Conclusion

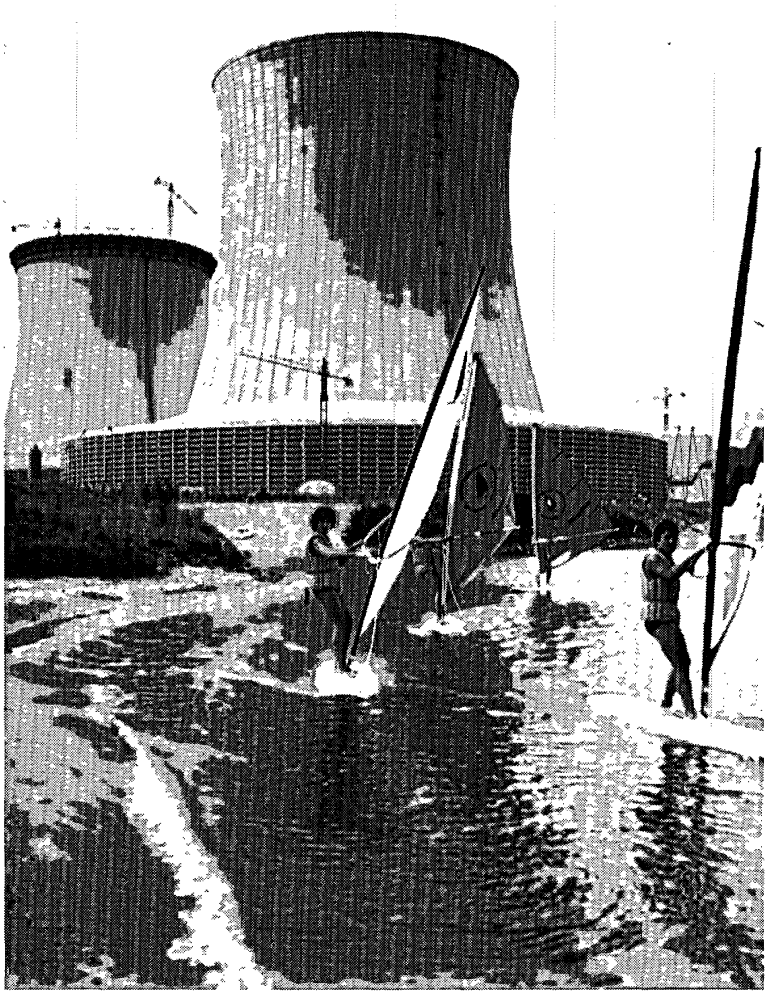
In 1996 I was invited to speak at a three-day conference celebrating the fiftieth anniversary of Electricité de France. The talks took place in the Louis Armand Hall[1] of the Museum of Science and Industry in La Villette. The venue would have appealed to Armand's esthetic sense. Elegant canoe-shaped fluorescent lamps, each lined with emerald green along one edge, graced the walls. The stylish charcoal gray chairs had their own audio hookups, which piped simultaneous translations to the audience. The museum, with its geodesic dome and its light, airy architecture, was exactly the sort of thing the members of the Groupe 1985 had in mind when they said that modern French technology could "engender its own beauty." La Villette's 1996 advertising campaign suggested that the links between technological prowess and national radiance—between technologies of the present and monuments of the past—are maintained as actively now as they had been three decades earlier. All over the subterranean passages of the Paris subways, tourists and commuters saw posters that juxtaposed images of the museum's dome with images of Notre Dame and the Arc de Triomphe.

Technologists of the 1990s continue to link technology and French radiance. In the closing speeches at the commemorative conference, Edmond Alphandéry, EDF's new president, affirmed that the utility's success was "recognized by the French as well as by the rest of the world." Technological prowess, nationalization, the state, and French grandeur: these were all part and parcel of the same thing, embodied in the "world's leading firm in the electricity sector," in "one of France's largest exporters." Minister of Industry Franck Borotra amplified these themes. "France," he declared, "has become the leader of sustainable development. Today, EDF is the symbol of the reconciliation of ecology and growth." Recalling the language Charles de Gaulle had used to talk about the Plan, Borotra maintained that EDF, in its unflagging mission

The Saint-Laurent site in 1974. In this EDF photograph, the two Saint-Laurent gas-graphite reactors appear in the background; in the foreground, we see a man in an old boat, fishing in the Loire in the "traditional" way. This photo was also probably meant to reassure people that fish taken from the Loire were as safe to eat as they had always been. Source: EDF Photothèque.

of public service, had an "ardent obligation" to the nation. He praised France's handling of nuclear waste and reactor decommissioning and averred its commitment to nuclear power. Responding to widespread concern that President Jacques Chirac's enthusiasm for the European Union would lead to the privatization of EDF, he invoked the utility's history: "EDF identified almost perfectly with the spirit of the Liberation and the Reconstruction. . . . Fifty years after its birth, EDF is more than ever the instrument of the nation." Then and now, the utility would "remain public"; "the government's resolve [would] not waver on this matter."[2]

The historians sitting with me groaned, squirmed, and shook their heads throughout these proclamations. They seemed embarrassed by such unabashed displays of national pride. They also appeared puzzled by my behavior. Why was I frantically taking notes and grinning so happily? Indeed, these speeches delighted me. The issues surrounding the



Windsurfers in front of the new cooling towers at the Saint-Laurent site in 1979. Source: EDF Photothèque.

nuclear program had evolved over the intervening decades, but the basic images and interpretive framework remained the same. The heir to the technopolitics whose development I had traced during eight years of research was being staged right before my eyes!

Further evidence of the persistence—and transformation—of this technopolitics could be found upstairs, in the museum itself. The Commissariat à l'Energie Atomique had celebrated its fiftieth anniversary the previous year, and its commemorative exhibit was still on display, arranged along a curved walkway at one end of the museum. At the bottom of the curve, visitors could learn about the CEA's early history. De Gaulle, Joliot-Curie, and Dautry were all there, along with the standard foundational narrative, recounted in the present tense:

> The CEA is born of a political demand: the independence of France in the domain of energy supply. . . . Despite the difficult context—the country must be reconstructed—the CEA receives considerable funds right from the beginning, as well as considerable autonomy of action. Means and skills unite around several great names of nuclear research, leading to a research institution capable of making up for the lag experienced during the war in just a few years.

The G2 reactor also took its place in this official history, accompanied by a now familiar description: "Located at Marcoule in a building large enough to hold three Arcs de Triomphe, G2 goes critical in June 1958. The first reactor hooked up to EDF's network, G2 marks the encounter between nuclear research and industry." Was it simply reflex that made the commentator gloss over G2's plutonium production nearly forty years after France officially embarked on a nuclear weapons program? It certainly could not have been secrecy, since at least a quarter of the exhibit displayed French military nuclear achievements.

In any case, the gas-graphite program received little attention. A single panel told the story of its demise: When EDF and the state embarked on a full-scale nuclear power program, they decided that the French system was not competitive, and it was abandoned. In the 1970s, Framatome, a corporate affiliate of the CEA, began building Westinghouse-licensed reactors. The license contract expired in 1984, "after the builder completely Frenchified the new plants." The rest of the exhibit covered the CEA's recent research and offered ample assurances about the safety of nuclear plants and the benign nature of radioactivity.

EDF also sponsored an anniversary exhibit at La Villette, entitled "An Electric Life." In contrast to the conference, this display elided the institution's history altogether. A few turn-of-the-century electrical appliances occupied one corner of the hall. Otherwise, the exhibit focused on contemporary electricity. Modern appliances were suspended in midair. Captions made statements like "electricity: it brings daily comfort; it changes lives." A map displayed France's entire distribution network, giving visitors a chance to apprehend their nation through electricity. A young man standing in front of a scale model of a light-water plant asked visitors whether they would like him to explain how it worked. Another model represented EDF's latest nuclear plant, N4; its caption made the gas-graphite system disappear altogether, alleging that N4 went beyond the Frenchification of a Westinghouse license, representing "the *first* stage of entirely French design."

The nation's nuclear industry has undergone dramatic transformations since the period covered in this book. Proportionally, France is now

the world's largest producer of nuclear energy. It derives 75–80 percent of its electricity from nuclear power, and even exports electricity to neighboring European countries. A reprocessing facility in La Hague treats nuclear waste from France, Japan, Switzerland, Germany, Belgium, and the Netherlands. There can be no question that France has attained the goal articulated by the technologists of the 1950s and the 1960s: it has become the world leader in nuclear power. True, the rest of the world no longer views nuclear power in quite the same light—but one could easily forget this while sitting in a high-speed train powered by nuclear-generated electricity, zooming past the nuclear plants that dot the banks of the Loire and the Rhône.

Ironically, France's nuclear triumph came at the expense of the "French system." Yet, in a sense, this too has been forgotten. Only a few years after establishing the licensing agreement with Westinghouse, French engineers proceeded to "Frenchify" the light-water design. The lure of American technology did not last long; ultimately the French technologists only redoubled their efforts to make their large-scale systems French. This "Frenchification" has entailed the rhetorical erasure of the original French system—so much so that in 1996 an employee of EDF's own archives insisted to me that there had been no nuclear program before 1970!

It may be in part because of this erasure that the engineers and workers who built the gas-graphite program look back on it with such fondness. Nostalgia has preserved, probably even amplified, their memories of the "pioneering spirit" that pervaded much of the program forty years ago. They were on a national mission, the success of which ended up entailing the failure of their program. Perhaps this is why their recollections sometimes conveyed the sense that they had made sacrifices for their country.

In one sense, though, they did not fail. Technological prowess has staked a firm claim as a basic element of French national identity. At least rhetorically, the builders of the high-speed train (the TGV), the Minitel communication system, the Concorde airliner, the Ariane rocket, and numerous other technological systems continue to cultivate the association between technology and French radiance—even when these systems are developed in cooperation with other European nations. Only more research can determine whether and how the design and operation of the systems themselves articulated such associations in a manner analogous to the nuclear program of the 1950s and the 1960s.

Imagining a Technological Nation

Clearly, however, the nuclear program was a site for articulating and negotiating the meaning of a technological France. The image of a radiant and glorious France appeared repeatedly in the discourse of engineers, administrators, labor militants, journalists, and local elected officials. These men actively cultivated the notion that national radiance would emanate from technological prowess.

Linking technological prowess and national identity was a complex, multidirectional process. Technologists, labor militants, and elected officials invoked apparently eternal characteristics of the nation, which at the most general level were qualities they could all agree made France French: radiance, glory, and grandeur. They simultaneously suggested that France had lost these things through wartime defeat, and/or postwar decolonization, and/or general economic and industrial backwardness. This, in turn, implied that France was no longer fully, truly French. In the scenarios these men envisaged, technological development would restore Frenchness to the nation in a way that made them—as men of action, as heroic male workers and militants, as representatives of their regions—central players. At the same time, they repeatedly invoked the nation in efforts to arbitrate disputes and to legitimate their scenarios. Thus the nation (and/or the national interest) justified particular forms of technological development, while technological prowess defined the nation. This circularity bound conceptions of the nation and of technology more tightly together. Furthermore, the fact that these links were so widely articulated gave them strength and flexibility.

Indeed, the general principle of a technological France drew strength from its multiple manifestations. In some respects, these manifestations supported one another. In both the Gard and the Touraine, for example, local elites and technologists *together* represented nuclear development as a glorious spectacle. Each group had different ideas about the meanings of technological France. Local elites focused on how nuclear sites would bind their region to the nation both economically and culturally, whereas nuclear technologists focused on how reactor development would enact French independence and place them in a position of political and/or industrial leadership. Although different, these visions were compatible; they did not undermine or even compete with each other. In the spectacle these men co-produced, regional history, national destiny, and technological development all worked together on several levels. Other images of technological France interacted or intersected in parallel

ways—for example, those of CGT and CFTC/CFDT labor militants and EDF engineers (especially up until the mid 1960s), or those of CEA and EDF engineers during the *guerre des filières.*

At the same time, though, the very multiplicity of "technological France" made that notion into contested terrain. Ideas about the nation could divide as well as unite. So, for example, while technologists at the CEA and EDF both cultivated ideologies of public service to a technological nation, from the mid 1950s to the mid 1960s they articulated different ideas about what that nation should be, and how best to serve it. They did work together to establish the nuclear program as an arena for defining France's future and identity. But they had competing definitions of the public interest and of the nation's future, which they translated into two distinct technopolitical regimes. The CEA's *nationalist* regime found form in its Marcoule reactors and its "policy of champions." EDF's *nationalized* regime found form in its Chinon and Saint-Laurent reactors and in its early efforts to control the development of private industry through its contracting practices. Each technopolitical regime developed distinct ideas about nuclear and industrial policy, which were simultaneously distinct prescriptions for the nation's future.

Technologists thus sought to define the nation through the example and action of their regime. At the same time, they invoked the nation in discussing, formulating, and implementing their technopolitical projects. So, for example, the national interest justified manufacturing weapons-grade plutonium before the government had decided to build a bomb. After that decision, the national interest warranted extracting plutonium from EDF reactors. National pride justified using prestressed concrete for reactor pressure vessels, as well as designing EDF3 to run at 500 megawatts. French radiance—especially the notion that France had to export technology in order to maintain its status as a world power—played a major role in conflicts over industrial contracting and the overall structure of private industry.

Labor militancy and reactor work also engendered both conflict and accommodation over conceptions of the technological nation. Conflict appeared in the realm of labor union politics. Militants in the three major unions produced distinct visions of a technological France. The CGT dreamed of the glorious technological France that would follow a socialist revolution. Force Ouvrière situated France's technological future in a non-communist international community. The CFTC/CFDT saw technological change as a potential conduit to a better and more just society. None of these visions stood alone; all were produced in counterpoint with

the others and in the context of union rivalries. In this sense, technological France was one of several contested terrains in union politics. Viewed alongside the future France imagined by leading state technologists, however, the three unions' scenarios had at least one point in common: each imagined a sociopolitical order that gave workers a more central and better-recognized role in shaping the nation's future. Yet, from the perspective of the Catholics or the Poujadistes, labor militants of all stripes also shared something with the state technologists: despite the differences they imagined in the sociopolitical order, they all contemplated a technological future for France. And indeed, the fact that all three labor unions sought to enroll the technical elite in their programs indicates that militants did think that their vision of technological France was potentially compatible with that of the technical elite—perhaps not the very top layer (at the level of Pierre Massé or Louis Armand or Marcel Boiteux), but conceivably up to the middle level (such as rank-and-file engineers and scientists at the CEA, like those who went on strike during the *guerre des filières*).

The dialectic of conflict and accommodation found yet another set of manifestations at the nuclear sites of EDF and the CEA. In neither case were the labor unions at odds in a significant way. Instead, the dialectic must be considered not so much across technopolitical regimes as within them. Hence the technological France prescribed by the CEA's regime was a source of conflict for Marcoule workers, who could not find a place for themselves in that vision. The nationalist military hierarchy at Marcoule privileged experts and ignored workers. In contrast, the technological France prescribed by EDF's nationalized regime formally made room for workers, according them a significant ideological and technical role in nuclear development. In the 1960s, most of the utility workers at Chinon accommodated fairly well to this vision of the technological nation. While CEA workers cast themselves in an adversarial role with respect to their regime's prescriptions, EDF workers cast themselves as pioneers on a par with their hierarchical superiors.

In 1969 these roles were replayed under somewhat different circumstances as the dialectic between conflict and accommodation acquired yet another configuration. Toward the end of the *guerre des filières*, unionized Marcoule workers joined engineers, scientists, and technicians throughout the CEA in protesting the termination of the gas-graphite system. Inasmuch as they directed this protest against the regime's top administrators (as well as against EDF and the government), Marcoule workers reenacted their familiar adversarial role. Yet joining with others at the

CEA symbolized an accommodation of sorts: though Marcoule workers felt little loyalty to the technopolitical regime instantiated in the gas-graphite system, they were nonetheless willing to defend that system because this also meant defending their jobs. Meanwhile, EDF workers at Saint-Laurent, who had also cast themselves as pioneers, came to interpret the cleanup of the accident there as a reenactment and an affirmation of those pioneering roles.

The year 1969 also provided an occasion for Gardois leaders and Marcoulins to reconcile and to once again declare a common set of interests. The Gardois had been promised a spectacular technological France, a drama of regional salvation through modernization. Their experiences, however, did not reflect this dramatic new nation. Instead, technological France seemed invasive and suffocating. Even the local leaders who had helped to produce the initial spectacle expressed dismay. But when the termination of the gas-graphite program threatened to remove the Marcoulins from the region, Gardois leaders realized that, for better or worse, their region's infrastructure had become dependent on the CEA. At the same time, they recognized that some cultural cross-fertilization had occurred. Though their place in it remained uncertain and conflicted, the technological nation had definitively arrived in the Gard. The events of 1969 made little difference to the Tourangeaux, whose experience, on the whole, tended to match their expectations. And though they did not yet know it, their region stood on the verge of even greater nuclear development.

Meanwhile, 1969 and the *guerre des filières* reconfigured disputes among nuclear technologists over the meaning of the technological nation. The *guerre des filières* showed just how slippery and malleable the concept of the national interest could be. Technopolitical regimes and visions of technological France were rearranged during that conflict. Top administrators at EDF and the CEA began to define the national interest in terms of economics, corporate development, and international markets. Engineers, technicians, and workers at both institutions continued to frame the national interest in terms of technical distinctiveness and energy independence. Once again, "the nation" legitimated competing technological trajectories, just as those trajectories articulated conceptions of the nation.

In 1969, rearranging the meanings of technological France also meant reconfiguring claims about the relationship between technology and politics. During the nearly two decades of gas-graphite development, enacting scenarios for a technological France had meant the deliberate,

conscious interweaving of technology and politics. In the process, the gas-graphite system had become an incarnation of the French nation. The only way to unseat the system was to attack the conflation of technology and politics—at least on a rhetorical level.

Technology and Politics

The relationship between technology and politics has interested scholars for a long time. In the past decade or so, most research has proceeded on two related fronts: (1) examining how politics shape technological design and development in particular historical or sociological contexts and (2) identifying the ontological relationship between technology and politics in those contexts. In this book I have explored these avenues, but I have also pursued two other questions: How do technological artifacts and practices, both in the process of being designed and after the completion of their design, function as forms of politics—as political negotiation, action, iconography, and rhetoric? And how do the actors we study 1conceptualize the relationship between technology and politics?

I have argued that technologists—defined broadly to include engineers as well as top administrators of industrial state enterprises, regardless of technical training—created distinct technopolitical regimes in the pursuit of nuclear development. These regimes consisted of linked sets of people, engineering and industrial practices, technological artifacts, political programs, and institutional ideologies, which acted together to govern technological development and pursue technopolitics. Time and again, a key component of technopolitics was the manipulation of flexibility and uncertainty. Flexibility in the basic principle of gas-graphite reactors meant that they could produce both plutonium and electricity. How well they did one or the other depended on the specific design. But the fact that they could do both made possible the production of weapons-grade plutonium in Marcoule's reactors before the government officially decided to build an atomic bomb. This flexibility also made it possible for the CEA to demand plutonium from EDF's reactors: thus technologies could not only enact political agendas but also make possible new political goals.

The manipulation of uncertainty also played a key role in technopolitics, in instances such as the definition of the competitive nuclear kilowatt-hour. Perhaps the most striking use of uncertainty, though, occurred in the *guerre des filières.* There, uncertainties included the lack of significant operational data for light-water reactors, the future performance of

the CEA's new fuel rods, fluctuations in the source and the price of reactor fuel, the reliability and longevity of reactors, and potential cost overruns. Advocates of the light-water system claimed that some of these uncertainties—the most relevant ones, in their opinion—could be quantified. Quantification would remove all ambiguity and would make possible a clear choice (in favor of the light-water system). Gas-graphite advocates did not think that the ambiguity generated by these uncertainties could be so easily erased. They argued that this ambiguity militated in favor of qualitative judgments.

In developing the gas-graphite system, technologists in both regimes deliberately conflated technology and politics. This conflation was itself a strategy, and it operated outside the nuclear program as well as within it. Recall the elaboration of the multi-year nation plans or the discourse of labor militants—both instances in which the conceptual conflation of technology and politics defined a way for planners or unions to shape the nation's future. Within the nuclear program, technologists who effected this conflation gave themselves permission to shape policy not just in the nuclear arena but also in the broader arenas of military and industrial development. This is not to say that technologists were the only policy makers in these arenas—clearly there were others—but rather that conflating technology and politics served technologists as a strategy for acquiring legitimacy as policy makers. In addition, politics and policy making gave the reactor projects significance, both within each regime and in the interactions each regime had with its surroundings. For example, EDF1 was important not because it itself would produce economically viable electricity but rather because it constituted the first step in a nationalized nuclear program that would enact and strengthen the utility's ideology and industrial contracting practices. In this instance as in many others, EDF1's technical characteristics were inseparable from its political dimensions. Had EDF1 failed to function properly, or had engineers and workers been unable to garner adequate operational experience from the reactor, the plant would have failed both technically and politically.

Conflating technology and politics created a major resource for engineers. In the debates over industrial organization, for example, EDF engineers reshaped the political meanings of their contracting policy in order to make it fit the priorities of the Fifth Republic. Under de Gaulle's regime, the conflation of technology and politics ultimately provided the gas-graphite system with its most powerful defense. As long as the identification of the gas-graphite system with national independence and identity held, the French system remained unassailable. In sum,

conflating technology and politics delineated an arena of action for gas-graphite technologists and created a defense for the system they produced.

In arguing for quantitative selection criteria, light-water advocates simultaneously sought a rhetorical separation of technology and politics. This separation was every bit as much a strategy as the conflation effected by gas-graphite's developers and advocates. This separation entailed aligning quantitative measurement with technology and economics, and qualitative judgment with politics. It also entailed some redefinitions: the redefinition of "politics" as irrational and backward-looking (which was the sense of "politics" that technologists had used to situate themselves as better qualified to make decisions than politicians) and the redefinition of "public service" as the support of the national economy through the support of private industry. Separating technology and politics made it possible to attack the identification of the gas-graphite system with the nation, and thus made it possible to attack the gas-graphite system. This meant inventing a technological determinism by defining a context in which there *was* such a thing as a single best technology and defining new standards for "best."

In sum, light-water's proponents used the separation of technology and politics in exactly the same way that gas-graphite's developers used their conflation: to delineate an arena of action and defend the system they advocated. In separating technology and politics, light-water advocates adopted what Ken Alder has called a "technocratic pose": a stance that rhetorically places technological activity above and beyond the sphere of politics and the reach of politicians.[3]

This "technocratic pose" is far more common in technological development than the deliberate and proud conflation of technology and politics espoused by gas-graphite advocates. It is particularly common in the United States. For example, Paul Edwards and Donald MacKenzie have observed that Cold Warriors in the United States spent a great deal of energy constructing discursive separations between science and technology (on one side) and politics (on the other). The successful prosecution of the Cold War and the concomitant pursuit of big science and complex technology depended on making this separation appear natural. Cold Warriors located momentum for change within science and technology. Conceptualizing science and technology as apolitical was crucial in justifying the vast resources poured into military and industrial development, as well as in legitimating specific technological choices.[4] Science and technology did take on political meanings, as scholars who have studied the politics of display in Cold War America have shown.[5] But if atomic

weapons, nerve gas, the moon landing, or any number of other achievements functioned as credible evidence of American superiority, it was precisely because technology was thought to provide an objective, natural, and *inherently apolitical* measure of strength.

Nonetheless, this separation of technology and politics was itself a political strategy. It worked only at the rhetorical level. As Edwards and MacKenzie have argued, computer and missile-guidance systems were not only shaped by political goals but also used as political tools. They were, in effect, forms of technopolitics. Unlike the developers of gas-graphite, however, American engineers would not— perhaps could not—admit that they engaged in political activity through their technological work.

What made the effacement of politics in American technological development an effective strategy? Part of the reason may lie in the McCarthyite construction of "politics"—in the sense of ideologies that competed with democracy— as un-American. In the black-and-white world of the Cold War, "politics" meant what the communists did. A striking instance appears in post-1947 American commentaries on industrial nationalizations in France. Popular publications such *Business Week* as well as trade journals such as *Electrical World* portrayed nationalized French companies (particularly EDF) as dangerous communist strongholds in which politics tainted the pursuit of technological development.[6]

I made this observation in my talk at EDF's fiftieth-anniversary conference, stressing that French technologists, by and large, did not seem to want or need to separate technology and politics. I meant this point to be provocative—after all, the triumph of light-water at EDF had resulted precisely from a separation of technology and politics. But my attempt at controversy failed. Numerous EDF engineers and administrators (the primary audience for this conference) told me afterward that I had been "absolutely right" in my assessment. Indeed, as efforts to "Frenchify" the light-water design in the 1970s also indicate, the rhetorical separation of technology and politics in the French nuclear program does not appear to have lasted very long.

Of course, this is not to say that everyone in France advocated the conflation of technology and politics. As we saw in chapter 1, in the 1950s and the 1960s many French intellectuals argued strongly for a separation of the two and viewed their conflation as a threat to democracy. This struggle between social scientists and engineers over the proper relationship between technology and politics has a contemporary equivalent, crystallized in attitudes toward the work of Bruno Latour and his colleagues at the Centre de Sociologie de l'Innovation in Paris. Latour has

argued that the work involved in keeping nature and culture (and technology and society) separate requires enormous intellectual and social energy, without correspondingly significant returns. It would be better, he believes, to think in hybrid categories.[7] Perhaps in part because it threatens the edifice of their theories, many (though by no means all) French social scientists dismiss this suggestion. Technologists, however, seem to find it eminently congenial. The Centre de Sociologie de l'Innovation (itself housed in the Ecole des Mines) regularly receives contracts from institutions such as the CEA, EDF, and the RATP (Paris's public transportation company) to study their scientific and technological histories, methods, and prospects.

Of course, the Cold War critics of technocracy were not entirely wrong. Certainly, the elaboration of French nuclear military policy was anything but democratic. Yet surely the road to technologies that better serve society lies along a different path from those that require a rigid and radical split between technology and politics. If for no other reason, such a separation proves impossible in practice, however attractive it may seem in rhetoric or theory. As historians and sociologists have demonstrated time and again, technologies are produced by institutions and people with stakes and interests—political, social, historical, and cultural. This is neither inherently good nor inherently bad; it simply is. Arguing that technology and politics are or should be separate serves only to obscure these interests and the struggles among stakeholders, which are part and parcel of the processes of technological development. It does not serve to produce better or more democratic technologies.

Although the stakeholders in the gas-graphite program rarely if ever resorted to an American-style separation of technology and politics, I am not suggesting that French nuclear development represents some kind of ideal. Clearly, recognizing the links between technology and politics does not *suffice.* But such recognition is a necessary first step to a deeper, broader, and more useful consideration of the social and political dimensions of technological change. There is nothing wrong or shameful about technopolitics. Technopolitics does not necessarily produce bad or inferior technology. But engineers must work within a framework that openly acknowledges the fact of technopolitics. This need not lessen their technical expertise in any way. They will remain, after all, better qualified than anyone else to build technological systems that work, and to judge which solutions can work and which cannot. Obviously, not all engineering choices are meaningfully political; nor are all technologies equally political. But many fundamental technical choices—such as choices about sys-

tem design and programmatic development—have significant and inseparable political dimensions. Recognizing this is important not just for social scientists and humanists but also for engineers.

Acknowledging the political dimensions of technological change does not imply that anyone and everyone should be able to influence decisions about technological development; this would be neither feasible nor appropriate. It can, however, breathe fresh air into decision making. Acknowledging and (especially) respecting political arguments in the process of technological decision making would, at the bare minimum, create a more honest process. Developing such respect for the full range of stakeholders in technical decisions is incumbent not simply upon engineers but upon all of us, as human beings who live in a technological world.

Notes

Introduction

1. Quoted in Gildea 1994 (p. 112).

2. Quoted in "Le ministre atomique," *Normandie*, 22 October 1945. (This and all subsequent translations are mine, unless an English-language source is cited. —GH)

3. Frank 1994.

4. *L'Aube*, 17 December 1949, quoted in Weart 1979 (p. 248).

5. Quoted in Renou n.d. (p. 34).

6. Anecdotal evidence suggests that, although the notion of French radiance existed in the late nineteenth and early twentieth centuries (usually in the context of rhetoric about the French empire), "radiance" did not gain widespread currency until after World War II. "Grandeur" has a much longer history, discussed in Gildea 1994.

7. For a recent English-language summary of this crisis of grandeur see Gildea 1996. As Kuisel (1995) notes, American scholars in the early postwar years also worried about France's losing its status as a great nation.

8. On the symbolic meanings of nuclear technology see Boyer 1985 and Weart 1988.

9. Weart (1979) provides an account of French nuclear science in the first half of the twentieth century.

10. For a sampling of arenas in which the notion of Frenchness was debated and contested see Nora 1996. See also Nora 1992.

11. Eric Fassin (1995), who has labeled this type of explanation "culturalism," notes that it is "not so much a set of intellectual rules as a spontaneous practice of interpretation, which is why academics tend to ascribe it to nonacademics: culturalism as 'popular knowledge'" (p. 453). Fassin (ibid., p. 455) describes the