TECHNOLOGY AND THE FUTURE

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11. Technological Politics As If Democracy Really Mattered

RICHARD SCLOVE

"Of all the social impacts of technology," writes Richard Sclove in the following selection, "perhaps the most worrisome are the adverse effects on democracy." Technologies as diverse as microwave ovens, air conditioning, and urban sewage systems all have aspects that can prove detrimental to human communities and to democracy. Sclove has no desire to reject all technology outright, however. Rather, he would like us "to become more discriminating in how we design, choose, and use technologies" — a course that might force us to give democracy priority over short-run economic goals.

How would democratic technologies look? Sclove proposes a set of design criteria. He gives examples, including several from Scandinavian nations, of technologies that meet these criteria. And he suggests some of the ways in which our political system and the nation's R&D enterprise might contribute to the development and promotion of democratic technologies. Sclove's essay comes from the "progressive left" political tradition. Some might regard it as hopelessly idealistic, particularly in view of current political trends in the United States that seem to run in the opposite direction. Nevertheless, it is a provocative piece that should give readers from all parts of the political spectrum much food for thought.

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A century and a half ago Alexis de Tocqueville described a politically exuberant United States in which steaming locomotives could not restrain citizens' enthusiasm to involve themselves in politics and community life:

> In some countries the inhabitants seem unwilling to avail themselves of the political privileges which the law gives them; it would seem that they set too high a value upon their time to spend it on the interests of the community; and they shut themselves up in a narrow selfishness. . . . But if an American were

condemned to confine his activity to his own affairs, he would be robbed of one half of his existence; he would feel an immense void in the life which he is accustomed to lead, and his wretchedness would be unbearable.[1]

That is not today's United States, in which a bare majority of eligible voters participate in presidential elections while usually even fewer engage in local politics.[2] The causes of Americans' political disengagement are complex, but one culprit, more significant and intricate than commonly believed, is technology. Consider an instructive story from across the Atlantic.

During the early 1970s running water was installed in the houses of Ibieca, a small village in northeast Spain. With pipes running directly to their homes, Ibiecans no longer had to fetch water from the village fountain. Families gradually purchased washing machines, and women stopped gathering to scrub laundry by hand at the village washbasin. Arduous tasks were rendered technologically superfluous, but village social life was unexpectedly altered. The public fountain and washbasin, once scenes of vigorous social interaction, became nearly deserted. Men began losing their sense of familiarity with the children and donkeys that once helped them haul water. Women stopped gathering at the washbasin to intermix scrubbing with politically empowering gossip about men and village life. In hindsight the installation of running water helped break down the Ibiecans' strong bonds — with one another, with their animals, and with the land — that had knit them together as a community.[3] Painful in itself, such loss of community carries a specific political cost as well: as social ties weaken, so does a people's capacity to mobilize for political action.[4]

Is this a parable for our time? Like Ibiecans, we acquiesce in seemingly benign or innocuous technological changes. Ibiecans opted for technological innovations promising convenience, productivity, and economic growth. But they did not anticipate the hidden costs: greater inequality, social alienation, and steps toward community disintegration and political disempowerment. Does technological change invariably embody a Faustian trade-off between economic reward and sociopolitical malaise? No, not invariably. But the best hope for escaping such trade-offs is to develop a full-blown democratic politics of technology — something that even political progressives have not begun to conceive.

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TECHNOLOGY AND DEMOCRACY

The approach to technology policy proposed here is grounded morally in the belief that people should be able to shape the basic social circumstances of their lives. It is aimed at organizing society along relatively equal and participatory lines, at achieving a system of egalitarian decentralization and confederation that Rutgers political scientist Benjamin Barber calls "strong democracy."[5] Historic examples of strong democracy include New England town meetings, the confederation of self-governing Swiss villages and cantons, and the tradition of trial by a jury of peers. Strong democracy also is apparent in the methods or aspirations of

various social movements, such as the late nineteenth-century American Farmers Alliance, the 1960s civil rights movement, and the 1980s uprising of Solidarity in Poland.[6] In each of these cases ordinary people claimed the rights and responsibilities of active citizenship.

If citizens ought to be empowered to participate in determining their society's basic structure and if technologies *are* an important part of that structure, it follows that technological design and practice should be democratized. Substantively, technologies must be compatible with our fundamental interest in strong democracy. And procedurally, people from all walks of life must have expanding opportunities to shape the evolving technological order.

DESIGN CRITERIA FOR DEMOCRATIC TECHNOLOGIES

Table 1 presents some criteria for distinguishing among technologies based on their compatibility with democracy. The criteria are labeled "provisional" because they are neither complete nor definitive. Rather, they are intended to provoke political debate that can lead to an improved set of criteria.

Each criterion is intended to fulfill the institutional requirements for strong democracy: democratic community, democratic work, or democratic politics.[7] Technological decisions should attend initially and foremost to strengthening democracy, because democracy provides the necessary circumstances for deciding freely and fairly what other considerations must be taken into account in technological (and non-technological) decision making. Until we do this, technologies will continue to hinder the advancement of other social objectives in subtle yet significant ways.

A series of examples can help explain these criteria and the feasibility of designing technologies that can satisfy them. Before proceeding, however, one clarifying note is in order. Each of the following examples illustrates a worthy social and democratic goal in its own right. However, isolated technological changes of this sort cannot be expected to represent a significant improvement in the overall democratization of society. The latter result will require multiple democratic design criteria, applied simultaneously to diverse technologies by citizens who employ broadly democratized processes of technological decision making. In other words, all the elements of a complete democratic politics of technology should converge at one time.

Criterion A: Technology and Democratic Community

Egalitarian community life is important to strong democracy because it enhances citizens' mutual respect, shared understanding, political equality, and social commitment. It empowers individuals within collectivities to challenge unjust concentrations of power. Unfortunately, diverse technological developments have contributed to the decline of community. The noise and danger of automobile traffic, detached single-family homes, air conditioning, and television all have

Table 1. A Provisional System of Design Criteria for Democratic Technologies

	TOWARD DEMOCRATIC COMMUNITY:
A.	Seek a balance among communitarian/cooperative, individualized, and inter-community technologies. Avoid technologies that establish authoritarian social relationships.
	TOWARD DEMOCRATIC WORK:
B.	Seek a diverse array of flexibly schedulable, self-actualizing technological practices. Avoid meaningless, debilitating, or otherwise autonomy-impairing technological practices.
	TOWARD DEMOCRATIC POLITICS:
C.	Seek technologies that can enable disadvantaged individuals and groups to participate fully in social and political life. Avoid technologies that support illegitimately hierarchical power relations between groups, organizations, or polities.
	TO SECURE DEMOCRATIC SELF-GOVERNANCE:
D.	Keep the potentially adverse consequences (e.g., environmental or social harms) of technologies within the boundaries of local political jurisdictions.
E.	Seek local economic self-reliance. Avoid technologies that promote dependency and loss of local autonomy.
F.	Seek technologies (including an architecture of public space) compatible with globally aware, egalitarian political decentralization and federation.
	TO PERPETUATE DEMOCRATIC SOCIAL STRUCTURES:
G.	Avoid technologies that are ecologically unsustainable or destructive of human health, survival, and the perpetuation of democratic institutions.

isolated families away from one another and undermined a sense of collective purpose. This has been exacerbated by the loss of public spaces (with, for instance, town commons being supplanted by shopping malls).[8]

Are these plausible alternatives? Zurich, Switzerland, has promoted a partial antidote by providing neighborhoods with legal advice and architectural assistance aimed at increasing community interaction.[9] Thanks to the program, neighbors have begun to remove backyard fences; to build new walkways, gardens, and other community facilities; and generally to refashion a system of purely private yards into a well-balanced blend of private, semipublic, and public spaces.[10]

A housing movement born in Denmark in the mid-1960s seeks, more ambitiously, to integrate desirable aspects of traditional village life with such contemporary realities as urbanization, smaller families, single-parent or working-parent households, and greater sexual equality. The result is "co-housing" — resident-planned communities ranging today from 6 to 80 households. More than 100 such communities now exist in Denmark and the Netherlands, and they are spreading to the United States and elsewhere.

The Trudeslund co-housing community, located near Copenhagen, comprises thirty-three families. Homes for each family cluster along two garden-lined

pedestrian streets and are surrounded by ample open space and forested areas. Each home has its own kitchen, living room, and bedrooms, though these rooms have been somewhat downsized so that the savings can be used to construct and maintain common facilities. The latter include picnic tables, sandboxes, a parking lot, and, most importantly, a "common house" with a large kitchen and dining room, playrooms, a darkroom, a workshop room, a laundry room, and a community store. Each night residents have the option of eating in the common dining room; cooking responsibilities rotate among all adults in the community (which means everyone cooks one evening a month). Because the community is designed to have residents walk past the common house on the way from the parking lot to any house, the common house becomes a natural gathering spot.

Trudeslund is successful by many measures. The common facilities save time and money, day care and baby-sitting flow naturally from the pattern of community life, social interaction flourishes without sacrificing privacy, and safety and conviviality both prosper by banishing cars to the outskirts of the community. Over time cooperation has grown, with resident families choosing to purchase and share collectively tools, a car, a sailboat, and a vacation home. Rather than becoming insular, residents are actively involved in social and political life outside Trudeslund, with the common house serving as an organizing base for other activities.[11]

Insofar as mutual respect and equality are fundamental democratic values, an egalitarian community represents a democratic gain in its own right. Moreover, if one could envision creating an interacting network of such communities, one could expect to see greater respect, tolerance, and commonality emerging *between* communities, with beneficial implications for democratization on a broader scale.[12]

Criterion B: Democratic Work

Social scientists have hypothesized that the quality of our work life influences our moral development and our readiness to function as engaged citizens — that is, as active participants in a strong democracy.[13] Technology, in turn, plays a critical role in shaping our work experiences. Some years ago sociologist and one-time union organizer Robert Schrank discussed alternative work arrangements with a group of union representatives at the General Motors Corporation. After describing several experiments in Scandinavian factories that permitted more interesting work routines and greater worker involvement in the day-to-day decision making, Schrank asked the men to imagine how they might redesign their own factories if given a chance. Their response was skeptical and unenthusiastic. Later Schrank reflected: "[T]he frame of reference of these workers was the linear assembly line as they experienced it. Even to think beyond that seemed difficult."[14]

Linear assembly lines not only tend to restrict possibilities for worker self-management, conviviality, and meaningful work but also to impair the ability of workers to envision technological alternatives. Schrank, however, was eventually able

to show the GM workers more democratic automobile manufacturing technologies that have been in use for some years. For example, an innovative Volvo factory in Kalmar, Sweden, uses independently movable electronic dollies — each carrying an individual auto chassis — in place of a traditional assembly line. The dollies enable small teams of workers to plan and vary their daily routines for assembling automobile subsystems.[15]

A more creative and self-managed workplace "is democratically desirable in itself. But it also can help workers develop the moral commitment, skills, and confidence to participate politically beyond the workplace.

Criterion C: Technology and Power

While political equality is essential for strong democracy, all contemporary political systems encompass groups whose opportunities for participating in social and political life are circumscribed. Today's technologies help reproduce this inequitable constellation of power. For instance, the technologies and architecture with which women must cope every day often help exclude them from the corridors of power. "Labor-saving" appliances "liberate" many wives to do housework that was once performed by other family members. (During the bygone era of open hearth cooking, for example, men chopped wood and children hauled water, thus contributing more equally to household maintenance.)[16] Likewise, modern neighborhood designs often isolate women socially, heighten their risk of physical abuse, and limit their opportunities to organize child care. The typical suburb lacks sidewalks, common gathering spaces, or the opportunity to work within a short distance of home.[17] Most public-transit systems have been designed without regard to women's typical social responsibilities. How is a mother supposed to get a baby carriage up onto a traditional bus or down the steps of a New York City subway station?[18] Many workplaces have jobs stereotyped as female that carry special risks of isolation, domination, stress, or harm. Secretaries and key-punch operators, who are preponderantly female, suffer unusually high levels of stress-related emotional and physical disorders. The marketing techniques of the mass media often degrade women and erect punishingly unattainable beauty standards.[19]

All of these consequences of technology limit women's opportunities to participate on equal terms in social and political life — including technological decision making. To explain these results, one need not invoke theories of misogyny or conspiracy (although the temptation may be strong). Generally it seems more plausible to blame the indifference and insensitivity of male-dominated institutions and design professions, in which women's evaluations of their own needs rarely qualify as even a discussion topic.

Criterion D: Translocal Harms

Local self-governance is a key building block for strong democracy. The average citizen can exert much more influence locally than nationally, and local political

equality and autonomy provide crucial opportunities for citizens to influence translocal politics.

Technologies can affect a community's ability to govern itself in several ways. For example, a technology that harms people in neighboring communities can provoke intercommunity conflict, which in turn can precipitate intervention by higher political authorities that subverts local self-governance. In the late nineteenth and early twentieth centuries, American cities imported clean water, or filtered and treated incoming water, while discharging raw sewage into rivers and lakes. Various methods of sewage treatment were known or under development, but few cities adopted them (unless the raw sewage caused local harm). As the buildup of sewage increased illness and death in downstream communities, state governments passed preemptive laws protecting water quality, established state boards of health to help administer the laws, and created new regional governmental authorities ("special districts") charged with integrating and managing the systems of water supply and sewage treatment. The result of this state intervention was that water quality and public health dramatically improved — but local autonomy dramatically declined. Indeed, regional water management set a precedent that influenced the development of institutions governing transportation, electrification, and telephone communication. The failure of municipal governments to assume technological responsibility toward neighboring communities wound up subverting their own autonomy and the tradition of local self-governance.[20]

Today a related pattern continues to play out as large corporations repeatedly use cross-border pollution as a rationale to justify environmental regulation at ever higher levels of political aggregation (shifting, that is, from local to state, national, and ultimately international authorities). When "successful," this reallocation of power has transposed environmental decision making to arenas relatively inaccessible to grassroots participation, where corporations have secured weak environmental standards that preempt stronger standards favored at the local level. This logic helps to explain industry support for the 1970 U.S. Clean Air Act and for the 1990 amendments to the Montreal Protocol (a treaty that regulates emissions of industrial chemicals hazardous to the earth's atmospheric ozone shield).[21] The erosion of local authority to control pollution has thus led to a violation of Criterion G in Table 1 — "seek ecological sustainability."

Criterion E: Local Economic Self-Reliance

How can citizens meaningfully decide the fate of their community if economic survival depends on institutions or forces utterly beyond their control? Just as a measure of local political autonomy is essential for strong democracy, so, in turn, is a measure of local and regional economic self-reliance essential for political autonomy. Many modern technologies, however, can subvert self-reliance.

A century ago London differed from other leading world cities in eschewing reliance on a single major electric company, large generating plants, or even a city-wide electric grid. Instead there were dozens of small electric companies scattered throughout London — some privately owned, some public — deploying a diverse

array of small-scale electrical generating technologies. Was London just backwards and irrational, as engineers from elsewhere commonly supposed? Not obviously. London's electric companies operated at a profit and provided reliable and affordable power adapted to local needs. London's borough governments, perceiving their own political significance and autonomy as inextricable from the infrastructures upon which they depended economically, consistently opposed Parliamentary efforts to consolidate the grid. The boroughs favored a highly decentralized electrical system that each could control more easily.[22]

For analogous reasons, a number of American cities, towns, and neighborhoods have begun to develop locally owned businesses oriented toward production for nearby markets. The Rocky Mountain Institute has developed an analytical process, along with supporting instructional materials, which a growing number of towns in economic difficulty are using to reduce their consumption of imported energy, water, and food (rather than to depend on distant supplies) and to reinvest local capital (rather than to put it in the hands of bankers thousands of miles away).[23] Once these communities are more secure against distant market forces or multinational corporate decisions, they are more empowered to conceive and undertake local democratic initiatives.[24]

This strategy of self-reliance contrasts strikingly with the prevalent strategy used by communities — self-defeating when it is not futile — of using concessionary tax breaks, waivers on environmental standards or the promise of low wages to try to entice geographically fickle corporations. While generally decrying these corporate inducements, most proposed progressive technological strategies nonetheless remain preoccupied with advancing U.S. international competitiveness in ways that will assuredly *erode* local self-reliance. [25]

DEMOCRATIC DESIGN VERSUS PROGRESSIVE PROPOSALS

Several of the preceding examples suggest an important deficiency in the familiar progressive call to "rebuild America's crumbling technological infrastructure."[26] If our infrastructure needs repair or modernization, shouldn't we rebuild it in ways amenable to local democratic governance? For instance, there are technologies for managing industrial and municipal waste and conserving energy that can be deployed and administered with extensive local involvement.[27] Facilities to store solar energy for heating homes and buildings, as pioneered in Scandinavia, comprise another example of neighborhood-scale technology. Indeed, unless localities regain more control of their own infrastructures, there will be diminished incentive for the kind of grassroots political involvement essential to strong democracy. People only will participate in local politics when they have the power to affect important local decisions.

Another significant feature of all the preceding criteria is that they are designed to work together as a complementary system applied to an entire technological order. This too can improve the technology policies advocated by progressives. For instance, advocates of workplace democracy aim admirably to fulfill Criteria A and B, but generally fail to inquire whether the resulting goods and services are socially

benign.[28] If we competitively and democratically produce democratically dubious technologies — say, chemical weapons, or certain consumer electronics like Walkmen that erode social interaction and solidarity — are we really making progress?[29]

Similarly, in an era of growing popular concern over acid rain, atmospheric ozone depletion, and global warming, few doubt the necessity of devising more ecologically sustainable technologies (Criterion G). Yet environmentalists sometimes imagine that sustainability alone is a sufficient basis for technological design.[30] To see the incompleteness here, recall the old sewage system configurations that both protected public health *and* subverted local self-governance, or consider Singapore's relatively stringent environmental policies that are coupled with a starkly authoritarian political regime.[31] In evaluating technology, we must learn to take into account all technologies, all their focal and nonfocal effects, and all the manifold ways in which technologies influence political relations.

TOWARD A DEMOCRATIC POLITICS OF TECHNOLOGY

Democratic design criteria are essential to a democratic politics of technology, but only if coupled with institutions for greater popular involvement in all domains of technological decision making. This suggests the need to establish new opportunities for popular participation to contest and apply the design criteria (in communities, workplaces, and other social realms), to set research and development (R&D) priorities, and to govern important technological systems. For instance, perhaps corporate R&D tax credits could be scaled up if a business introduces a democratic process or uses democratic design criteria to guide its R&D.

Our basic goal must be to open, democratize, and partly decentralize pertinent government agencies, to create avenues for worker and community involvement in corporate R&D and strategic planning, and to strengthen the capabilities of public institutions to monitor and, as needed, guide the political and social consequences of technology. We also need political strategies to accomplish these objectives, preferably built on popular movements and technological initiatives that already exist.[32]

One pertinent example of how to democratize technological decision making began in the early 1970s, when natural gas was found beneath the frigid and remote northwest comer of Canada. Energy companies soon proposed building a high-pressure, chilled pipeline across thousands of miles of wilderness, the traditional home of the Inuit (Eskimos) and various Indian tribes. At that point a government ministry, anticipating significant environmental and social repercussions, initiated a public inquiry under the supervision of a respected Supreme Court justice, Thomas R. Berger.

The MacKenzie Valley Pipeline Inquiry opened its preliminary hearings to any Canadian who felt remotely affected by the proposal. Berger and his staff developed a novel format to encourage a thorough, open, and accessible inquiry. Formal, quasi-judicial hearings were held that combined conventional expert testimony with cross-examination. Berger also conducted a series of informal "community hearings." Traveling 17,000 miles to 35 remote villages and settlements, the

MacKenzie Inquiry took testimony from nearly 1,000 native witnesses. And it provided funding to disadvantaged groups to support travel and legal counsel for more competent participation. The Canadian Broadcasting Company carried daily radio summaries of all the hearings in English and in six native languages.

One of the MacKenzie Inquiry's important lessons was that laypeople can produce useful social *and* technical information. According to one technical adviser:

> Input from nontechnical people played a key role in the Inquiry's deliberations over even the most highly technical and specialized scientific and engineering subjects. . . . [The final report] discusses the biological vulnerability of the Beaufort Sea based not only on the evidence of the highly trained biological experts who testified at the formal hearings but also on the views of the Inuit hunters who spoke at the community hearings. . . . [Moreover,] when discussion turned to . . . complex socioeconomic issues of social and cultural impact, [native] land claims, and local business involvement — it became apparent that the people who live their lives with the issues are in every sense the experts. . . . Their perceptions provided precisely the kind of information necessary to make an impact assessment.[33]

Quoting generously from expert and citizen witnesses, Berger's final report became a national best-seller. Within months the original pipeline proposal was rejected, and the Canadian Parliament instead approved an alternate route paralleling the existing Alaska Highway.[34] One can fault the MacKenzie Inquiry for depending so much on the democratic sensibilities and good faith of one man — Judge Berger — rather than empowering the affected native groups to play a role in formulating the conclusions. But the process was nevertheless vastly more open and egalitarian than comparable decisionmaking efforts in other industrial societies.[35]

There are many other prototypes for institutions or processes that enable greater popular involvement in technological decisions. For instance, the nascent Community Health Decisions (CHD) movement has developed grassroots procedures to forge popular consensus on ethical principles governing medical policy and technology. One of the accomplishments of the movement has been to organize dozens of community meetings throughout Oregon to debate proposed reforms in the state's health care system.[36] The CHD movement could provide a model for future forums in which citizens debate more general democratic design criteria for technology.

In several states, including Maine, Washington, and California, coalitions of peace activists, labor unions, business leaders, community groups, and government officials have created democratic processes to wean regional economies away from their dependence on military production. For example, responding to grassroots pressure, the state of Washington has established a citizen advisory group that monitors military spending in the state, assesses post–Cold War economic needs and opportunities, and promulgates action plans to help defense-dependent communities diversify their productive base.[37] This shows how a region can use social criteria to evaluate and redirect an entire technological order.

During the past twenty years the Dutch have developed a network of street corner "science shops," supported by nearby university staff and students, where citizen groups receive free assistance to address social issues with technical components. One science shop helped a local environmental group document the contamination of heavy metals in vegetables, which pressured the Dutch government to sponsor a major cleanup in metalworking plants. The science shops have empowered citizens to participate in technological decision making so successfully that they have prompted similar efforts throughout much of Western Europe.[38]

Traditional Amish communities, often misperceived as technologically naive or backwards, have pioneered popular deliberative processes for screening technologies based on their cumulative social impacts, in effect attending to many of the criteria listed in Table 1. One of their methods is to place the adoption of a new technology on probation for one year to discover what the social effects might be. For instance, Amish dairy communities in east-central Illinois ran a one-year trial with diesel-powered bulk milk tanks before judging them socially acceptable; other Amish communities used social trials to prohibit once-probationary household telephones or personal computers.[39]

The preceding examples are, of course, atypical. Most technological choices are made by experts, bureaucratic machination, or unregulated market interactions. But the exceptions provide crucial evidence that, given the right institutional circumstances, lay citizens can make reasonable technological decisions reflecting their own priorities. Even federal agencies, such as the Office of Technology Assessment, the National Science Foundation, and the National Institutes of Health (NIH), have occasionally supported or incorporated citizen participation in their decisionmaking procedures.[40] For instance, the NIH has used both expert and lay advisory panels to evaluate research proposals. The experts judge the scientific merits, while laypeople help weigh the social value, political import, or ethical propriety. One can envision a wide range of private or public institutions using such models to develop a new system of democratic procedures for choosing among technological alternatives.

PARTICIPATORY RESEARCH, DEVELOPMENT, AND DESIGN

Democratic processes for technological choice and oversight are vital, yet hardly worth the effort unless participants have a broad range of alternative technologies from which to choose. Hence it is essential to weave democracy into the fabric of technological research, development, and design (RD&D).[41] Consider four examples of how this has been done.

Democratic Design of Workplace Technology

In Scandinavia during the early 1980s unionized newspaper-graphics workers — in collaboration with sympathetic university researchers, a Swedish government laboratory, and a state-owned publishing company — succeeded in inventing a form of computer software unique in its day. Instead of following trends toward routinized or mechanized newspaper layout, this software contained some of the capabilities later embodied in desktop publishing programs that enable printers

and graphic artists to exercise considerable creativity in page design.[42] Known as UTOPIA, this project demonstrated how broadened participation in the RD&D process could lead to a design innovation that, in turn, supported one condition of democracy — creative work (Criterion B).

UTOPIA is less ambitious than several other attempts at participatory design within the workplace. For example, in the 1970s workers at Britain's Lucas Aerospace Corporation sought not only to democratize their own work processes but also to produce more socially useful products.[43] But UTOPIA demonstrated that workers could go beyond just developing prototypes. It also should be noted that this instance of collaboration between workers and technical experts — initially limited to a single technology within a single industry — occurred under unusually favorable social and political conditions. Sweden's workforce is 85 percent unionized, and the nation's pro-labor Social Democratic party has held power during most of the past 50 years.

Participatory Architecture

Compared with the relatively few examples of participatory design of machinery, appliances, or technical infrastructure, there is a rich history of citizen participation in architectural design. One example is the "Zone Sociale" at the Catholic University of Louvain Medical School in Brussels. In 1969 students insisted that new university housing mitigate the alienating architecture of the adjacent hospital. Architect Lucien Kroll established an open-ended, participatory design process that elicited intricate organic forms (e.g., support pillars shaped like gnarled tree trunks), richly diverse patterns of social interaction (e.g., a nursery school situated near administrative offices and a bar), and a dense network of pedestrian paths, gardens, and public spaces. Walls and floors of dwellings were movable, so that students could design their own living spaces. Construction workers were given design principles and constraints rather than finalized blueprints, and they were encouraged to create and display their own sculptures. Initially baffled by the level of spontaneity and playfulness, the project's structural engineers gradually adapted themselves to the diversity of competent participants.

Everything proceeded splendidly for some years until the university administration became alarmed at the extent to which they could not control the process. When the students were away on vacation, they fired Kroll and halted further construction.[44]

Feminist Design

What would happen if women played a greater part in RD&D? One answer comes from feminists who have long been critical of housing designs and urban layouts that reinforce the social isolation and the low, unpaid status of women as housewives.[45] If women were more actively engaged in community design, they might set up more shared neighborhood facilities for day care, laundry, or food preparation, or they might locate homes, workplaces, stores, and public facilities more closely together. Realized examples of feminist design exist in London, Stockholm, and Providence, Rhode Island.[46]

Another approach has been pioneered by an artist and former overworked mother named Frances Gabe, who devoted several decades to inventing a self-cleaning house. "In Gabe's house," according to author Jan Zimmerman, "dishes are washed in the cupboard, clothes are cleaned in the closets, and the rest of the house sparkles after a humid misting and blow dry!"[47]

Other feminists have established women's computer networks and designed alternatives to dreary female office work and to transportation networks insensitive to women's needs.[48] An explicit feminist complaint against current reproductive technologies — such as infertility treatments, surrogate mothering, hysterectomy, and abortion — is that women have played a negligible role in guiding the medical RD&D agendas which have imposed on women agonizing moral dilemmas that might otherwise be averted or structured differently.[49]

Barrier-Free Design

During the past two decades there has been substantial innovation in the design of "barrier-free" equipment, buildings, and public spaces responsive to the needs of people with physical disabilities. Much of the impetus came from disabled citizens who organized themselves to assert their needs or helped invent design solutions. For example, prototypes of the Kurzweil Reading Machine, which uses computer voice-synthesis to read typed text aloud, were tested by over 150 blind users. In an eighteen-month period these users made over a hundred recommendations, many of which were incorporated into later versions of the device.[50]

Technology by the People

All these examples of participatory design demonstrate that it is possible to have a much wider range of people participating in technological research, development, and design.[51] Moreover, participatory design broadens the menu of technological choices. But many participatory design exercises also have encountered fierce opposition from powerful institutions — opposition engendered, not because the exercises were failing, but because they were succeeding.

Still, some advocates of participatory RD&D have elected to state their case entirely in terms of the material interests of the nonparticipants. Others have noted the contribution that participation can make to improved productivity or to better design solutions. These are all fair and reasonable arguments. What is rarely articulated is the specific moral argument that the opportunity to participate in RD&D should be a matter of right, because it is essential to individual moral autonomy, to human dignity, and to democratic self-governance.

A powerful moral case for participatory design has been made by people with disabilities who have demanded barrier-free design. The movement's achievements are now apparent in the profusion of ramps and modified rest rooms in public places (responsive to Criterion C), and they will soon become even more apparent with the promulgation of new regulations under the Americans with Disabilities Act of 1990. The movement not only opposes antidemocratic design but also has a constructive, hopeful thrust. Nonmarket, democratic design criteria — often formulated and applied by disabled laypeople — are now being used to define individual and collective needs, including access to public spaces. Moreover, participants do not evaluate just one technology at a time — the norm in conventional technology assessment — but entire technological and architectural environments. When the range of democratic criteria broadens and when the participants expand beyond the disabled population, we will be well on our way toward ensuring that our technology is compatible with democracy.

CONCLUSION

Current technological orders are generally short on communitarian or cooperative activities, and long on isolation and authoritarianism (violating Criterion A). Work is frequently stultifying and tends to impair moral growth and political efficacy (violating Criterion B). Illegitimate power asymmetries are reproduced through technological means (violating Criterion C.)

The opportunity to engage in a vibrant civic life is often preempted by shopping malls, suburban subdivisions, unconstrained automobilization, and an explosive proliferation in home entertainment devices. Thus we have diminished access to local mediating institutions or to public spaces that could support democratic empowerment within the broader society (violating Criteria A and F). The need to manage translocal harms, coupled with widespread dependence on centrally managed technological systems and with the growing integration of the global economy, has helped render local governments relatively powerless, thereby reducing anyone's incentive to participate (violating Criteria D, E, and F). Meanwhile, there is little compensating incentive to engage directly in national politics, which television reduces to a passive spectator sport, where powerful corporations exert disproportionate influence, where deep questions of social structure are slighted, and where the average citizen has negligible effect.

While it is not always easy to establish causal connections running from structural deficiencies to other social ills, it hardly seems conceivable that weak community ties, atrophied local political capabilities, and authoritarian and degraded work processes have had no influence upon illiteracy, stress, illness, divorce rates, teen pregnancy, crime, drug abuse, psychological disorders, and so on. Perhaps, as de Tocqueville foresaw, many of us *do* sometimes feel shut up in a narrow selfishness, robbed of one half of our existence, left with an immense void in our lives.

Progressive technological strategists face a dilemma. We can couch our nostrums in terms of prevailing economic goals like competitiveness and try to win short-run victories. Or we can strive for a world worthy of our ideals. But we can

no longer pretend that the progressive policies so far proposed for improving national economic performance, any more than conservative policies, are going to avoid exacerbating the United States' most profound social and political maladies. Has not the time arrived to mobilize for a democratic politics of technology?

NOTES

1. Alex De Tocqueville, *Democracy in America*, ed. Phillips Bradley, rev. ed. (1848; reprint, New York: Vintage Books, 1954), Vol. 1, p. 260.
2. John J. Kushma, "Participation and the Democratic Agenda: Theory and Praxis," in Marc V. Levine et al. *The State and Democracy: Revitalizing America's Government* (New York: Routledge, 1988), pp. 14–48. According to the Harwood Group, many Americans would like to be move involved in public affairs, but feel locked out of the current system. See *Citizens and Politics: A View from Main Street America* (Dayton, OH: The Kettering Foundation, 1991).
3. Susan Friend Harding, *Remaking Ibieca: Rural Life in Aragon under Franco* (Chapel Hill: University of North Carolina Press, 1984).
4. Samuel Bowles and Herbert Gintis, *Democracy and Capitalism: Property, Community, and the Contradictions of Modern Social Thought* (New York: Basic Books, 1986). The converse causal tie between community strength and political empowerment is suggested, for instance, by solidaristic Amish communities' success in resisting mandatory public schooling, military conscription, and participation in the federal social security system. See Donald B. Kraybill, *The Riddle of Amish Culture* (Baltimore: Johns Hopkins University Press, 1989).
5. Benjamin Barber, *Strong Democracy: Participatory Politics for a New Age* (Berkeley: University of California Press, 1984).
6. See, for example, Sara M. Evans and Harry C. Boyte, *Free Spaces: The Sources of Democratic Change in America* (New York: Harper and Row, 1986).
7. For the complete derivation and justification for these and additional democratic design criteria, see Richard E. Sclove, *Democracy and Technology* (New York: Guilford Press, 1995).
8. See, for example, Kenneth T. Jackson, *Crabgrass Frontier: The Suburbanization of the United States* (New York: Oxford University Press, 1985); and Barber, *Strong Democracy* pp. 267–273, 306–6.
9. I define technology broadly as material artifacts and the practices or beliefs that accompany their creation or use. Hence I regard architecture and community planning as a subdomain of technology.
10. Dolores Hayden, *Redesigning the American Dream: The Future of Housing, Work, and Family Life* (New York: W. W. Norton, 1984), pp. 189–91.
11. Kathryn McCamant and Charles Durrett, *Cohousing: A Contemporary Approach to Housing Ourselves* (Berkeley, CA: Habitat Press, 1988).
12. Some supporting evidence can be found in the emerging international network of "sister cities." See, for example, Michael Shuman, "From Charity to Justice," *Bulletin of Municipal Foreign Policy* 2:4 (Autumn 1988), pp. 50–59.
13. Edward S. Greenberg, *Workplace Democracy: The Political Effects of Participation* (Ithaca: Cornell University Press, 1986); William M. Lafferty, "Work as a Source of Political Learning among Wage-Laborers and Lower-Level Employees," in *Political Learning in Adulthood: A Sourcebook of Theory and Research*, ed. Roberta S. Sigel (Chicago: University of Chicago Press, 1989), pp. 102–42; Melvin L. Kohn et al., "Position in the Class Structure and Psychological Functioning in the United States, Japan, and Poland," *American Journal of Sociology*, 95:4 (January 1990), pp. 964–1008.
14. Robert Schrank, *Ten Thousand Working Days* (Cambridge, MA: MIT Press, 1978), p. 226.

15. Ibid., pp. 221–27. On remaining democratic shortcomings in the Volvo factories, see Stephen Hill, *Competition and Control at Work: The New Industrial Sociology* (Cambridge, MA: MIT Press, 1981), pp. 39 and 104–5. For further recent examples of both democratic and nondemocratic workplace technology, see Shoshana Zuboff, *In the Age of the Smart Machine: The Future of Work and Power* (New York: Basic Books, 1988).
16. See Ruth Schwartz Cowan, *More Work for Mother: The Ironies of Household Technology from the Open Hearth to the Microwave* (New York: Basic Books, 1983).
17. Hayden, *Redesigning the American Dream;* Ray Oldenburg, *The Great Good Place: Cafes, Coffee Shops, Community Centers, Beauty Parlors, General Stores, Bars, Hangouts, and How They Get You though the Day* (New York: Paragon House, 1989).
18. See Women and Transport Forum, "Women on the Move: How Public Is Public Transport? in *Technology and Women's Voices: Keeping in Touch,* ed. Cheris B. Kramarae (New York: Routledge & Kegan Paul, 1988), pp. 116–34.
19. Barbara Drygulski Wright, *Women, Work, and Technology: Transformations* (Ann Arbor: University of Michigan Press, 1987); Naomi Wolf, *The Beauty Myth: How Images of Beauty Are Used against Women* (New York: William Morrow, 1991).
20. See Joel A. Tarr, "Sewerage and the Development of the Networked City in the United States, 1850–1930," in *Technology and the Rise of the Networked City,* ed. Joel A. Tarr and Gabriel Dupuy (Philadelphia: Temple University Press, 1988), pp. 159–85; and Gerald E. Frug, "The City as a Legal Concept," *Harvard Law Review,* 93:6 (April 1980), pp. 1057–1154.
21. See Samuel P. Hays, *Beauty, Health, and Permanence: Environmental Politics in the United States, 1955–1985* (Cambridge: Cambridge University Press, 1987), pp. 443–45, 456–57; Gareth Porter and Janet Welsh Brown, *Global Environmental Politics* (Boulder, CO: Westview Press, 1991), pp. 64, 66; Wolfgang Sachs, "Environment and Development: The Story of a Dangerous Liaison," *The Ecologist,* 21:6 (November/December 1991), pp. 252–57. Local ability to pressure corporations to reduce pollution could be much advanced by supportive legislation such as the Environmental Bill of Rights proposed in Samuel Bowles, David M. Gordon, and Thomas E. Weisskopf, *Beyond the Wasteland: A Democratic Alternative to Economic Decline* (Garden City: Anchor Press/Doubleday, 1983), pp. 346–46.
22. Thomas Parke Hughes, *Networks of Power: Electrification in Western Society, 1880–1930* (Baltimore: Johns Hopkins University Press, 1983), Chapter 9.
23. See Robert Gilman, "Four Steps to Self-Reliance: The Story behind Rocky Mountain Institute's Economic Renewal Project," *In Context,* 14 (Autumn 1986), pp. 41–46; Barbara A. Cole, *Business Opportunities Casebook* (Snowmass, CO: Rocky Mountain Institute, 1988); and David Morris, "Self-Reliant Cities: The Rise of the New City-States," in *Resettling America: Energy, Ecology, and Community,* ed. Gary J. Coates (Andover, MA: Brick Housing Publishing Co., 1981), pp. 240–62.
24. See John Gaventa, *Power and Powerlessness: Quiescence and Rebellion in an Appalachian Valley* (Urbana: University of Illinois Press, 1980), Chapter 8; and Frug, "The City as a Legal Concept."
25. See, for example, Stephen S. Cohen and John Zysman, *Manufacturing Matters: The Myth of the Post-Industrial Economy* (New York: Basic Books, 1987); Michael L. Dertouzos, Richard K. Lester, Robert M. Solow, and the MIT Commission on Industrial Competitiveness, *Made in America: Regaining the Productive Edge* (Cambridge, MA: MIT Press, 1989); Lester C. Thurow, *The Zero-Sum Solution: Building a World-Class American Economy* (New York: Simon & Schuster, 1985); and Joel S. Yudken and Michael Black, "Targeting National Needs: A New Direction for Science and Technology Policy," *World Policy Journal,* 7:2 (Spring 1990), pp. 282–83. While sharply critical of economic nationalism, Robert B. Reich's *The Work of Nations* (New York: Vintage Books, 1992) assumes increased integration into an ever more intensively globalized economy. On the importance of granting greater local power over national self-reliance, see Ann J. Tickner, *Self-Reliance versus Power Politics: The American and Indian Experiences in Building Nation States* (New York: Columbia University Press, 1987).

26. See, for example, Bowles et al., *Beyond the Wasteland;* Yudken and Black, "Targeting National Needs"; and Robert B. Reich, "The Real Economy," *Atlantic Monthly,* 267:2 (February 1991), pp. 35–52.
27. Amory B. Lovins, *Soft Energy Paths: Toward a Durable Peace* (Cambridge, MA: Ballinger 1977); National Center for Appropriate Technology, *Wastes to Resources: Appropriate Technologies for Sewage Treatment and Conversion,* DOE/CE/15095-2 (Washington, DC: US. Government Printing Office, July 1983); Ken Darrow and Mike Saxenian, *Appropriate Technology Sourcebook: A Guide to Practical Books for Village and Small Community Technology* (Stanford, CA: Volunteers in Asia, 1986); Valjean McLenighan, *Sustainable Manufacturing: Saving Jobs, Saving the Environment* (Chicago: Center for Neighborhood Technology, 1990).
28. See, for example, Michael J. Piore and Charles F. Sabel, *The Second Industrial Divide: Possibilities for Prosperity* (New York: Basic Books, 1984); Cohen and Zysman, *Manufacturing Matters.*
29. David F. Noble's deservedly influential essay, "Social Choice in Machine Design: The Case of Automatically Controlled Machine Tools," lauds Norwegian factory worker involvement in technology choices that helped workers maintain autonomy and creativity. True enough, but the factory in question was a state-owned weapons production plant. In *Case Studies on the Labor Process,* ed. Andrew Zimbalist (New York: Monthly Review Press, 1979), pp. 18–50.
30. See, for example, John Todd and Nancy Jack Todd, *Bioshelters, Ocean Arks, City Farming: Ecology as the Basis of Design* (San Francisco: Sierra Club Books, 1984).
31. Stan Sesser, "A Reporter at Large: A Nation of Contradictions," *The New Yorker,* 13 January 1992, pp. 37–68.
32. See Richard E. Sclove, "The Nuts and Bolts of Democracy: Toward a Democratic Politics of Technological Design," in *Critical Perspectives on Non-Academic Science and Engineering,* ed. Paul T. Durbin (Bethlehem, PA: Lehigh University Press, 1991), pp. 239–62; and Sclove, *Technology and Freedom.*
33. D. J. Gamble, "The Berger Inquiry: An Impact Assessment Process," *Science,* 199:4332 (3 March 1978), pp. 950–51.
34. Ibid., pp. 946–52; Thomas R. Berger, *Northern Frontier, Northern Homeland: The Report of the MacKenzie Valley Pipeline Inquiry,* 2 vols. (Ottawa: Minister of Supply and Services, Canada, 1977); Organisation for Economic Cooperation and Development (OECD), *Technology on Trial. Public Participation in Decision-Making Related to Science and Technology* (Paris: OECD, 1979).
35. See, for example, Barry M. Casper and Paul David Wellstone, *Powerline: The First Battle of America's Energy War* (Amherst: University of Massachusetts Press, 1981); David Dickson, *The New Politics of Science* (Chicago: University of Chicago Press, 1988).
36. Bruce Jennings et al., "Grassroots Bioethics Revisited: Health Care Priorities and Community Values," *Hastings Center Report* 20:5 (September/ October 1990), pp. 16–23.
37. Kevin J. Cassidy, "Defense Conversion: Economic Planning and Democratic Participation," *Science, Technology, and Human Values,* 17:3 (Summer 1992), pp. 334–48.
38. Seth Shulman, "Mr. Wizard's Wetenschapswinkel," *Technology Review,* 91:5 (July 1988), pp. 8–9.
39. On Amish technological decision making see, for example, Marc A. Olshan, "Modernity, the Folk Society, and the Old Order Amish: An Alternative Interpretation," *Rural Sociology,* 46:2 (Summer 1981), pp. 297–309; Victor Stoltzfus, "Amish Agriculture: Adaptive Strategies for Economic Survival of Community Life," *Rural Sociology,* 38:2 (Fall 1973), pp. 196–206; Kraybill, *The Riddle of the Amish Culture.*
40. See for example, U.S. Congress, Office of Technology Assessment, *Coastal Effects of Offshore Energy Systems* (Washington, DC: U.S. Government Printing Office, 1976); Rachelle Hollander, "Institutionalizing Public Service Science: Its Perils and Promise," in *Citizen Participation in Science Policy,* ed. James C. Petersen (Amherst: University of Massachusetts Press, 1984), pp. 75–95.
41. For additional arguments in support of participatory design, see Richard E. Sclove, "The Nuts and Bolts of Democracy: Democratic Theory and Technological Design," in

Democracy in Technological Society, ed. Langdon Winner (Dordrecht: Kluwer Academic Publisher, 1992), pp. 132–57.

42. Andrew Martin, "Unions, the Quality of Work, and Technological Change in Sweden," in *Worker Participation and the Politics of Reform*, ed. Carmen Sirianni (Philadelphia: Temple University Press, 1987), pp. 99–139.
43. Hilary Wainwright and Dave Elliott, *The Lucas Plan. A New Trade Unionism in the Making?* (London: Allison and Busby, 1982).
44. Lucien Kroll, "Anarchitecture," in *The Scope of Social Architecture*, ed. Richard C. Hatch (New York: Van Nostrand Reinhold, 1984), pp. 166–85.
45. Hayden, *Redesigning the American Dream*, Chapter 4.
46. Ibid., pp. 163–70.
47. Jan Zimmerman, *Once Upon the Future: A Woman's Guide to Tomorrow's Technology* (New York: Pandora, 1986), pp. 36–37.
48. Wright, *Women, Work, and Technology*; Kramarae, *Technology and Women's Voices*.
49. See Sarah Franklin and Maureen McNeil, "Reproductive Futures: Recent Literature and Current Feminist Debates on Reproductive Technologies," *Feminist Studies*, 14:3 (Fall 1988), pp. 545–60.
50. See Michael Hingson, "The Consumer Testing Project for the Kurzweil Reading Machine for the Blind," pp. 89–90, and Raymond Kurzweil, "The Development of the Kurzweil Reading Machine," pp. 94–96, in Virginia W. Stern and Martha Ross Redden, eds., *Technology for Independent Living: Proceedings of the 1980 Workshops on Science and Technology for the Handicapped* (Washington, DC: American Association for the Advancement of Science, 1982).
51. For a number of additional examples, see Sclove, "The Nuts and Bolts of Democracy: Toward a Democratic Politics of Technological Design," or contact the Loka Institute, P.O. Box 355, Amherst, MA 01004; e-mail: Loka@amherst.edu.