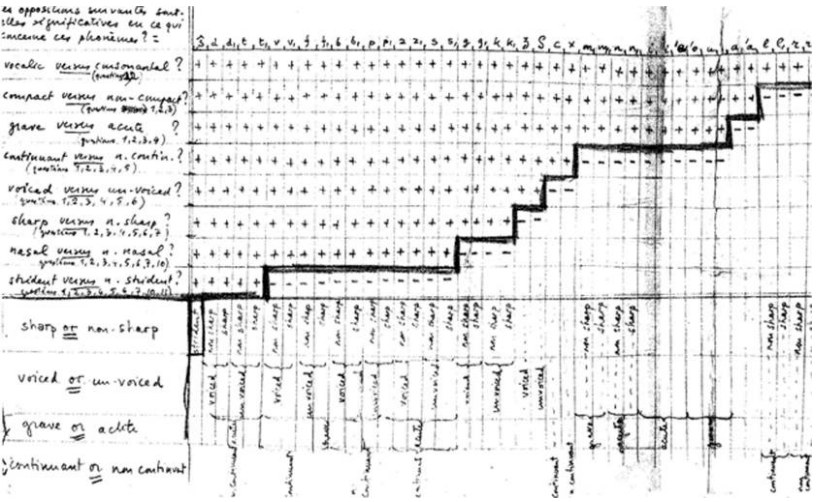

FIGURE 5. Lévi-Strauss's revision of Jakobson's phonemic analysis, according to a simplified system of binary analysis (folder 45, box 12, RJP).

played the ambitions of his reanalysis, Lévi-Strauss warned that "all that [I've done] is probably meaningless." He added: "My only excuse is that I replaced all the linguistic terms, which are beyond me, by symbols, and that the things seem to work on the basis of pure manipulation of symbols."[73] This shift towards the manipulation of abstract symbols took structuralism one step closer towards the work of Wiener and Shannon by restricting communications to a nonsemantic accounting of symbolic manipulation and representation. Without laboratories or machines, Lévi-Strauss had turned his own pencil into part of the cybernetic apparatus.[74]

Fellow seminar participant Lacan also took a turn within the feedback loops of cybernetic inscription. The following year in his celebrated seminar on the "Purloined Letter" Lacan reimagined a game from Edgar Allan Poe's story, as performed by a cybernetic automaton.[75] The automaton, which Lacan refrained from citing by name, was entitled *SEER*, short for

73. Ibid.

74. Erich Hörl's media theoretical study of anthropology and communication notes that Lévi-Strauss continued this experimentation by developing note card systems and building three-dimensional paper models that were intended to compute mythical structures. See Hörl, *Die heiligen Kanäle: Über die archaische Illusion der Kommunikation* (Berlin, 2005), pp. 247–48 n. 42 and 43. Hörl tells me that Lévi-Strauss later destroyed these models and was reluctant about discussing them.

75. My references are to the unabridged text from the original seminar. See Jacques Lacan, *The Ego in Freud's Theory and in the Technique of Psychoanalysis, 1954–1955*, trans. Sylvana Tomaselli (New York, 1988), especially pp. 171–205.

SEquence **E**xtracting **R**obot. David Hagelbarger of Bell Labs developed the machine in collaboration with Shannon.[76] Lacan recounted how, rather than guessing whether human players would choose even or odd, Hagelbarger's machine predicted if human players would choose + or −. Due to humans' difficulty generating random numbers, the machine could make its predictions with impressive accuracy. By luring humans into a series of signs easily processed by machines, Hagelbarger had theatrically demonstrated how human "thought" is patterned and predictable.

Lacan cited the machine and its results as evidence that human interactions are structured by an impersonal and nonsubjective symbolic order. Ever the showman, he provided an in-class demonstration; in a canny, low-tech demediation of *SEER*'s high-tech remediation of the written word, Lacan handed two of his auditors pencil and paper. He exhorted them to quickly write out a series of + and − signs, which he would later submit to statistical analysis.[77] The students reluctantly agreed, but the mere structuring of their in-class activities by the operations and symbols of an absent, American computing machine should have provided proof enough that the cybernetic apparatus was already operating at the heart of psychoanalysis.

Dissemination and Dissent

By the mid-1950s the cybernetic apparatus showed signs of straining under the weight of the national and disciplinary traditions it was intended to bridge. As French structuralists explored cybernetics, Jakobson's American experiment mixing cybernetics and structural linguistics faltered. At the RLE, a young colleague by the name of Noam Chomsky disproved claims that natural language could be modeled as an information-theoretical process, striking a major blow to Jakobson's research with Cherry and Halle.[78] Halle abandoned his efforts to apply information theory to natural language, and many years later Cherry admitted that the project had been a fool's errand.[79] Except for the publication of Cherry's

76. Although built and publicized in the early 1950s, the first comprehensive scientific treatment of the machine can be found in D. W. Hagelbarger, "SEER, a Sequence Extraction Robot," *I.R.E. Transactions on Electronic Computers* 5 (Mar. 1956): 1–7. My own account of the machine is supplemented by personal communications with Hagelbarger. Annette Bitsch has also offered an account of this machine and Lacan's commentaries; see Annette Bitsch, "Kybernetik des Unbewusstens," in *Cybernetics - Kybernetik 2,* pp. 157–58.

77. Lacan, *The Ego in Freud's Theory and in the Technique of Psychoanalysis, 1954–1955,* p. 190.

78. See Noam Chomsky, *Structures syntaxiques* (Paris, 1957).

79. See Carol Wilder, "A Conversation with Colin Cherry," *Human Communication Research* 3 (Summer 1977): 354–62, and Morris Halle, interview by author, Cambridge, Mass., Feb. 2008.

book *On Human Communication* (1957), Jakobson's book series with the MIT Press never came to fruition. MIT administrators abandoned plans for the interdisciplinary Center for Communication Sciences around 1962.[80] Philosopher Hubert Dreyfus and computer scientist Joseph Weizenbaum, both of MIT, launched polemics against colleagues' efforts to model natural language as a stochastic (information-theoretical) process. Their sometimes cranky complaints crystallized a wider sense of ennui and moral disquiet with the ever-expanding claims of cybernetics.[81]

Lévi-Strauss encountered resistance as well. Following a 1952 presentation in New York City of "Social Structure"[82]—Lévi-Strauss's manifesto for cybernetically abetted structuralism—American scientists demurred. Margaret Mead, a founding member of the Macy Conferences on Cybernetics, tactfully noted that Lévi-Strauss's work was at variance with her collaborations with Wiener.[83] In what seemed like a rebuke to Jakobson, who was also in attendance, philosopher and Macy participant F. S. C. Northrop expressed objections over the attempt to characterize all cultures according to a single, highly refined method of mathematics that was itself a product of Western scientific cultures.[84] Meanwhile, French Marxists across the ocean attacked the nascent structural movement as an agent of American technocratic imperialism. In "Marxism and the Theory of Information" (1958), Henri Lefebvre ridiculed structuralists' claim that techniques for measuring telegraph transmissions provided suprahistorical procedures for understanding anthropological and sociological arrangements. He dismissively labelled cybernetics and information theory as a science of "apparatuses *[dispositifs]* that maintain and consolidate a *structure* which has been determined within and by an information machine."[85] In other words, Lefebvre suggested that structuralists ontologized and universalized the artifactual and contingent structures of machines. In a response to his Marxist critics Lévi-Strauss insisted that it was necessary to "distinguish scientific findings, strictly speaking, from the political and ideological uses to which they are put, all too frequently, in the United States and

80. One of the Jakobson's final correspondences regarding the center was in 1962. See Townes, letter to Jakobson, 7 Dec. 1962, box 3, folder 64, RJP.

81. Following the publication of a number of scientific articles along these lines in the 1960s, Joseph Weizenbaum summarized his critiques in *Computer Power and Human Reason: From Judgment to Calculation* (San Francisco, 1976). Hubert L. Dreyfus developed his critique during the 1960s and 1970s and summarized his arguments in Dreyfus, *What Computers Can't Do: The Limits of Artificial Intelligence* (New York, 1979), especially pp. 165–66.

82. See Lévi-Strauss, "Social Structure," in *Anthropology Today: An Encyclopedic Inventory*, ed. A. L. Kroeber (Chicago, 1952), pp. 524–53.

83. See *An Appraisal of Anthropology Today*, ed. Sol Tax et al. (Chicago, 1953), p. 111.

84. See ibid., pp. 315–16.

85. Henri Lefebvre, *Au-Delà du structuralisme* (Paris, 1971), p. 72.

elsewhere."[86] The objections of American and French detractors highlighted, however, an intractable incongruity between Lévi-Strauss's attempts to define "communications" as an idealized, homogeneous, scientific-technical enterprise that transcended culture and history and the reality of "communications" as a highly politicized problem inextricable from the sites, communities, and media advancing it.

With the 1962 French publication of *The Savage Mind*, Lévi-Strauss refined more than a decade worth of cybernetic experimentation into a philosophically allusive and poetic elegy to the informational character of totemistic practices in native cultures. There are no explicit references to the Voder or cybernetics, and Lévi-Strauss is sparing in explicit references to information theory. In what may be seen as an intellectual coda, his earlier infatuation with cybernetic machines had given way to a discipline of analysis and writing that reduced strange and foreign practices to a simples series of patterns and codes, repeating and circulating like communications along a wire. In this regard, the status of *The Savage Mind* as a masterpiece rests largely on its infidelity—that is, on a brilliant misreading of information theories to suggest a new interpretation of cultures as dynamic systems of communication in which language, women, plants, hunting procedures, and economic practices circulated among one another to configure immanent possibilities of intelligibility and reasoning.

The Afterlife of the Cybernetic Apparatus

By the mid-sixties the cybernetic apparatus had fallen into disrepair. In America, scientists' enthusiasm over cybernetics' universal claims transformed into embarrassment over its proponents' unchecked hubris. The Rockefeller Foundation turned its efforts towards other initiatives and the Voder languished in a Bell Labs warehouse, looking very much like the 1930s theatrical prop that it was. After public diatribes by Shannon and other engineers against the popularization of information theory, that field had narrowed its ranks to engineers focused on specialized mathematical analysis.[87] Cybernetics and its founder, Wiener, fell into disrepute.[88] Jakobson's interests shifted to molecular biology. The CIA tried to revive the field in the 1960s by channeling support through the Ford Foun-

86. Lévi-Strauss, "Postscript to Chapter XV," *Structural Anthropology,* pp. 342–43, n. 1.

87. See Shannon, "The Bandwagon," *IRE Transactions on Information Theory* 2 (Mar. 1956): 3.

88. See F. L. H. M. Stumpers, "Review of *Cybernetics, or Control and Communication in the Animal and the Machine* by Norbert Wiener," *IRE Transactions on Information Theory* 8 (July 1962): 332.

dation and the American Society for Cybernetics, but American cybernetics remained moribund.[89]

Across the Atlantic another cybernetics endured—what might be called another possibility of intelligibility and reason immanent to the relations once set up by the cybernetic apparatus. In the 1960s, French critics associated with the journals *Tel Quel* and *Communications* adapted elements of Jakobson's and Lévi-Strauss's cybernetic structuralism and merged it with French Marxist critiques. The result was French semiotics, an experimental—in both the scientific and artistic sense of the word—mode of writing that deployed cybernetic tropes and problematics to thematize the historical and political frameworks of communications and science. In his 1961 essay "*Le Message photographique*," Roland Barthes reinterpreted Jakobson's and Shannon's schematic account of communication to develop new methods in critical and historical analysis. As he put it, "Every [semiotic] code is at once arbitrary and rational; recourse to a code is thus always an opportunity for man to prove himself, to test himself through a reason and a liberty. In this sense, the analysis of codes perhaps allows an easier and surer historical definition of a society than the analysis of its signifieds."[90] In *De la grammatologie* (1967), Jacques Derrida proposed that the "nonfortuitous" conjunction between the human sciences and cybernetics was the contemporary embodiment of how Western science was in the process of self deconstructing its own *logos*.[91] Julia Kristeva cited Wiener's research on models as a resource for developing a "science of critique" that would be coextensive with a "critique of science," and in particular a critique of scientists' efforts to pacify an unruly world with orderly models.[92] A host of other postwar philosophers and critics including Deleuze, Félix Guattari, and Foucault joined in by ironically experimenting with terms such as encoding, decoding, code, information, and communication. Rather than positing a flight from politics into science, their deployment of these terms transformed writing into an experimental system for investigating the politics and historicity of scientific discourse and communications.[93]

This seemed like a second death knell for the cybernetic apparatus, first

89. On this CIA activity, see Kline, "Cybernetics in Crisis: Reviving and Reinventing a Postwar Interdiscipline in the United States."

90. Roland Barthes, *Image, Music, Text*, trans. Stephen Heath (New York, 1977), p. 31.

91. Jacques Derrida, *Of Grammatology*, trans. Gayatri Spivak (Baltimore, 1976), p. 10.

92. Julia Kristeva, "Semiotics: A Critical Science and/or a Critique of Science," *The Kristeva Reader*, trans. Hand, ed. Toril Moi, (New York, 1986), pp. 74–89.

93. See Deleuze and Félix Guattari, *A Thousand Plateaus,* trans. Brian Massumi, volume 2 of *Capitalism and Schizophrenia*, trans. Massumi et al. (Minneapolis, 1987), pp. 75–85, and Foucault, "Message ou bruit ?" *Dits et écrits, 1954–1975,* ed. Daniel Defert and François Ewald, 4 vols. (Paris, 1994), 1:557–60.

as American tragedy and again as French farce. By the late 1960s Warren Weaver's dream of a "a world-wide fraternity of scientists with their unifying bond of impersonal and unselfish interest and understanding" could find no refuge in the language or tools of cybernetics. But some theories are born posthumously; in the 1970s and 1980s America's cybernetic gift to French semiotics began a slow migration home. Through texts such as Barthes's *S/Z* (an encomium to information encoding and decoding)[94] and Jean-François Lyotard's *The Postmodern Condition* (a pessimistic account of information-based societies), American scholars learned from their French colleagues to understand texts, cultures, and entire societies as vying systems of cybernetic code. What Peter Galison has termed "the ontology of the enemy"—namely, a cybernetic ontology based on World War II conflict—became the object of strange new conflicts dubbed "the culture wars" and "the science wars" in the scientific and popular press.[95] American admirers of the critical accounts of science in "French Theory" often overlooked the authors' ironic—sometimes even wistful or nostalgic—engagements with structuralist and Cold War fantasies of a communications science.[96] Meanwhile opponents ridiculed French poststructuralism as a dangerous parasite threatening the vitality of science.[97] In *Intellectual Impostures*, an infamous screed against postmodernism, physicists Alan Sokal and Jean Bricmont condemned French theorists for their frivolous and politicized embrace of scientific terms and their application of them to nonscientific problems. Both authors were evidently ignorant of the ways science and politics were imposed on the human sciences in the postwar period.[98] In a response to Sokal and Bricmont published in the French newspaper *Le Monde*, Derrida commented:

> In the United States . . . I was initially one of their favorite targets, particularly in the newspapers. . . . because they had to do their utmost, at any cost, on the spot, to discredit what is considered the exorbitant and cumbersome "credit" of a foreign professor. . . . But what I do take more seriously is the wider context—the American

94. See Hayles, "Information or Noise? Economy of Explanation in Barthes's S/Z and Shannon's Information Theory," in *One Culture: Essays in Science and Literature*, ed. George Levine (Madison, Wisc., 1987), pp. 119–42.

95. See Galison, "The Ontology of the Enemy."

96. See François Cusset's argument that "French Theory" is largely an American invention in his *French Theory: How Foucault, Derrida, Deleuze, & Co. Transformed the Intellectual Life of the United States*, trans. Jeff Fort (Minneapolis, 2008).

97. For the classic text on critiques of French theories (and of deconstruction specifically) see J. Hillis Miller, "The Critic as Host," *Deconstruction and Criticism* (New York, 1979), pp. 217–54.

98. See Alan D. Sokal and Jean Bricmont, *Intellectual Impostures: Postmodern Philosophers' Abuse of Science* (London, 1998).

> context and the political context—that we can't begin to approach here [in *Le Monde*], given the limits of space. . . . This work has been going on for a long time and will continue elsewhere, differently, I hope, and with dignity.[99]

Derrida's elliptical and enigmatic commentary questioned the very possibility of direct communications and seemed to suggest that medial, scientific, and political structures conditioned their claims and constrained his response. Resigned to this deferral, he expressed a hope that the conversation would continue elsewhere, and differently.

A step in that direction might be to put aside conceptions of French theory as a foreign parasite and start thinking of it as a prodigal son returning from adventures abroad. Another might be to reflect on what kinds of historical and political structures return, unrecognized, in contemporary efforts to reform the discourse and methods of the human sciences through digital apparatuses.

99. Derrida, "Sokal and Bricmont Aren't Serious," *Paper Machine*, trans. Rachel Bowlby (Stanford, Calif., 2005), pp. 70–72.