Day 4: Do Artifacts Have Politics?

Wednesday, September 16, 2020 11:33 PM

The idea of history as a record of progress driven by the application of science-based knowledge was not simply another idea among many. Rather it was a figurative concept lodged at the center of what became, sometime after 1750, the dominant secular world-picture of Western culture. That it was no mere rationale for domination by a privileged bourgeoisie is suggested by the fact that it was as fondly embraced by the hostile critics as by the ardent exponents of industrial capitalism. Marx and Engels, who developed the most systematic, influential, politically sophisticated critique of that regime, were deeply committed to the idea that history is a record of cumulative progress. In their view, the critical factor in human development—the counterpart in human history of Darwinian natural selection in natural history—is the more or less continuous growth of humanity's productive capacity. But of course they added a political stipulation, namely that the proletariat would have to seize state power by revolution if humanity was to realize the universal promise inherent in its growing power over nature. To later followers of Marx and Engels, the most apt name of that power leading to communism, the political goal of progress—of history—is "technology."

But the advent of the concept of technology, and of the organization of complex technological systems, coincided with, and no doubt contributed to, a subtle revision of the ideology of progress. Technology now took on a much grander role in the larger historical scheme—grander, that is, than the role that originally had been assigned to the practical arts. To leaders of the radical Enlightenment like Jefferson and Franklin, the chief value of those arts was in providing the material means of accomplishing what really mattered: the building of a just, republican society. After the successful bourgeois revolutions, however, many citizens, especially the merchants, industrialists, and other relatively privileged people (predominantly white and male, of course), took the new society's ability to reach that political goal for granted. They assumed, not implausibly from their vantages, that the goal already was within relatively easy reach. What now was important, especially from an entrepreneurial viewpoint, was perfecting the means. But the growing scope and integration of the new systems made it increasingly difficult to distinguish between the material (artifactual or technical) and the other organizational (managerial or financial) components of "technology." At this time, accordingly, the simple republican formula for generating progress by directing improved technical means to societal ends was imperceptibly transformed into a quite different technocratic commitment to improving "technology" as the basis and the measure of—as all but constituting—the progress of society. This technocratic idea may be seen as an ultimate, culminating expression of the optimistic, universalist aspirations of Enlightenment rationalism. But it tacitly replaced political aspirations with technical innovation as a primary agent of change, thereby preparing the way for an increasingly pessimistic sense of the technological determination of history.

The cultural modernism of the West in the early twentieth century was permeated by this technocratic spirit. (A distinctive feature of the technocratic mentality is its seemingly boundless, unrestricted, expansive scope—its tendency to break through the presumed boundaries of the instrumental and to dominate any kind of practice.) The technocratic spirit was made manifest in the application of the principles of instrumental rationality, efficiency, order, and control to the behavior of industrial

were applied to the movements of workers in the new large-scale factory system. The technocratic spirit also was carried into the "fine" arts by avant-grade practitioners of various radically innovative styles associated with early modernism. The credo of the Italian Futurists; the vogue of geometric abstractionism exemplified by the work of Mondrian and the exponents of "Machine Art"; the doctrines of the Precisionists and the Constructivists; the celebration of technological functionalism in architecture by Le Corbusier, Mies Van der Rohe, and other exponents of the international style—all these tendencies exemplified the permeation of the culture of modernity by a kind of technocratic utopianism.

Architecture, with its distinctive merging of the aesthetic and the practical, provides a particularly compelling insight into the modern marriage of culture and technology. The International Style featured the use, as building materials, of such unique products of advanced technologies as steel, glass, and reinforced concrete; new technologies also made it possible to construct stripped-down, spare buildings whose functioning depended on still other innovative devices (the elevator, the subway system, air conditioning). This minimalist, functional style of architecture anticipated many features of what probably is the quintessential fantasy of a technocratic paradise: the popular science-fiction vision of life in a spaceship far from Earth, where recycling eliminates all dependence on organic processes and where the self-contained environment is completely under human control.

Do Artifacts Have Politics?

LANGDON WINNER

In controversies about technology and society, there is no idea more provocative than the notion that technical things have political qualities. At issue is the claim that the machines, structures, and systems of modern material culture can be accurately judged not only for their contributions of efficiency and productivity, not merely for their positive and negative environmental side effects, but also for the ways in which they can embody specific forms of power and authority. Since ideas of this kind have a persistent and troubling presence in discussions about the meaning of technology, they deserve explicit attention.

Writing in *Technology and Culture* almost two decades ago, Lewis Mumford gave classic statement to one version of the theme, arguing that "from late neolithic times in the Near East, right down to our own day, two technologies have recurrently existed side by side: one authoritarian, the other democratic, the first system-centered, immensely powerful, but inherently unstable, the other man-centered, relatively weak, but resourceful and durable." This thesis stands at the heart of Mumford's studies of the city, architecture, and the history of technics, and mirrors concerns voiced earlier in the works of Peter Kropotkin, William Morris, and other nineteenth century critics of industrialism. More recently, antinuclear and prosolar energy movements in Europe and America have adopted a similar notion as a centerpiece in their arguments. Thus environmentalist Denis Hayes concludes, "The increased deployment of nuclear power facilities must lead society toward authoritarianism. Indeed, safe reliance upon

Tech has an authoritarian or democratic leanings

Makes sense how nuclear (centralized, dangerous, harms some for greater good) is authoritarian vs. solar (healthy, democratized)

Facebook = centralized = authoritarian fascist, censorship

nuclear power as the principal source of energy may be possible only in a totalitarian state." Echoing the views of many proponents of appropriate technology and the soft energy path, Hayes contends that "dispersed solar sources are more compatible than centralized technologies with social equity, freedom and cultural pluralism."

An eagerness to interpret technical artifacts in political language is by no means the exclusive property of critics of large-scale high-technology systems. A long lineage of boosters have insisted that the "biggest and best" that science and industry made available were the best guarantees of democracy, freedom, and social justice. The factory system, automobile, telephone, radio, television, the space program, and of course nuclear power itself have all at one time or another been described as democratizing, liberating forces. David Lilienthal, in *T.V.A.: Democracy on the March,* for example, found this promise in the phosphate fertilizers and electricity that technical progress was bringing to rural Americans during the 1940s. In a recent essay, *The Republic of Technology,* Daniel Boorstin extolled television for "its power to disband armies, to cashier presidents, to create a whole new democratic world—democratic in ways never before imagined, even in America." Scarcely a new invention comes along that someone does not proclaim it the salvation of a free society.

It is no surprise to learn that technical systems of various kinds are deeply interwoven in the conditions of modern politics. The physical arrangements of industrial production, warfare, communications, and the like have fundamentally changed the exercise of power and the experience of citizenship. But to go beyond this obvious fact and to argue that certain technologies *in themselves* have political properties seems, at first glance, completely mistaken. We all know that people have politics, not things. To discover either virtues or evils in aggregates of steel, plastic, transistors, integrated circuits, and chemicals seems just plain wrong, a way of mystifying human artifice and of avoiding the true sources, the human sources of freedom and oppression, justice and injustice. Blaming the hardware appears even more foolish than blaming the victims when it comes to judging conditions of public life.

Hence, the stern advice commonly given those who flirt with the notion that technical artifacts have political qualities: What matters is not technology itself, but the social or economic system in which it is embedded. This maxim, which in a number of variations is the central premise of a theory that can be called the social determination of technology, has an obvious wisdom. It serves as a needed corrective to those who focus uncritically on such things as "the computer and its social impacts" but who fail to look behind technical things to notice the social circumstances of their development, deployment, and use. This view provides an antidote to naive technological determinism—the idea that technology develops as the sole result of an internal dynamic, and then, unmediated by any other influence, molds society to fit its patterns. Those who have not recognized the ways in which technologies are shaped by social and economic forces have not gotten very far.

But the corrective has its own shortcomings; taken literally, it suggests that technical *things* do not matter at all. Once one has done the detective work necessary to reveal the social origins—power holders behind a particular instance of technological change—one will have explained everything of importance. This conclusion offers comfort to social scientists: it validates what they had always suspected, namely, that there is nothing distinctive about the study of technology in the first place. Hence, they can return to their standard models of social power—those of interest group politics, bureaucratic politics, Marxist models of class struggle, and the like—and have everything they need. The social determination of technology is, in this view, essentially no different from the social determination of, say, welfare policy or taxation.

There are, however, good reasons technology has of late taken on a special fascination in its own right for historians, philosophers, and political scientists; good reasons the standard models of social science only go so far in accounting for what is most interesting and troublesome about the subject. In another place I have tried to show why so much of modern social and political thought contains recurring statements of what can be called a theory of technological politics, an odd mongrel of notions often crossbred with orthodox liberal, conservative, and socialist philosophies. The theory of technological politics draws attention to the momentum of large-scale sociotechnical systems, to the response of modern societies to certain technological imperatives, and to the all too common signs of the adaptation of human ends to technical means. In so doing it offers a novel framework of interpretation and explanation for some of the more puzzling patterns that have taken shape in and around the growth of modern material culture. One strength of this point of view is that it takes technical artifacts seriously. Rather than insist that we immediately reduce everything to the interplay of social forces, it suggests that we pay attention to the characteristics of technical objects and the meaning of those characteristics. A necessary complement to, rather than a replacement for, theories of the social determination of technology, this perspective identifies certain technologies as political phenomena in their own right. It points us back, to borrow Edmund Husserl's philosophical injunction, *to the things themselves.* . . .

. . . Anyone who has traveled the highways of America and has become used to the normal height of overpasses may well find something a little odd about some of the bridges over the parkways on Long Island, New York. Many of the overpasses are extraordinarily low, having as little as nine feet of clearance at the curb. Even those who happened to notice this structural peculiarity would not be inclined to attach any special meaning to it. In our accustomed way of looking at things like roads and bridges we see the details of form as innocuous, and seldom give them a second thought.

It turns out, however, that the two hundred or so low-hanging overpasses on Long Island were deliberately designed to achieve a particular social effect. Robert Moses, the master builder of roads, parks, bridges, and other public works from the 1920s to the 1970s in New York, had these overpasses built to specifications that would discourage the presence of buses on his parkways. According to evidence provided by Robert A. Caro in his biography of Moses, the reasons reflect Moses's social-class bias and racial prejudice. Automobile-owning whites of "upper" and "comfortable middle" classes, as he called them, would be free to use the parkways for recreation and commuting. Poor people and blacks, who normally used public transit, were kept off the roads because the twelve-foot tall buses could not get through the overpasses. One consequence was to limit access of racial minorities and low-income groups to Jones Beach, Moses's widely acclaimed public park. Moses made doubly sure of this result by vetoing a proposed extension of the Long Island Railroad to Jones Beach.

All things come back to Robert Moses

As a story in recent American political history, Robert Moses's life is fascinating. His dealings with mayors, governors, and presidents, and his careful manipulation

of legislatures, banks, labor unions, the press, and public opinion are all matters that political scientists could study for years. But the most important and enduring results of his work are his technologies, the vast engineering projects that give New York much of its present form. For generations after Moses has gone and the alliances he forged have fallen apart, his public works, especially the highways and bridges he built to favor the use of the automobile over the development of mass transit, will continue to shape that city. Many of his monumental structures of concrete and steel embody a systematic social inequality, a way of engineering relationships among people that, after a time, becomes just another part of the landscape. As planner Lee Koppleman told Caro about the low bridges on Wantagh Parkway, "The old son-of-a-gun had made sure that buses would *never* be able to use his goddamned parkways."

Histories of architecture, city planning, and public works contain many examples of physical arrangements that contain explicit or implicit political purposes. One can point to Baron Haussmann's broad Parisian thoroughfares, engineered at Louis Napoleon's direction to prevent any recurrence of street fighting of the kind that took place during the revolution of 1848. Or one can visit any number of grotesque concrete buildings and huge plazas constructed on American university campuses during the late 1960s and early 1970s to defuse student demonstrations. Studies of industrial machines and instruments also turn up interesting political stories, including some that violate our normal expectations about why technological innovations are made in the first place. If we suppose that new technologies are introduced to achieve increased efficiency, the history of technology shows that we will sometimes be disappointed. Technological change expresses a panoply of human motives, not the least of which is the desire of some to have dominion over others, even though it may require an occasional sacrifice of cost-cutting and some violence to the norm of getting more from less. . . .

In cases like those of Moses's low bridges . . . one sees the importance of technical arrangements that precede the *use* of the things in question. It is obvious that technologies can be used in ways that enhance the power, authority, and privilege of some over others, for example, the use of television to sell a candidate. To our accustomed way of thinking, technologies are seen as neutral tools that can be used well or poorly, for good, evil, or something in between. But we usually do not stop to inquire whether a given device might have been designed and built in such a way that it produces a set of consequences logically and temporally *prior* to any of its professed uses. Robert Moses's bridges, after all,

it impossible for many handicapped persons to move about freely, a condition that systematically excluded them from public life. It is safe to say that designs unsuited for the handicapped arose more from long-standing neglect than from anyone's active intention. But now that the issue has been raised for public attention, it is evident that justice requires a remedy. A whole range of artifacts are now being redesigned and rebuilt to accommodate this minority.

Indeed, many of the most important examples of technologies that have political consequences are those that transcend the simple categories of "intended" and "unintended" altogether. These are instances in which the very process of technical development is so thoroughly biased in a particular direction that it regularly produces results counted as wonderful breakthroughs by some social interests and crushing setbacks by others. In such cases it is neither correct nor insightful to say, "Someone intended to do somebody else harm." Rather, one must say that the technological deck has been stacked long in advance to favor certain social interests, and that some people were bound to receive a better hand than others.

BEST FOR WHOM?

The mechanical tomato harvester, a remarkable device perfected by researchers at the University of California from the late 1940s to the present, offers an illustrative tale. The machine is able to harvest tomatoes in a single pass through a row, cutting the plants from the ground, shaking the fruit loose, and in the newest models sorting the tomatoes electronically into large plastic gondolas that hold up to twenty-five tons of produce headed for canning. To accommodate the rough motion of these "factories in the field," agricultural researchers have bred new varieties of tomatoes that are hardier, sturdier, and less tasty. The harvesters replace the system of handpicking, in which crews of farmworkers would pass through the fields three or four times putting ripe tomatoes in lug boxes and saving immature fruit for later harvest. Studies in California indicate that the machine reduces costs by approximately five to seven dollars per ton as compared to hand-harvesting. But the benefits are by no means equally divided in the agricultural economy. In fact, the machine in the garden has in this instance been the occasion for a thorough reshaping of social relationships of tomato production in rural California.

By their very size and cost, more than $50,000 each to purchase, the machines are compatible only with a highly concentrated form of tomato growing. With the introduction of this new method of harvesting, the number of tomato growers declined from approximately four thousand in the early 1960s to about six hundred in 1973, yet with a substantial increase in tons of tomatoes produced.

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Because the point is most easily understood in the light of particular intentions embodied in physical form, I have so far offered [an] illustration that seems almost conspiratorial. But to recognize the political dimensions in the shapes of technology does not require that we look for conscious conspiracies or malicious intentions. The organized movement of handicapped people in the United States during the 1970s pointed out the countless ways in which machines, instruments, and structures of common use—buses, buildings, sidewalks, plumbing fixtures, and so forth—made

By their very size and cost, more than $50,000 each to purchase, the machines are compatible only with a highly concentrated form of tomato growing. With the introduction of this new method of harvesting, the number of tomato growers declined from approximately four thousand in the early 1960s to about six hundred in 1973, yet with a substantial increase in tons of tomatoes produced. By the late 1970s an estimated thirty-two thousand jobs in the tomato industry had been eliminated as a direct consequence of mechanization. Thus, a jump in productivity to the benefit of very large growers has occurred at a sacrifice to other rural agricultural communities.

The University of California's research and development on agricultural machines like the tomato harvester is at this time the subject of a law suit filed by attorneys for California Rural Legal Assistance, an organization representing a group of farmworkers and other interested parties. The suit charges that University officials are spending tax monies on projects that benefit a handful of private interests to the detriment of farmworkers, small farmers, consumers, and rural California generally, and asks for a court injunction to stop the practice. The University has denied these charges, arguing that to accept them "would require elimination of all research with any potential practical application."

As far as I know, no one has argued that the development of the tomato harvester was the result of a plot. Two students of the controversy, William Friedland and Amy Barton, specifically exonerate both the original developers of the machine and the hard tomato from any desire to facilitate economic concentration in that industry. What we see here instead is an ongoing social process in which scientific knowledge, technological invention, and corporate profit reinforce each other in deeply entrenched patterns that bear the unmistakable stamp of political and economic power. Over many decades agricultural research and development in American land-grant colleges and universities has tended to favor the interests of large agribusiness concerns. It is in the face of such subtly ingrained patterns that opponents of innovations like the tomato harvester are made to seem "antitechnology" or "antiprogress." For the harvester is not merely the symbol of a social order that rewards some while punishing others; it is in a true sense an embodiment of that order.

Within a given category of technological change there are, roughly speaking, two kinds of choices that can affect the relative distribution of power, authority, and privilege in a community. Often the crucial decision is a simple "yes or no" choice—are we going to develop and adopt the thing or not? In recent years many local, national, and international disputes about technology have centered on "yes or no" judgments about such things as food additives, pesticides, the building of highways, nuclear reactors, and dam projects. The fundamental choice about an ABM or an SST is whether or not the thing is going to join society as a piece of its operating equipment. Reasons for and against are frequently as important as those concerning the adoption of an important new law.

A second range of choices, equally critical in many instances, has to do with specific features in the design or arrangement of a technical system after the decision to go ahead with it has already been made. Even after a utility company wins permission to build a large electric power line, important controversies can remain with respect to the placement of its route and the design of its towers; even after an organization has decided to institute a system of computers, controversies can still arise with regard to the kinds of components, programs, modes of access, and other specific features the system will include. Once the mechanical tomato harvester had been developed in its basic form, design alteration of critical social significance—the addition of electronic sorters, for example—changed the character of the machine's effects on the balance of wealth and power in California agriculture. Some of the most interesting research on technology and politics at present focuses on the attempt to demonstrate in a detailed, concrete fashion how seemingly innocuous design features in mass transit systems, water projects, industrial machinery, and other technologies actually mask social choices of profound significance. . . .

From such examples I would offer the following general conclusions. The things we call "technologies" are ways of building order in our world. Many technical devices and systems important in everyday life contain possibilities for many different ways of ordering human activity. Consciously or not, deliberately or inadvertently, societies choose structures for technologies that influence how people are going to work, communicate, travel, consume, and so forth over a very long time. In the processes by which structuring decisions are made, different people are differently situated and possess unequal degrees of power as well as unequal levels of awareness. By far the greatest latitude of choice exists the very first time a particular

instrument, system, or technique is introduced. Because choices tend to become strongly fixed in material equipment, economic investment, and social habit, the original flexibility vanishes for all practical purposes once the initial commitments are made. In that sense technological innovations are similar to legislative acts or political foundings that establish a framework for public order that will endure over many generations. For that reason, the same careful attention one would give to the rules, roles, and relationships of politics must also be given to such things as the building of highways, the creation of television networks, and the tailoring of seemingly insignificant features on new machines. The issues that divide or unite people in society are settled not only in the institutions and practices of politics proper, but also, and less obviously, in tangible arrangements of steel and concrete, wires and transistors, nuts and bolts.

The Social Shaping of Technology

DONALD MACKENZIE

. . . The idea that technological change is just "progress," and that certain technologies triumph simply because they are the best or the most efficient, is still widespread. A weaker but more sophisticated version of technological determinism—the idea that there are "natural trajectories" of technological change—remains popular among economists who study technology.

In my experience, the idea of unilinear progress does not survive serious engagement with the detail of the history of technology. For what is perhaps most striking about that history is its wealth, complexity, and variety. Instead of one predetermined path of advance, there is typically a constant turmoil of concepts, plans, and projects. From that turmoil, order (sometimes) emerges, and its emergence is of course what lends credibility to notions of "progress" or "natural trajectory." With hindsight, the technology that succeeds usually does look like the best or the most natural next step.

However . . . we must always ask "Best for whom?" Different people may see a technology in different ways, attach different meanings to it, want different things from it, assess it differently. Women and men, for example, may view the same artifact quite differently. Workers and their employers may not agree on the desirable features of a production technology.

Such discrepant meanings and interests are often at the heart of what is too readily dismissed as irrational resistance to technological change, such as that of the much-disparaged Luddite machine breakers. We must also ask "Best for whom?" even when we are discussing such apparently "technical" decisions as the best way to automate machine tools or typesetting. These two technologies were the subjects of now-classic studies of Cynthia Cockburn (who focused on the shaping of technology by gender relations) and David Noble (who focused on its shaping of relations of social class). . . .

From Donald MacKenzie, "The Social Shaping of Technology" originally appeared as "Underpinnings" in *Knowing Machines: Essays on Technical Change* (Cambridge, MA: MIT Press, 1996), pp. 5–8.