

## The Mechanical Marianne: Democracy and Progress Talk in Twentieth Century France

Robert L. Frost

SUNY-Albany

Someone examining the technological artifacts of France over the past century might be stunned by their epic scale and profound evolution.<sup>1</sup> Perusing artifacts at each end of the past century, the Eiffel Tower and the plutonium breeder reactor at Creys-Malville, can elucidate these aspects. While their large scales certainly evoke strong reactions, their respective meanings are vastly different. The Eiffel Tower reflected republican engineering, with each equally-sized member structured rationally and functioning harmoniously as the eminently public monument reached skyward. By contrast, the breeder reactor communicates its technocratic-authoritarian style by several steel strata of security shielding, which house plutonium, the deadly namesake of the ancient Greek underworld, far from the public. The public can freely mingle at the Eiffel Tower unhampered by police or guards.<sup>2</sup> The proprietors of the breeder grudgingly welcome the public with a solar-heated visitors center (placed outside the security perimeter), replete with heroic, pressed-plastic photos of experts designing, building, and operating a seminal symbol of energy engineers' expertise.

An effort to decode the meanings of Eiffel Tower and Creys-Malville would have to proceed from a recognition that the two artifacts are social and cultural constructs as well as mechanical structures. The Eiffel Tower, a French revolutionary centennial structure, reinvented the 'republic of virtue' to become a republic of functionalist reason. The monument, though constructed of brittle iron, used its thousands of equal (yet hierarchically-arranged) members, bound by pivotable rivets, to flex and adjust to changes in the weather. Open and accessible, hierarchically egalitarian, flexi-

---

1. The author is Assistant Professor of History at SUNY-Albany. Thanks are in order to Ramòn Gutierrez, Margaret Hedstrom, Steven Lyon, James Mancuso, Byran Pfaffenberger, Kim Rogers, John Staudenmaier, Tyler Stovall, and Gerald Zahavi.

2. For an incisive study of the Eiffel Tower as a technological and political artifact, see Miriam R. Levin, "The Eiffel Tower Revisited," *French Review* LXII:6 (May, 1989), pp. 1052-1064.

ble, and speaking to an aesthetic of machine progress, the Eiffel Tower stood mockingly as a critique of traditionalist anti-republicans. By implication the latter were closed (politically, socially, and intellectually), dysfunctionally inegalitarian, rigid, and opposed to human-mechanical progress. In contrast, Creys-Malville, the leading icon of the French technocracy, symbolizes the consolidation of a new elite. The product of public funds, private suppliers, and publicly-educated experts, Creys-Malville begs the public to ignore the 'technicalities' of progress and to accept the bounty of plentiful power. The plant's scale, rather than inspiring awe at a technical-democratic aesthetic, intimidates the hapless visitor. It artifactually argues that only experts are capable of making technical-industrial decisions, and that 'politics' and popular intervention are dysfunctional. A demonstrator was shot in 1977 as he tried to demand more open public debate on energy issues. To the builders of the plant, the incident was a police issue, not one of technological choices. As symbols, the Eiffel Tower and Creys-Malville not only reflected the political values of emerging elites, they *created* and *reconstituted* them. The former empowered as the latter disempowered.

These two technological-cultural signs, between which the heart of France spatially lies and the past century temporally extends, shall serve a dual purpose for this article. They will function as emblems for a theoretical discussion about the making and workings of technological culture, and they will help to elucidate the evolution of French technological culture, particularly since the Second World War. This article will first develop theoretical, methodological and explanatory links between technology and culture in a broad sense, particularly as they pertain to technical, political-economic, and cultural-symbolic change. It will then examine the postwar French economic miracle, using the notion of technology as heroic narrative to explain the French preoccupation with technological display, and how a new discourse about Progress forestalled genuine political debate. We shall close by examining a political nexus in which debates over merely the form of ownership—not the products, practices, or style—of major firms has become the substitute for real contention over the shape of France's workplaces, worklife, products, and distribution of economic and political power. This paper argues that popular ideology has gradually reified technology, so that technological images have overshadowed their function. Public debate about the ends of technological

change has run up against a premature closure because references to expert-dominated technological sign systems has helped to shift decisions about technology and political economy out of the public forum in contemporary France.

Recent scholarship in the history of technology sheds new light on the connections between technology and culture. Earlier approaches within the history of technology tended to focus upon heroic inventors and necessary or critical inventions. From this point of view, necessity is the mother of invention and the history of technology is a linear evolution of single best solutions, as Robert Heilbroner termed it, "[the] technical conquest of nature that follows one and only one grand avenue of advance."<sup>3</sup> This 'internalist' and technologically determinist approach makes for societies as spectators and inventors as heroic discoverers.<sup>4</sup>

More sophisticated analyses have investigated the invention and diffusion processes. Arnold Pacey and Jeffrey Meikle, respectively, show how broad cultural and personal styles and tastes—from cultural predilections for scale to personal aesthetics of mathematical or design elegance—drive the inventive process and end up being built into technological artifacts.<sup>5</sup> Parsonians and neo-classical economic historians link a dual, almost transcendent co-functionality to inventions and businesses. David Landes and Alfred Chandler well portray the magic mix of astute design, bold vision, and organizational acumen behind successful technologies. They nonetheless imply that technical efficiency (however defined) is virtually identical with economic efficiency (however de-

---

3. "Do Machines Make History?," *Technology and Culture* VIII:3 (1967), p. 336, cited in John M. Staudenmaier, S.J., *Technology's Storytellers: Reweaving the Human Fabric* (Cambridge, MA: MIT Press, 1985), p. 164. See also David F. Noble, *Forces of Production: A Social History of Industrial Automation* (New York: Knopf, 1984), pp. 144-147. In the latter work, this view is characterized as a form of naive neo-Darwinism.

4. For an astute summary of the historiography of technology, see T. Misa, "How Machines Make History, and How Historians (and Others) Help Them to Do So," *Science, Technology, and Human Values* XIII:3 & 4 (Summer-Autumn 1988), pp. 308-331.

5. Pacey, *Culture*, and Meikle, *Twentieth Century Limited: Industrial Design in America, 1925-1939* (Philadelphia: Temple University Press, 1979).

fined), provided lower forms of intervention, such as politics and social demands, do not intervene.<sup>6</sup> Landes and Chandler argue that scale, rationality, and scientific business methods have interactively been in a constant state of evolution toward higher forms along a trajectory of single-best technico-economic solutions. These authors do, however, offer a valuable conceptual parrying at the problem of how societies and technologies shape each other by offering a range of useful techniques and theoretical frameworks.<sup>7</sup>

Thomas Hughes' and John Law's concentration on the growth and development of technological systems—broadly defined to include individuals, social groups, and the logics intrinsic to specific technical systems—offers a far more promising tack.<sup>8</sup> These authors grant equal status to technical and social forces in shaping technological systems, stressing the complex interaction between technical logics and and social forces.<sup>9</sup> Hughes' conception of momentum (again, a social-technical construct) offers a way to understand how past choices impinge upon later options,<sup>10</sup> and his notion of 'reverse salients' gives valuable insight into dysfunctionalities among elements within and contiguous to social-technical systems. Systems analysis requires that system boundaries be precisely defined, yet the new history of technology denies the utility of system boundaries—not only did a British jet fighter of the 1960s have links of differing strengths with various producer-promoters, it had them as well with state agencies and potential users.<sup>11</sup> This sort of systems approach owes much of its power to the flexible boundaries it allows actors themselves to draw around

---

6. Landes, *The Unbound Prometheus: Technological Change, 1750 to the Present* (New York and Cambridge: Cambridge University Press, 1967), and Chandler, *The Visible Hand: The Managerial Revolution in American Business* (Cambridge, MA: Harvard University Press, 1977).

7. Nathan Rosenberg takes a similar tack, discussing unilinearity most explicitly in his discussion of 'bottlenecks', see "The Direction of Technological Change," *Economic Development and Cultural Change* 17 (October 1969), pp. 1-14.

8. Thomas P. Hughes, "The Evolution of Large Technological Systems," in Wiebe Bijker, Thomas P. Hughes, and Trevor Pinch, eds. *The Social Construction of Technological Systems* (Cambridge, MA: MIT Press, 1987), pp. 51-82, see also his *Networks of Power: Electrification in Western Society* (Baltimore: Johns Hopkins University Press, 1983); John Law, "On the Social Explanation of Technical Change: The Case of Portuguese Maritime Expansion," *Technology and Culture* XXVIII:2 (1987), pp. 227-252, and "Technology and Heterogeneous Engineering: The Case of Portuguese Expansion," in Bijker, Hughes, and Pinch *op. cit.*, 111-134.

putative systems, yet in using such loose boundaries, this tack loses much of its heuristic appeal.<sup>12</sup>

Hughes' conception of momentum shows how choices within technical systems at one time tend to prestructure later options, and how social dynamics and structures (one is tempted to assert *subcultures*) associated with specific systems bequeath legacies. The concept of momentum has within it, however, a subtle conception of movement upon a unilinear vector, and one is left musing about whether, for example, power system reliabilities could better have been served by a larger number of smaller facilities, especially after returns to scale level off in mature technologies.<sup>13</sup> Hughes' notion of style, which for him seems to be national, can easily be seen as subcultural as well.<sup>14</sup> At that level, subcultural technological style can become analogous to the cultures specific to individual firms or technocracies.

More radical approaches to the society-technology issue appeared in 1980, 1983, and 1984 with, respectively, the publication of a special issue of *Culture technique* on domestic technologies, Ruth Schwartz Cowan's *More Work for Mother*, and David Noble's *Forces of Production*.<sup>15</sup> These authors adopt a largely socially determinist notion of technological change, in which

---

9. Perhaps the best example for Hughes in terms of internal technical logics is his recognition of the non-storable character of electricity, ineluctably demanding that utilities produce the exact quantity of power needed at any given moment. Production capacity in power utilities thus has to be equal to maximum rather than long-term average demand levels, in turn demanding a highly capital-intensive industry. See *Networks*, Ch. 1, and UNIPEDE, *Méthodes de prevision de consommation à moyen terme* (Paris: UNIPEDE, 1972), p. 9. At the same time, one is still left with the sense that by their inexorability, technical constraints are ontologically prior to lower-order political or social ones, parallel to the ranking of knowledge by the French Encyclopædist in the eighteenth century; see Robert Darnton, *The Great Cat Massacre and Other Episodes in French Cultural History* (New York: Basic Books, 1984), Ch. 5: "Philosophers Trim the Tree of Knowledge: The Epistemological Strategy of the *Encyclopédie*."

10. Hughes, "Evolution," p. 71 ff.

11. John Law and Michael Callon, "The Life and Death of an Aircraft: A Network Analysis of Technical Change," in Weibe Bijker and John Law, *Constructing Networks and Systems: Case-Studies and Concepts in the New Technology Studies* (Cambridge, MA: MIT Press, forthcoming).

12. A possible solution to the problem of anti-system systems might be to develop Foucault's anti-causal "genealogies" to socio-technical constructs; see Patricia O'Brien, "Michel Foucault's History of Culture," in Lynn Hunt, ed., *The New Cultural History* (Berkeley: University of California Press, 1989), pp. 33-35.

13. Perhaps this is rooted in the fact that *Networks* deals only with developing systems (up to 1930), not with mature ones. One is left wondering, nonetheless, if the best choices were as obvious and singular as they appear in retrospect.

artifacts are relevant only within social contexts and where those upon whom new technologies are foisted remain passive or mute. To use literary language, from this perspective, the technological text is meaningless outside of its social context. Furthermore, an overdetermining context compels inventors, innovators, and diffusers consciously or subconsciously to build often oppressive social relations into artifacts. In *Culture technique's* and Cowan's view, the relevant context is gender, and in Noble's, it is social class. Context often limits imagination, yet for Noble, innovators consciously chose technologies which reproduced structures of class domination. Implicitly or explicitly, this genre of scholarship built upon Langdon Winner's highly innovative work.<sup>16</sup>

One may question the uncompromising social determinism of this work. Though it can be shown that some better technologies failed because of their rejection by dominant social interests, this doesn't prove that technical performance will necessarily always be subordinated or controlled by inventors or elites.<sup>17</sup> Though Noble allows for choices and he may be correct about the cynical classism of machine tool designers in their quest to deskill labor, one wonders if all inventors are so prescient or powerful. The omniscient rational actor of the Parsonians appears here in contrasted colors. A flat unilinearity can re-enter this debate through a social determinist back door. Nonetheless, these approaches often elegantly open the technological black box, arguing that the internal technical characteristics of technological artifacts are set in some detail by external forces. Equally important, they show how historical actors invent idealized futures and plot social routes toward them.

---

14. Hughes, *Networks*, Introduction.

15. *Culture technique* 3 (special: September 1980), Cowan, *More Work for Mother*, and Noble, *Forces*. For a systematic examination of the Noble thesis and the arguments of Harry Braverman (*Labor and Monopoly Capital* (New York: Monthly Review Press, 1975), which deal with technology as a managerial weapon against the skills and power of labor, see my "Labor and Technology."

16. Winner, "Do Artifacts Have Politics?," *Daedalus* 109 (1980), pp. 121-136, and *Autonomous Technology: Technics-Out-of-Control as a Theme in Political Thought*. (Cambridge, Mass.: MIT Press, 1977).

17. Zuboff (*Smart Machine*) and Margaret Hedstrom ("Automating the Office: Technology and Skill in Women's Clerical Work, 1940-1970," Ph.D. dissertation, University of Wisconsin-Madison, 1988, Ch. 4) have argued that new technologies often destabilize existing social relations and can escape the control of their authors. One is reminded of literary critics' arguments about how texts can become autonomous from their authors.

Sociologists and anthropologists have recently helped to clarify several issues in the debate about the interrelationships between society and technology. Students of the social construction of science have broken through the common intellectual division between a natural science of hard facts and the human sciences of interpretation.<sup>18</sup> Using a notion of 'interpretive flexibility,' Wiebe Bijker argues that in practical terms, artifactual "facts" are actually only sets of social meanings.<sup>19</sup> What is materially behind the image is irrelevant because it cannot be known. Thus, the modes for constructing meaning and the social groups which attribute meanings offer the integral avenues to look at the techno-social artifacts.<sup>20</sup> Bijker focuses on 'relevant social groups,' whose interests are built into artifacts and later inferred by historians, as the key to discern the social meanings and impacts of artifacts. The problem of defining social interests remains paramount.<sup>21</sup> Bijker nonetheless crucially offers a way to understand how the social meaning and physical shape of artifacts become stabilized by defining a process of 'closure,' in which debate over the meanings of artifacts essentially ceases and designs and social roles solidify.<sup>22</sup> Nonetheless, by divorcing social contexts from technical attributes, this approach tends to be overly social-determinist, rendering the actual designs and physical attributes of technology as simple, flat outcomes of social forces and leaving little latitude for recognizing that certain laws of physics might also have considerable impact—it begins perilously to reclose the black box. In addition, Bijker stresses contention over meanings,

---

18. Hayden White, *Tropics of Discourse. Essays in Cultural Criticism* (Baltimore: Johns Hopkins University Press, 1978), pp. 236-238.

19. The possible links between this approach and those of literary criticism and symbolic anthropology are obvious; see below. The most recent version of Bijker's evolving argument is: "The Social Construction of Fluorescent Lighting, Or How an Artefact was Invented in Its Diffusion Stage," in W. Bijker and J. Law, eds., *Constructing Networks and Systems* (Cambridge, MA: MIT Press, forthcoming).

20. The simplest way to use this approach is to deconstruct the functions of an artifact and, once the interests have been "read" from it, find the artifice and his/her interests: *ibid.*

21. Bijker and many other sociologists rely on what Joan W. Scott has termed an "objectively determined interests." She and the present author would instead seek to discern interests as being discursively produced through social, material, rhetorical, and symbolic interactions; see Joan W. Scott, *Gender and the Politics of History* (New York: Columbia University Press, 1988), p. 5.

22. This cessation of contention could be represented within a marxist framework as the successful reproduction of existing social relations; this point is explicitly argued by Pfaffenberger, below.

but he doesn't allow for negotiated redesigns of artifacts, nor does he grapple with the ways that meanings are constructed, except through the methods of organizational sociology.

Bruno Latour and Madeleine Akrich have developed ways to understand how both the meanings and material content of technologies can be adjusted in order to implant both artifacts and innovators. They also indicate how closures are at best provisional and subject to renegotiation when the social and technical networks supporting them weaken.<sup>23</sup> Using sociologists' resource mobilization framework, they show how all parties to an innovation—inventors, recipients, and artifacts—adjust artifacts, meanings, and social networks to make new technologies and contexts socially credible and powerful.<sup>24</sup> A process of implicit negotiation (*translation* in Latour's terminology) modifies artifacts, meanings, and contexts. Innovation and diffusion therefore become a single, dialogic socio-technical process, indifferently redesigning physical characteristics and reshaping social coalitions as power and resourcefulness demand. This approach represents an important development, yet it seems to presume that the social actors somehow objectively know and consciously act upon all social and technical variables. Latour tends to ignore the larger social, ideological, and political structures which shape and set the parameters of decision making.

Cultural anthropologists have long argued that the construction of meanings is an imaginative, yet culturally structured, process and that those who create meanings need not be aware of all aspects of their context. They offer ways to view artifacts as complex texts susceptible to reading and decoding, but with the additional twist that until closure, designs and meanings are constantly shifting. Bryan Pfaffenberger, a cultural anthropologist, has recently presented a first foray into this set of issues.<sup>25</sup> He indicates how people relate to new technologies by showing how, intentionally

---

23. Latour, *Science in Action* (Cambridge, MA: Harvard University Press, 1977) and Akrich, "How Can Technical Objects be Described," conference paper, Twente colloque, 3-5 September 1987 (Paris: CSI/École des Mines discussion paper).

24. For a basic summary of resource mobilization theory, see J. Craig Jenkins, "Resource Mobilization Theory and the Study of Social Movements," *Annual Review of Sociology* 9 (1983), pp. 527-553. For a masterful application of resource mobilization theory, see Doug McAdam, *Political Process and the Development of Black Insurgency, 1930-1970* (Chicago : University of Chicago Press, 1982).

or otherwise, signs—syntheses of signifiers and signifieds, images or words and artifacts—attain meanings, and how people act upon them. Within this framework, meanings can be shifted and reconstructed according to changes in the real or perceived social and material context. Because such processes of adjustment and reconstitution must draw from culturally available meanings, they most often serve to mirror, and, over time, reproduce the existing social-cultural order. By this argument, there can be no genuinely 'revolutionary' technologies. Nonetheless, this approach does not suggest a clear empirical technique for linking people who are acting within specific cultural frameworks to real objects and cultural signs.<sup>26</sup> This approach seems to assume that the material characteristics of devices remain rather fixed and that adjustments of meaning do not entail adjustments of objects beyond what is necessary to meet socio-cultural demands.<sup>27</sup> Pfaffenberger describes the process of meaning adjustment and reconstitution as, "a rather pathetic quest for self-validation in terms laid down by the dominant culture,"<sup>28</sup> which offers only a limited foray into understanding how images *and* artifacts are constructed and reconstituted.

Similar problems emerge in studying more literary and structuralist explications of sign systems. Their approaches do, however, suggest ways that we can see the link between social meanings and artifacts because the latter are, as "texts," susceptible to being read and deconstructed. Roland Barthes offers ways to analyze the apolitical and anti-conceptual ways that popular ideology is promulgated,<sup>29</sup> and how meanings are impoverished and manipulated while perhaps preserving

---

25. "The Social Construction of the Personal Computer, Or, Why the Personal Computer Revolution Was No Revolution," *Anthropological Quarterly* 61 (1988), pp. 39-47; see also Pfaffenberger, "Fetishized Objects and Humanized Nature: Towards an Anthropology of Technology," *Man* XXIII (1988), pp. 236-252.

26. This problem parallels that of Lynn Hunt in *Politics, Culture, and Class in the French Revolution* (Berkeley: University of California Press, 1984), Ch. 3: without, say, a generation of meaning by the internal structures of a sign system (in classically structuralist fashion), the parameters for decoding signs-as-perceived implicitly rest on the inexplicit, shared presumptions of analyst and reader.

27. It is at this juncture that an semiotically expanded version of Law's 'heterogeneous engineering' or of Latour's translations might be able to encompass concurrent adjustments of meanings and of real artifacts, see Law, "Technology and Heterogeneous Engineering," and Latour, *Science in Action*.

28. Pfaffenberger, "Personal Computer," p. 22.

29. *Mythologies* (New York: Hill and Wang, 1972), pp. 114 ff.

the physical integrity of the artifact.<sup>30</sup> For Barthes, myths—linguistic and symbolic constructs which replace the real objects they once represented—can form the basis for perceptions upon which people act, for example, in pursuing imperialism, purchasing consumer goods, or (for our purposes) inventing new technologies.<sup>31</sup> Nonetheless, structuralists, from Lévi-Strauss to Foucault and Barthes, render the recipients of images passive and cannot explain actions *in response* to myths. Were historians of technology to adopt this pure form of structuralism, we would not only destroy the heroic inventor of the antiquarians, would also arrive at a history without conscious actors, not unlike that of Braudel. These approaches do offer ways to understand sign systems themselves and (with some major modifications) the available fragments out of which people construct often disordered meanings for objects. For example, as a sign, a flag has no more or no less meaning or significance than a nuclear plant or playground incident, it only occupies a different place in a constructed world-view assimilated by a passive receiver. Nonetheless, we have no way to understand how people might personally link disparate signs—how or whether a flag-sign might link to an automobile-sign or a vacation-sign.

We can look to conceptions of narrative within both literary criticism and cognitive psychology as ways to link symbols and actions, and to understand how people might assimilate and adjust available technological signs.<sup>32</sup> Some cognitive psychologists argue that individuals construct narratives in order to understand change. Stories are constructed to organize signs, events, and pro-

---

30. *Ibid.*, p. 121.

31. Pierre Lemonnier goes a step further, arguing that one cannot conceptually divorce form or style or function—indeed, that form has a functional role: “Bark Capes, Arrowheads, and Concorde: On Social Representations of Technology,” in I. Hodder, ed., *The Meaning of Things. Material Culture and Symbolic Expression* (London: Unwin Hyman, 1989), pp. 156-169.

32. The work of Hayden White and Theodore Sarbin (both at the University of California, Santa Cruz), in the history of consciousness and psychology, respectively, is promising in this respect. See particularly Theodore R. Sarbin, ed., *Narrative Psychology: The Storied Nature of Human Conduct* (New York: Praeger, 1985); see also Hayden White, “The Value of Narrativity,” pp. 5-27. For a review of scholarship in constructivist psychology, see J.M. Sperry, “Structure and Significance of the Consciousness Revolution,” *Journal of Mind and Behavior* 8 (Winter 1987), pp. 37-61. Robert Neimeyer writes that personal construct psychology, “depart[s] from the environmental determinism of radical behaviorist formulations and the intrapsychic determinism of classic psychoanalysis” (*The Development of Personal Construct Psychology* (Lincoln, NB: The University of Nebraska Press, 1985), p. 2).

cesses—indeed, the entire panoply of perception.<sup>33</sup> Historians have recently begun to recognize the value of the narrative approach as a tool of analysis.<sup>34</sup> Along with Bijker but from entirely different perspectives, students of narrative identify moments of 'closure,' the point at which contention over meanings ends and new signs become stable.<sup>35</sup>

Those who stress the significance of narratives most often offer them as tools for retrospective analysis or for literary criticism, viewing narrative construction as a way of serially interpreting the past or of interpreting a text. Historians trying to understand the changing character and meaning of artifacts or the intentions of historical actors need a conception of *prospective* narrative. Prospective narrative, or scripting, is thus the process through which historical actors visualize futures and invent scenarios to arrive at those futures.<sup>36</sup> Just as consciousness is constructed by a subjective and half-conscious ordering of the terrain of available signs, conscious actions (be they political, inventive, or social) are directed to a reordering of signs and meanings—toward 'closures'—by scripting future histories. Scripts are, of course, constructed by each individual with implicit weightings arbitrarily assigned to constituent parts. In addition, Madeleine Akrich has correctly argued that inventors prescribe (or pre-script) the meanings of artifacts and socio-technical processes within designs themselves.<sup>37</sup> Recipients must therefore negotiate their own future scripts against those pre-

---

33. A capsule summary of the method is: James C. Mancuso and Theodore R. Sarbin, "The Self-Narrative in the Enactment of Roles," in T.R. Sarbin and Karl Scheibe, eds., *Studies in Social Identity* (New York: Praeger, 1983), pp. 234-253, especially 235-237.

34. Most recently, see Richard Harvey Brown, "Positivism, Relativism, and Narrative in the Logic of the Historical Sciences," *American Historical Review* XCII: 4 (October 1987), pp. 908-920. Oral historians have used this approach for some time; see, for example: Kim Lacy Rogers, "Memory, Struggle, and Power: On Interviewing Political Activists," *Oral History Review* 15 (Spring 1987), pp. 165-184. See also Hunt, p. 88.

35. While one may rightfully criticize, as Clifford Geertz does, the mainstream Parsonian stress upon stasis and the maintenance of social order as a critical tool, this does not preclude the possibility that historical actors might have sought stasis or the annihilation of change; see Clifford Geertz, *The Interpretation of Cultures* (New York: Basic Books, 1973), pp. 142-144.

36. On this subject in the psychology literature, see Jean Matter Mandler, *Stories, Scripts, and Scenes: Aspects of Schema Theory* (Hillsdale, NJ: Lawrence Erlbaum Associates, 1984), Chs. 2-3.

37. Madeleine Akrich, "The De-description of Technical Objects," in Bijker and Law, eds., *Constructing Networks*.

scripted in specific artifacts. This discursive process affects both the meaning of the artifact and the self-identity of the perceiver. The flexibility of an artifact's built-in pre-scripted helps determine its ability to adapt to different and changing circumstances. A liquid propane gas range has far less cultural or material adaptability than a cast iron stove; the former 'demands' a specific fuel and social environment, the latter is 'indifferent' to fuels and requires fewer social preconditions. Non-negotiable pre-scripted or unilateral inventions are less apt to be socially assimilated because they are inherently less adaptable.

Scenarios are important for us as integrators of signs and media for meanings, and when specified in fine enough grain and viewed from outside, definitions of frontiers between structural and individualist determinants. Indeed, on this latter point, if people are to retain a sense of power and membership within their social context, they must constantly re-invent scenarios to take account of their shifting perceptions of what is possible and what is structurally forestalled or inevitable. Similarly if promulgators of signs (political parties, inventors, advertising agencies, etc.) are to remain viable, they must also adjust signifiers to meet the changing priorities of recipients.<sup>38</sup> Thus the process of adjustment occurs on both sides of sign systems, and it encompasses both meanings and contents. As such it is dialogic. Just as meanings can be adjusted or reconstituted to take account of new circumstances or the intrinsic character of artifacts, so the design and utilization of artifacts can be modified: airfoils could be added to cars and computers could be used to cast astrological charts. By observing and inferring prospective narrative and adjustment strategies, we can therefore start to transcend some of the thorniest historiographic tangles—between structures and wills, and among artifacts, meanings, and actions.

What makes prospective narratives valuable for historians are their commonality and con-

---

38. A successful invention of tradition can supplant this rule. Vestigial wood grain patterns still adorn station wagons and suggest the the "tradition" of the 1930s "woodies," and baby shampoo has remained unchanged for decades, thereby encouraging inter-generational product association. Neither artifact need be reinvented or redeveloped. On the invention of tradition in another context, see Eric Hobsbawm, "Mass Producing Traditions: Europe, 1870-1914," in Eric Hobsbawm and Terence Ranger, eds., *The Invention of Tradition* (New York: Cambridge University Press, 1983), pp. 263-307.

trasts—the linkages which arise primarily from common experience, and the differences which lend the definition. More significantly, the successful promulgation of signs (as well as the ultimate hegemony of specific sign-systems) can be seen as supplying a society with a set of meanings which explain seemingly disparate phenomena. The successful appeal of a party programme, advertising campaign, or new invention can to an extent be ascribed to success in inducing individuals to identify a meaningful diagnosis and prognosis in a set of propaganda materials. A propensity for people to take certain sets of sign symbols seriously hinges upon the perceived legitimacy of the promulgator, upon the latter's successful references to culturally available meanings, and, if necessary, upon an appropriate adjustment of an artifact.<sup>39</sup> By this avenue, we can begin to conceive of communities which are constructed out of sets of commonly recognized meanings. Safe, clean, and cheap nuclear power made for a nation of warm and contented power consumers; expensive potential bombs in the countryside made for communities of anti-nuclear activists. One scripted a future of a convenient, labor-saved lifestyles, the other envisioned an Orwellian nightmare of 'electro-fascism.'<sup>40</sup>

In sum, earlier historians of technology who analyze the inside of the black box referred to an engineering conception of functionality or an economic sense of cost and benefit characteristics. Both of these approaches (and a combination of them<sup>41</sup>) tended to be reductionist. At the same time, few more recent authors attempt to examine concretely how ostensibly socially-determined technical characteristics of artifacts serve to reproduce, extend, or undermine existing social relations.<sup>42</sup> Historians of technology are becoming more aware of the symbolic content of technologies, and how the imagery of functionalism and utility may be more important than their reality. If we are to discuss technology as a cultural dynamic and social process, we can enrich our analyses

---

39. See Pfaffenberger, "Personal Computer," pp. 16-18.

40. Such was the language of André Gorz, *Ecology and Politics* (Boston: South End Press, 1980), Ch. 3.

41. See, for example the essays in Nathan Rosenberg, *Inside the Black Box: Technology and Economics* (New York: Cambridge University Press, 1982).

42. Notable exceptions are Cowan, *More Work for Mother*, Noble, *Forces*, and Zuboff, *Smart Machine*.

by showing how people imagine, interpret, and interact with artifacts. Machines and artifacts are both evocative, to use Sherry Turkle's term,<sup>43</sup> yet the meanings and attributes evoked are often far from transparent or functional in the usual sense. Machines and the social meanings of them may serve psychological, social, and cultural ends which can exist quite apart from more mundane mechanical purposes. Historians of technology have long told us how artifacts can help beget new social formations. If, as Lynn Hunt argues, "...symbolic practices [can call a] new political class into existence,"<sup>44</sup> technological symbols can create new forms of social identity and organization. While cultural analysts of technology have richly shown how promulgators of technology seek to imbue specific social groups or societies at large with determinate sets of meanings,<sup>45</sup> few have grappled with how and to what degree such images are either assimilated or acted upon by putative target groups. We are often left to assume that images are impressed into a social *tabula rasa*. A theory of technological narratives allows historians to address the ways that promulgators and recipients might have negotiated over the material content and meanings of technological artifacts.

Historians and philosophers of technology might use this framework to study the relationship between society and technology, particularly to define the presuppositions which people brought into their relations with technology. While it might appear that this method re-closes the 'black box' (or worse yet, shows little interest in revealing its contents), it allows the relevant actors themselves to open the box—to define which issues are relevant. For example, Jean Baudrillard has argued that in domestic technologies, the message of functionalism in appearance and arrangement often belies serious lack of functionality.<sup>46</sup> To borrow from Barthes, mythologies of high technology and expertise may well have served to keep the black box closed, even when it was empty.

---

43. *The Second Self: Computers and the Human Spirit* (New York: Simon and Schuster, 1984), p. 13.

44. *Politics, Culture, and Class*, p. 13.

45. See, for example, Michael L. Smith, "Selling the Moon: The US Manned Space Program and the Triumph of Commodity Scientism," in T. J. Jackson Lears, *et al.*, eds., *The Culture of Consumption* (New York: Pantheon, 1983).

46. *Le Système des objets: la consommation des signes* (Paris: Gallimard, 1968), p. 21-23.

One only has to view the objects of the current minimalist, high-tech style to understand the contradiction between the appearance and reality of function. One might also argue that black boxes have at times been consciously kept closed, particularly those which contain representations of skills, such as computers and special purpose machine tools. From a technical standpoint, some boxes remained closed because ‘closure of meaning’ (in Bijker’s sense) had already occurred, as with American cars between the mid-1930s and the early 1970s. Some may have remained closed because the subculture which controlled them didn’t consider some issues as even existing—hence the automotive carburetor remained untouched with respect to fuel economy until 1973, when signs of (as it were) greedy oil blackmailers and gas lines forced a redefinition and redesign of the carburetor.

Perhaps the most appropriate way to examine the ways to use this method is to return to our example of the Eiffel Tower and analyze its position as the first step toward the closure of technological discourse in France. The Eiffel Tower, an icon designed for the 1889 centennial of the Great French Revolution, represented social-technological republicanism at a time when French progressives were battling for a secular republic. Opposed to conservative, Catholic, and family-oriented business, the Tower bespoke a critique of the old order. As such, it was one of the first images in a long series deployed by an emerging social technocratic milieu, and its very existence imagematically attacked traditionalists. Nonetheless, it represented a goal for the people who wanted to get France out of a miasma of technological, social, and economic stasis, but it obviously remained mute on the way to achieve a modern and rational republican régime. The iron and structural concerns of the Eiffel Tower were turned to rapid industrial growth in the years up to 1914 and symbolically began to promise a world of plenty once the fruits of prosperity were better distributed. World War One inverted the imagery—technological ‘progress’ had provided the means for mass destruction—but ironically, many imagined that French industry and technology (not indigenous perseverance or American troops) had won the war. The static tower had become the dynamic and victorious assault tank. As the war wound down, many envisioned a postwar world in which the output of mass production industry would serve broad and prosperous popular mar-

kets.

Images in the 1920s, from those of domestic appliances to power plants underlined the gap between visions and the future and the feeble means available to get there, but by that time, businessmen affirming the value of a technology-driven growth economy had elicited the support of trade union reformers and socialists such as Jean-Louis Breton and Hyacinthe Dubreuil in their battle of images.<sup>47</sup> Leaving the Communist Party in an isolated adoration of the Soviet Union and criticizing conservative business for its production-inhibiting 'malthusianism,' leaders of the General Confederation of Labor (CGT) and elements of the Socialist Party allied with modernist businessmen to promulgate an image of symmetric technologized environments: the rationalization and Taylorization of factories, and a modernization of homemakers' domestic tasks.<sup>48</sup> Technology as liberator from material want and physical drudgery became a powerful image for this emerging modernist coalition, but the symbols remained hollow, static, and without concrete referents. Indeed, those who sought to import Ford's vision of mass production for mass markets had no credible scenario for implementing their visions, as political power and economic policy control remained in the hands of a reluctant Center-Right. Industrial rationalization (which included a range of activities, from reorganizing the labor process to developing production-cost analysis models and notions of material flows within factories) was limited to a few leading-edge industries such as electric power and automobiles. The politics of rationalization were merely discussed within small circles of experts.<sup>49</sup>

---

47. Martin Fine, "Hyacinthe Dubreuil: Le Témoignage d'un ouvrier sur le syndicalisme, les relations industrielles et l'évolution technologique de 1921 à 1940," *Le Mouvement social* 105 (1977), entire, and Martine Martin, "La rationalisation du travail ménager en France dans l'entre-deux guerres," *Culture technique* 3 (1980), p. 161, Martin, "Ménagère: Une profession? Les dilemmes de l'entre-deux-guerres," *Le mouvement social* 140 (juillet-septembre 1987), pp. 89-106, and Martin, "Femmes et société: le travail ménager (1919-1939)," (thèse de troisième cycle, Université de Paris VII, 1984), Chapter 3.

48. Michelle Perrot, "Histoire de la condition féminine et histoire de l'électricité", in *L'Électricité dans l'histoire, problèmes et méthodes, Actes du colloque de l'Association pour l'histoire de l'électricité en France, Paris, 11-13 octobre 1983* (Paris: Presses Universitaires de France, 1985), pp. 175-184, and Françoise Werner, "Du ménage à l'art ménager: l'évolution du travail ménager et son écho dans la presse féminine française de 1919 à 1939," *Le Mouvement social* 116 (1984); Cf. Charles S. Maier, "Between Taylorism and Technocracy: European Ideologies and the Vision of Industrial Productivity in the 1920s," *Journal of Contemporary History* 5 (1970).

Interwar technological imagery ironically succeeded—popular visions of a heroic, technologized future became firmly implanted and formed the basis for later political aspirations—despite minimal implementation of the new techniques and technologies. In part, the failure can be ascribed to a lack of credible scenarios to meet the new goals. Most proprietors were loath to risk the capital-intensive investments in new machinery that innovation in manufacturing required, particularly because they sensed that their markets were too small to warrant the effort.<sup>50</sup> In addition, most entrepreneurs still affirmed the traditional French production model of small batch production of luxury products executed by skilled artisans and sold at high prices, and indeed, many gentleman entrepreneurs were reluctant to believe that quality could be mass-produced. Artisanal production had worked for their forefathers and few saw reason to change. Finally, the Fordist model seemed to imply a shift toward managerial capitalism, thereby removing “divine right” owners from control of their firms. A shortage of technocratic managerial personnel, whether business experts or engineers, further compounded the owners’ reluctance.<sup>51</sup> In sum, the chasm between heroic visions and the banal quotidian underlined the fact that productivists—those seeking to maximize output through rationalization and other efficiency measures—could offer no credible scenario to reach the future.

The history of the Salons des Arts Ménagers, or annual home fairs, echoes the problems of

---

49. Robert L. Frost, *Alternating Currents: Nationalized Power in France, 1946-1970* (forthcoming, Cornell University Press), Chapter 1, Patrick Fridenson, *Histoire des usines Renault* (Paris: Éditions du Seuil, 1972), Chapter 5. On the study circles, see Richard F. Kuisel, *Capitalism and the State in Modern France* (New York: Cambridge University Press, 1981) Chapter 3, and Philippe Bauchard, *Les Technocrates au pouvoir* (Paris: Arthaud, 1966), Chapter 2.

50. Yves Cohen (in “Management, Organization, and Production in French and American Automobile Industries Between the Two World Wars: Some Aspects,” paper delivered to the annual meetings of the Society for the History of Technology, Cleveland, October 1990) cites this wariness even on the part of the boldest innovators in French industry, the auto makers. Aimée Moutet consistently argues that most French industrial sectors were too small to achieve the necessary scale for mass production; see in particular, “Une rationalisation de travail dans l’industrie française des années trente,” *Annales E.S.C.* XLII:5 (September-October 1987), p. 1087. The important point here is not whether or not in fact mass markets were lacking, but that entrepreneurs perceived them to be.

51. Fridenson, “Les expériences de la rationalisation dans la France des années 1920,” *Sciences sociales et santé* VI:3-4 (novembre 1988), pp. 51-54, Aimée Moutet, “L’introduction de travail à la chaîne,” *Histoire, économie et société* (janvier-mars 1983), and Ernest Mercier, “Le Redressement Français,” Speech to the Comité National d’Études, 28 janvier 1926, pamphlet (Paris: Comité National d’Études, 1926).

industrial rationalization. The Salons, held in Paris from 1923 until 1980, enjoyed massive attendance in the interwar era—almost a half-million in the late 1930s—yet few families bought appliances other than clothes irons or radios. Reasons for the gap abounded. Designs rarely stabilized in the interwar era because of a broad array of energy sources (coal, charcoal briquets, kerosene, gasoline, natural gas, and electricity) and a large number of small manufacturers who remained wedded to artisanal techniques.<sup>52</sup> Design closure also remained elusive because manufacturers, lacking markets research capabilities, often imagined what their potential markets wanted and left little room for negotiation with consumers.<sup>53</sup> As a result, they often simply imported American images of the users of appliances.<sup>54</sup> Defining domestic consumerism meant inventing new social roles for women, and wives and husbands themselves were not yet sure about what shape the new roles would take.<sup>55</sup> A new, class-blind definition of femininity, of women liberated from household drudgery by machines, found little resonance either within the elite (which dreamt of servants) or the working class (which was too poor to afford the new machines). The budgets of most families largely precluded items deemed to be luxuries, and even the most primitive sense of accounting would show that pricey home appliances could never really be amortized.<sup>56</sup> Middle class women were be-

---

52. French manufacturers replicated the problems that David Hounshell (*From the American System to Mass Production*, Baltimore: Johns Hopkins University Press, 1987, Ch. 2) characterized as the European style for the Singer works in the late nineteenth century: many fitters and no standardized parts.

53. Loose document and attached form letter from Paul Breton, head of Salon des Arts Ménagers, 15 May 1928, Archives Nationales code 850023/3.

54. This was particularly the case for refrigerators: Frigéco (General Electric designs manufactured to specifications by Thomson, SA, in France), Frigidaire, and Norge all essentially imported American ad copy for their French ads. Norge's advertisement of 1935 for the French market even pictured American products.

55. For example, Birnam-Lutra offered a floor polisher in 1928 which in its advertising text bragged of its industrial strength and ability to do the job (an appeal to the female users' practicality), yet presented a line drawing of a well-coiffed woman in spike heels and short skirt deftly manipulating a 50+ kg. machine with one hand (an appeal to the husband, who might fear that his wife would be de-feminized by industrial machinery): advertising copy in *Catalogue du Salon des Arts Ménagers, 1928* AN côte 850023/6, n.p.

56. anon., "Budgets ouvriers. Le Travail et la Famille," *Dossiers de l'Action Populaire* (25 oct 1923), p. 3. Jean Fourastié et Françoise Fourastié, "Le Gendre de vie," Chapter XIII in Alfred Sauvy, *Histoire économique de la France entre les deux guerres*, Vol. III (Paris: Economica, 1984), pp. 214-222. In 1928 a regular stand-up vacuum cleaner by Mors cost 855 francs and that a skilled male textile worker made 5 to 6 francs per hour: AN série F22 191 (for wage levels, which for unskilled workers outside Paris hovered at about 2 to 3 francs per hour); vacuum cleaner price from Mors prices listed in 1928 Salon des Arts Ménagers catalog, in Archives Nationales series 850023/65.

ginning to shift toward new conceptions of public life based on paid labor and education, and to the ad-man's romanticization of domesticity they responded with a hard-headed practicality.<sup>57</sup> Finally, urbanites faced a dire shortage of quality housing, and presumably, additional domestic expenditures would first go toward housing itself.<sup>58</sup> Hence, neither manufacturers nor putative users of domestic technologies could agree on the social meaning of appliances or housewives. There could be no credible path to women or families liberated by technology without the closure of appliances' physical features or social meanings. In the blocked society of the interwar era, few offered credible scenarios to reach an idyllic future.

Thus, the interwar era in France thus saw only a proposal for marriage between consumerism and productivism, never its consummation. Trade shows, expositions, and managerial revolution literature remained signifiers without material referents, yet members of the modernist coalition also promulgated them as critiques. By the 1930s, however, the Communists began scripting a mass-production — mass-consumption scenario based on the heroic Soviet successes under Stalin. Until 1935, that prospective story was, of course, an agenda for social revolution. For the French Communist Party (PCF), in the USSR, fanatically productive workers joyfully worked under 'comrade managers' to build a workers' material paradise, replete with massive steel mills and hydroelectric projects. In the interwar era, the PCF thus also began to use its version of heroic technology as a criticism of capitalism, but once the PCF consented to support the Center-Left Popular Front coalition in 1936, its images again lacked scripts.

Indeed, the failure of the Popular Front, despite its traditional appeal to social solidarity and its occasional references to technology-as-social solution,<sup>59</sup> can be ascribed to its lack of any co-

---

57. Interviews by Gaston Picard, "Mesdames, êtes-vous 'Arts-Ménagères?'," *L'Art Ménagère* (mars 1927), p. 24.

58. Peggy Phillips, "The Lonely House: Paris and France," *Proceedings of the Annual Meeting of the Western Society for French History* (1986), and communication with author.

59. Some of the Popular Frontist language was strictly *anti*-technological, blaming industrial rationalization for the high rates of unemployment. Indeed, the mix of social-technocratic and anti-technological rhetoric within the Popular Front is perhaps symbolic of the divisions within the coalition.

herent program offering more than piecemeal reform. Based in sentiment more than programs and promulgating images of technological prosperity without content or coherent means, the Popular Front could do little to put France’s economy back together. Maintaining a coalition against fascism demanded nearly the full attention of the Popular Frontists. State-financed heroic dam projects in the Rhône basin—reminiscent of TVA—required years of construction time to benefit consumers, and their employment effects were minimal. The régime wished to increase the size of the economic pie as an alternative to warring over its division, but failing such, it fell amid class contention. The Center-Right managed to elicit high levels of productivity from 1938 to the defeat of 1940, but they were largely based upon a yawning fear of impending invasion.<sup>60</sup>

France’s defeat in 1940 was broadly viewed as not only a military affair, but as an indictment of an entire class and social system. As a result, the traditional élite was forced into retreat after the war. A leading wartime resistance study group wrote,

The ‘armistice with honor’ posed the problem clearly to our people because it had been preceded by the failure of almost the entire ruling elite. After 150 years of rule, our bourgeoisie, who controlled the army, the political system, and industry admitted its sterility and could conceive of national renewal only in defeat.<sup>61</sup>

In addition, the Depression and war had clearly left France in dire material straits; she was woefully short of capital, labor, and resources. Technocratic reformers therefore began to write the scenario for a French renaissance. On the advice of Stalin, the PCF rejected a revolutionary strategy and became part of the modernizing coalition—at least for a short time.<sup>62</sup> The political preconditions for a cooperative relationship between business and labor were set, and the modernization scenario emerged as a combination of nationalizations and planning. The three unlikely personalities head-

---

60. For the best discussion of this productivity boom in the airframe construction industry, see Herrick Chapman, *State Capitalism and Working Class Radicalism in Twentieth Century France: Industrial Politics in the French Aircraft Industry, 1928-1950* (Berkeley: University of California Press, 1990), 164-165.

61. Comité Général d’Études (C.G.E.), “Pour une nouvelle révolution française,” *Les cahiers politiques* 5 (January 1945), p. 11.

62. Philippe Robrieux, *Histoire intérieure du Parti communiste*, vol. II (Paris: Fayard, 1981) pp. 81-85, and Charles Tillon, *On chantait rouge* (Paris: Laffont, 1977) p. 445.

ing these efforts were General de Gaulle, the virulently nationalist president, Jean Monnet, the technocratic father of the plan, and Marcel Paul, the Communist Minister of Industry.

Despite very real political differences within the modernization coalition, there was a consensus on a number of material issues. All recognized the dire capital shortage, and that borrowed or granted capital would not suffice. Capital had to be accumulated, not unlike the "socialist accumulation" overseen by Stalin, and this accumulation demanded a vast shift of income uses from consumption to investment in an already impoverished population. The producer-consumer imagery of the interwar period had to be untied, and consumerism a dream deferred. Success in this venture ostensibly depended upon the willingness of the PCF, now the dominant influence in the General Confederation of Labor (Confédération Générale du Travail, CGT), to pursue a "battle of production" at long hours and low pay, and under the command of technocratic managers. In return for its efforts the CGT was offered a vague participatory role in management and planning organisms. The PCF began to script a future in terms not unlike the socialist-realist art of the Soviet 1930s, replete with heroic workers, dogged party and union leaders, and "patriotic bosses" building the New France.<sup>63</sup>

The modernization coalition also developed a consensus on the style and imagery associated with the modernization, and indeed, to an extent, on the scenario for "progress." Reacting to the traditionally small scale and decentralized character of French industry, modernists envisioned a national technical apparatus dominated by large, centralized systems, owned by large, centralized firms, all integrated by "indicative planning"—a system of capital and resource allocations for the private firms that voluntarily followed state-set industrial guidelines. While there were certain disagreements about which enterprises were to be public or private, notions of scale and centralization reached the colossal proportions of a Barthesian myth.<sup>64</sup> Reflecting the rationalist-positivist tradi-

---

63. On the CGT's analysis of managers, see Annie Lacroix, "La CGT et action ouvrière de la libération à mai 1945," *Revue d'histoire de la deuxième guerre mondiale* 116 (October 1979), and Darryl O. Holter, "Miners Against the State," doctoral dissertation, (Madison: University of Wisconsin, 1980), pp. 231-242.

tions of French engineering and political discourse, modernizers also tended to place high value upon mathematical demonstrations, often (as in the case of planning) appreciating the æsthetics of “ideal” resource allocations, for which the actual resources and the cash to buy them were often unavailable.<sup>65</sup>

Communists thus affirmed a rather solidaristic and heroic vision of industrial renovation, while the vague Left-Center bloc of Socialists, Christian Democrats, leading-edge businessmen, progressive Catholics, and state managers supported a more managerial and technocratic one. Ironically, though the Communists retained an explicitly political language in discussing technological renovation, both parts of the modernizing coalition tended to use politics to attain goals they judged would launch France to a historical stage beyond politics, and they were to use a rhetoric of linear progress to do so.

Building on the “objective” character of the elements needed for modernization, both visions of a technological future tended to reify and depoliticize technology. Dams, mills, and rail networks of an epic scale and with largely uncontested technological characteristics were to be emblematic of a new France in the making. After all, the Communists could look to the USSR and see steel mills and power systems nearly identical to those in the USA, to which the other wing of the coalition made reference. Even on the question of ownership, the majorities in favor of nationalizing coal, rail, banking, insurance, electrical power, and Renault were all quite lopsided. A long debate on the nationalization of electricity indicated less direct opposition than an opportunity for neo-liberals to take rhetorical stands against what they saw as the creeping power of the state. Indeed,

---

64. Part of this fixation with large-scale, centralized systems is also probably rooted in the training of French engineers, whose Cartesian mathematical approach makes them far better at large ‘drawing board’ conceptions and weak at more mundane ‘detail’ work.

65. The program documents for the Monnet Plan, authored in 1946, bear this out. In the electricity program, for example, dam projects were set which used vast quantities of capital, construction machinery, concrete, and labor, none of which were in sufficient supply. See France-Commission de la Modernisation de l’Électricité, *Rapport* (Paris: Imprimerie Nationale, 1946), and Henry Rousso, ed., *De Monnet à Massé* (Paris: Éditions de la CNRS, 1986), and Alan S. Milward, *The Reconstruction of Western Europe, 1945-51* (Berkeley: The University of California Press, 1984), Chapters 1 and 2.

most of the opposition voted for passage of the bill to nationalize electricity.<sup>66</sup> Modernists thus enjoyed near-total unanimity on the only vaguely “political” aspect of the modernization effort, that of nationalizing a number of key industrial sectors, including coal, oil exploration, gas production and distribution, investment banking, insurance, rail, public transport, and Renault. Though it of course remained unspoken, many sensed that even if France hadn’t really won a major war in almost two centuries, her techno-intellectual skills still warranted her a place in the sun, a sun which was to become nuclear. Indeed, the massive modernization projects of the late 1940s and early 1950s were to be artifacts of technological display, symbols to a dubious world of France’s greatness.<sup>67</sup> The symbols had important political functions, for they helped to recruit erstwhile conservative businessmen and radical labor activists into the modernization coalition, and to persuade a rather localist society that technocrats in Paris could be the guarantors of prosperity.

The contrasts among the different prospective narratives of the path toward France’s future reflected subtle differences, however. Neo-liberals envisioned the tasks ahead as necessary pains on the way to re-establishing a healthy, prosperous capitalism with less dramatic income gaps.<sup>68</sup> Technocratic socialists saw the modernization as a first step to a white-collar, expert-managed socialism—a socialist version of Thorstein Veblen’s vision—in which more technically efficient state firms would defeat private firms in the market, and workers and outsiders would defer to expertise.<sup>69</sup> Be-

---

66. Guy Bouthillier, “La Nationalisation du gaz et de l’électricité en France,” thesis, (Paris: Université de Paris, 1968), entire, *op. cit.*, Frost, Chapter 2. *Communist* authors argue otherwise, claiming that business put up a genuine fight; see Annie Lacroix, “La nationalisation de l’électricité et du gaz,” *Cahiers d’histoire de l’Institut Maurice Thorez* 6 (new series 34; January 1974). Symbolic resistance does not mean, however, that opponents conceded permanent defeat; René Courtin wrote: “It is the bourgeoisie who have betrayed the country. We will therefore nationalize. It is a political necessity. In fifteen years, when a new bourgeoisie emerges which is worthy, we will denationalize;” cited in interview with André Philip, in Sven Nordengren, *Economic and Social Targets in Postwar France* (Lund, Sweden: Belingska Boktryckriet, 1972), p. 240.

67. The concept of ‘technological display’ has been fruitfully developed in Michael L. Smith, “Selling the Moon.”

68. Kuisel, *Capitalism and the State*, Chapter 5.

69. Jules Moch, a Polytechnique Socialist leader, was most explicit about this; see his series of pamphlets and articles, from *Socialisme et rationalisme* (Paris: Librairie du Parti: 1924), through “Reflexions sur les socialisations,” (*Les Cahiers politiques* (clandestine), 8 (March 1945) [pseud. J.M.]), to *Guerre aux trusts* (Paris: Editions de la Liberté, 1945).

neath thin socialist-realist imagery, the Communists' positions were more ambiguous. While it seemed that they were embracing the modernization consensus on a permanent basis, particularly because they had won an institutionalized position within the industrial régime for the CGT (over which they won political control in 1946), they seemed to cooperate only as a way to gain power within the new institutional frameworks.<sup>70</sup> The implication of all of these strategies was clear, however, that a dogged campaign for greater production in the near term was ultimately to give the material basis for a transformation of everyday life in the form of more consumer goods. A technological liberation from drudgery was to follow from a similar liberation from penury.

The Cold War eventually doused the enthusiasm of the modernization coalition. By late 1947, the Communists were in the opposition and the Right was on the path to renewed power, which it would gain in 1950. Though the coalition died at the top of politics, it continued among social networks within the CGT, state sector, and modernist businesses. In Thomas Hughes' terms, the coalition and its projects had already developed considerable momentum, supported by Marshall Plan funds. The Communists in particular were placed in a deeply contradictory position. While the Party doctrinally argued that nationalizations and planning were only ways of rebuilding capitalism, and that the program of deferred consumption deprived workers in order to enrich the bourgeoisie, Communist union leaders within the state sector recognized their position of power and weren't about to go into opposition at the grass roots level, where the coalition therefore continued.

The technocratic-Communist coalition inside the modernization network began to close ranks in the face of opposition. Following a set of state budget cuts on modernization projects in 1948, the Communist head of the CGT electrical workers' union joined the head of France's largest electrical equipment and public works combine on a publicity tour of "the land of the kilowatt." In the publicity brochure produced after the tour, the collective authors vaunted the camaraderie of

---

70. For a full discussion of the Communists' position, see *op. cit.*, Frost, *Alternating Currents*, Chapters 2 and 3.

the construction workers, who labored up to ninety-four hours per week as the pioneers of the emerging new France. At the Bort dam site, "in less than five years, men correct[ed] the work of millenia." Peasant resistance to the dams was written off simply as a result of "medieval fear and superstition." The pre-Cold War vision of the working class was underlined: "...social barriers are abolished, unknown. The hierarchy exists, [it is] normal and natural, but as a function of value, competence, and love for the task ahead."<sup>71</sup> Similarly, when the peasants at Tignes in Savoy desperately fought the construction of a hydroelectric project which would annihilate their village, Communist unionists and modernist industrialists combined to suppress opposition (using no small number of riot police who occupied the village for several years) and forge ahead with the project.<sup>72</sup> Of the incident and the social costs of modernization, one journalist wrote,

The basic and significant fact was not the sacrifice of a village for the production of energy, but that it was not even discussed. Between man and production, the debate is resolved in advance, and always in the same way. This automatic reaction and the inhibitions it places on our spirits shows clearly that productivism is not for us a rational issue but a collective myth....[Indeed,] religious dogma has been replaced by economic dogma...<sup>73</sup>

The imagery of technological modernization was indeed mythological. Enamored by sheer scale and by an emerging cult of mathematical economic analysis, technocrats began to demonstrate the economic necessity for ever-larger facilities, ignoring issues of system reliabilities inherent in smaller scale. The new dams emerged as icons of the new France, though Tignes today represents only two percent of France's generating capacity. From the minimalist elegance of Tignes' dam to the Romanesque arches at Roselend and the new series of coal plants, massive transmission lines spider-webbed a new France together. The modernization coalition was succeeding, and each

---

71. Le Comité pour l'Équipement Électrique Français, "Cinq jours au pays du kilowatt," pamphlet (Paris: CPEEF, 1949), pp. 9, 40.

72. For a complete rendition of the Tignes incident, see Robert L. Frost, "The Flood of 'Progress': Technocrats and Peasants at Tignes (Savoie), 1946-1952," *French Historical Studies*, XIV:1 (Spring 1985), pp. 117-140.

73. G. Charbonneau, "Maintenant que Tignes est oubliée Réforme a choisi d'en parler," *Réforme*, 28 June 1952, p. 6.

completed project became another signpost on the path to a technologized future.

At the same time, mathematical economists within the modernization networks developed new mathematical models to justify cheap power and rail rates to the largest consumers. Increasingly, technological artifacts and economic equations became reified from their socio-political context; facilities became material proof of the success of the modernization program, and workers—even white-collar technicians—became mere factors of production. This decontextualization of people, artifacts, and equations was not unlike the decontextualization of scientific facts as they become part of accepted canons.<sup>74</sup> Planning models began to take a mythological free market as a reference standard for all projects, regardless of industrial or market structure, or the security of material inputs. For example, guided by formulas which projected the price of oil falling well into the 1980s, the power company had several thousand megawatts of oil-fired power plants under construction when the crisis hit in 1973. Worse, experts had calculated that the total capital costs for fuel-conserving technology could not be justified when oil prices were low, so France was saddled with a set of inefficient plants as prices trebled. Mathematics became a language not only of description and analysis, but also of obfuscation and inaccessible power, performing the useful task of insulating the technocracy from outside criticism.<sup>75</sup>

Communists shared many of the neo-positivist predilections of the technocrats, part of an ideological tradition within orthodox marxism.<sup>76</sup> Indeed, during the years of political isolation, French Communists began to adopt the old interwar imagery of the link between mass production

---

74. Bruno Latour and Steve Woolgar, *Laboratory Life: The Social Construction of Scientific Facts* (Beverly Hills, CA: Sage, 1977), pp. 105-107.

75. Members of the Senate (Conseil de la République) became particularly incensed at the obfuscatory nature of the technocrats' equations during debate over the enactment of a marginal cost high tension electrical power tariff, see: France, Conseil de la République, Commission de la Production Industrielle, “Rapport No. 418,” pamphlet, annexe au procès verbaux du Conseil, séance du 21 juillet 1954 (Paris: Imprimerie Nationale, 1954), pp. 2-4.

76. In this context see D. MacKenzie, “Marx and the Machine” *Technology and Culture* (July 1984), pp. 473-502, and Langdon Winner, *Autonomous Technology: Technics-Out-of-Control as a Theme in Political Thought* (Cambridge, Mass.: MIT Press, 1977), pp. 65-75. Louis Puisseux, a former Électricité de France official, stated a similar perception based on his own experience: interview with author, Paris, 18 February 1981.

and popular consumerism. For Communists within the modernization networks, this old rhetoric represented a plausible future; for Communists outside, it represented a mode of criticism against a stingy capitalist order. Those inside continued a heroic proof by production, using output statistics as a mode of defense against parsimonious régimes. This meant that notions of “democratic management,” once vaunted by the CGT, were removed from the agenda in favor of a deference to technocratic authority, now judged to be the surest guarantee of productive success. An implicit prospective narrative thus began to emerge for the Communists: deferred consumption in the present would foster larger industrial structures and later popular consumerism. The director of the power company characterized the Communist attitude on the shop floor as one of, “work hard, follow orders, and collect your growing paycheck.”<sup>77</sup> Making the consumerist agenda more explicit—characterizing the use of the larger paycheck—, Marcel Paul said, “...the washing machine is now an instrument of class struggle.”<sup>78</sup> The Communists never discarded the dogma that the workplace was to be the flashpoint of class struggle, yet by supporting a depoliticized consumerist mentality, they were undercutting their own position.

During the 1950s, therefore, many businessmen, technocrats, and trade unionists developed shared visions of a technologized future, offering parallel scenarios about how to get there. For these constituencies, a technologically-based growth economy became a central political concern, yet the vision of growth was itself largely depoliticized. In the mid-1950s, the productive successes were obvious and opponents were rendered increasingly mute. By the late 1950s, the need to complete infrastructural development and to wrest control of the state from the provincial traditionalists who dominated Parliament remained the only barriers to realizing the modernists’ vision of the future. Both of these tasks were completed by 1960, and the emerging Gaullist state—one which gave both big business and Communist labor an institutional presence—symbolized their fulfillment.

---

77. Interview with Roger Gaspard by author, Paris, 23 June 1981.

78. Paul’s report to the 25th CGT National Congress, June 1955, cited in Jean-François Picard, Alain Beltran et Martine Bungener, *Histoire(s) de l’EDF* (Paris: Dunod, 1985), p. 375.

De Gaulle himself strongly believed in technological imagery, particularly for nationalist uses. It can be argued that he opted to pull out of Algeria because a dirty little war precluded France's emergence as a great power. The development of nuclear weapons, the archetypal icon of the marriage between technology and nationalism, would for de Gaulle and others compensate for the disaster of lost empire. One may muse over the utility of nuclear weapons on a small continent, particularly when deployed against a power with whom de Gaulle was seeking friendly relations, but image was more significant than the function. Indeed, de Gaulle initiated a wave of technological projects which made far more sense as objects of display, because their economics were dubious; the Concorde and the French design of nuclear reactors were only the most obvious artifacts of this sort.<sup>79</sup>

After de Gaulle's departure, his successors extended the logic of technology-as-display.<sup>80</sup> The high-speed Paris-Lyon train is indeed fast, but it is rather expensive for popular transport and relegates many towns without appropriate stations to oblivion. The design of the Pompidou museum uses the architectural aesthetics of an oil refinery to minimize the art it displays. The "Cit  of Sciences and Industry" at La Villette decontextualizes science and technology with its infantilizing, Mr. Wizard approach to visitor participation. The world's most massive atomic power system, replete with a complete nuclear fuel cycle, is vastly oversized for the task, but it remains the object of adoration for depressed utility engineers worldwide. At times, technological display is used not to ascribe new meanings, but to annihilate them: an earthquake room at La Villette placed earth tremors on a program and thus destroyed the disconcerting sense of an earthquake's total unpredictability. Similarly, a proposal for a massive mirror placed in orbit around the earth to commemorate the French revolutionary bicentennial ascribed no meaning to the revolution itself (opposition from astronomers outside of France stopped the project). There was (and is) rarely political opposition

---

79. On economics of the Concorde (albeit in Britain), see Peter Geoffrey Hall, *Great Planning Disasters* (London: Weidenfeld and Nicolson, 1980), Chapter 4; on the French nuclear design, see: *op. cit.*, Picard, *et al.*, *Histoire(s)*, pp. 185-203, and R. Frost, *Alternating Currents*, Ch. 5.

80. The term is from Michael L. Smith, "Selling the Moon."

to these projects; indeed, the Communists' central criticism of the nuclear program was that it was too small.

De Gaulle's rise to power similarly reinvigorated the planning apparatus. He appointed Pierre Massé, one of France's top technocrats, as the Commissioner of the Plan. Massé had once claimed that with his models, he had successfully rendered quality "quantitative and calculable."<sup>81</sup> He began his work on the Fourth Plan (to run from 1962 to 1965) in 1959, on the assumption that France had successfully completed her infrastructure-building, so that French state policy could now begin to respond to consumers' needs by consciously redirecting a portion of national income flows from investment and toward households. The political benefit of this to the régime was incalculable, and clear: the austerity economics of the Fourth Republic were history.

In the 1960s, state-sector technocrats encouraged the development of consumer-goods industries and urged its nationalized entities to do so as well. In this fashion and with the encouragement of the CGT, Électricité de France (EDF) not only helped to promote the infant appliance firm Moulinex, it also began to promote wider domestic electrical use, offering financial help and technical oversight for expanding residential electrical wiring.<sup>82</sup> Emphasis in transportation policy shifted from railroads to cars. Coming from firms which had legitimated themselves through the 1950s by reference to heroic-scale technological artifacts, state-fostered consumerism reflected its roots in reified technology, from the nuclear strike force of the publicly-owned arms sector to the "all electric home" promoted by EDF. Technology had liberated France from want. Now it was time to liberate the nation from the danger of foreign domination and French women from the travails of housework. Seeking self-justification and political aggrandizement, modernists began to divorce

---

81. Électricité de France, *Dix ans de progrès* (Paris: EDF, 1957), p. 19.

82. Letter from Marcel Paul (head of CGT-Fédération Nationale de l'Énergie (FNE)) to Roger Gaspard (c.e.o. of Électricité de France), 2 February 1960, CGT-FNE archives, Pantin, dossier: "Entreprises privées;" see also *Le Moniteur professionnel de l'électricité* 73 (July 1961); H. Pottier, "L'Industrie du matériel électro-ménager," *Revue française de l'énergie* 134 (November-December 1961), pp. 162-170; Editorial, "Un tournant à l'Électricité de France," *Revue Française de l'énergie* 137 (March 1962), p. 299; and Marcel Boiteux, "Principes de la politique commerciale de distribution d'Électricité de France," *Bulletin d'Information des cadres d'Électricité de France*, Article No. 30 (December 1959), pp. 1-6.

technology from its thickly political and social provenance and attribute entirely new and reified meanings to artifacts.<sup>83</sup> The invention of a new context for artifacts was a critical part of the new marketing mentality, and the terrain of redefined signs implied a new cultural frame, characterized by mass media, rapid transit, rationalized work, and the kitchen-as-clinic—a push-button world commanded by a technologized populace, the alienated world of Godard's *Alphaville*.

Thus, the imagery of EDF and appliance company advertising in the 1960s echoed that of the 1920s, yet the imagery finally had a credible material base. The revised scenarios built upon technological infrastructures and the promise of upward social mobility. Discount retailers touted a plethora of new appliances and domestic technologies, all designed to make the housework easier for the *maîtresse de maison*. She was to become a genuine sartorial and culinary *technicienne*. For the first time since before the First World War, French women were entering the labor force in large numbers, and advertisements proclaimed that the high-tech home would make women's "natural" task, housework, easier.<sup>84</sup> As gift-giving occasions such as Christmas and Mothers' Day became more resplendent, many of the promotional efforts were aimed less at women than at husbands, who could participate in appliance-giving rituals as a means to underscore and reinforce the intrafamilial division of labor and gender roles. The modern hubby gave his wife a new, clean-lined mangle as much to demonstrate his role as provider and hers as housewife as actually to iron clothes. Most importantly, however, the subtext of the advertising and of the mass consumption nexus generally annihilated politics in the public and private spheres alike.

While the revolt of May 1968 placed the new consumerist ethos under intense scrutiny and criticized the sterility of the new social order, it also signalled that the apolitical technological society had finally emerged. As they demanded a better quality of life in the place of more goods, the *soix-*

---

83. Ironically, even New Left writers fed into this emerging ideology: writers such as André Gorz (in *Strategy for Labor*, 1964) and Serge Mallet (*The New Working Class*, 1964) developed "new working class" theory, which argued that the technology-driven automated workplaces of the post-industrial age had liberated workers from drudgery and compelled them to raise new demands about the quality of worklife and of consumer products.

84. Drawn from advertisements on file at EDF offices, Centre de Documentation Murat-Messine, Paris.

*ante-huitards* knew all too well that the cults of technology and quantity of goods had reduced political language to the reproduction of empty mythologies. Material success based in technological mastery seemed to render difficult the old debate over the division of the economic pie. The new technocratic élite had shifted public discourse about political-economic choices to narrow debates over what centralized, expert-run, and monopoly-owned technological systems would look like.<sup>85</sup> After the failure of the revolt, the discourse of the political class in France degraded to disagreements over tactics to achieve the unquestioned goal of economic growth driven by reified technology, managed by technocrats. Firms were to be large, centralized, expert-managed, and rigidly hierarchical internally. In political terms, debate centered only upon the modes of financing such firms—equity-financed if privately owned and debt-financed if publicly owned. Aside from a few Catholics and *gauchistes*, the scenarios, or prospective narratives of left and right, modernist and traditionalist, had fully converged: France gained the high-tech world of prosperity, and public debate over collective choices lost. There is little wonder why pundits now write of a French polity that is calmly divided between two essentially centrist parties. French society constructed a common technological sign system, and in the process emaciated the language needed to discuss the values behind it. The *citoyens* and *citoyennes* of 1989 faced a new Bastille at Creys-Malville.

---

85. One can argue that the centralized, expert-run synthesis of state and economy has its origins with Colbert, running through Necker, Robespierre, and Étienne Clémentel, finally to Pierre Massé and Pierre Mesmer. Nonetheless, this interpretation would exclude a large part of the history of the Third Republic, in particular, the constant victories of provincial politicians against Parisian experts and technocrats (a common truism about the Third Republic is that it represented the victory of the provinces over Paris), as well as the major strains of French industrial historiography.