

## PART II

### DEBATING TECHNOLOGY: 1960s STYLE

Chapter 10, Emmanuel Mesthene's essay, "The Role of Technology in Society," and the piece that follows it, "Technology: The Opiate of the Intellectuals" by John McDermott (Chapter 11), constitute a classic debate about the role of technology in society. The articles date from the late 1960s, when the war in Vietnam was in full swing and intellectual and political life in the United States was torn by bitter conflicts between the "establishment" and the "New Left."

The two articles are included here, as they have been in every edition of *Technology and the Future* since the book was first published in 1972, as a means of illustrating in sharp relief the different perspectives on technology of the powerful and powerless. Mesthene, a Harvard professor and former RAND Corporation analyst, head of a large research program funded by a multimillion dollar grant from IBM, is comfortable with technology. He and his colleagues feel that technology is something that they can control and use. It is a neutral tool that can be employed for purposes that are good as well as those that are evil and it often has both positive and negative effects on society.

McDermott, on the other hand, sees technology from the lower rungs of society's ladder. A professor of labor studies writing in the then-radical left *New York Review of Books*, his viewpoint is that of the factory worker struggling to make ends meet rather than the highly paid industry executive. He is the foot soldier slogging through the jungles of Vietnam in a war whose purpose he doesn't understand, rather than the systems analyst comfortably ensconced in the Pentagon or in RAND's Santa Monica headquarters. Technology, seen from McDermott's side of the fence, is hardly a neutral tool; it is the means by which those in power maintain their control of society while perpetuating social injustice.

Some of the illustrations the authors use in these two essays — which were instantly recognizable and conjured up clear images to readers of their day — may be unfamiliar to today's college students. But the issues they raise and the differing perspectives on technology of the rulers and the ruled are as important today as they were three decades ago.

# 10. The Role of Technology in Society

EMMANUEL G. MESTHENE

Emmanuel Mesthene's essay, "The Role of Technology in Society," originated as the overview section of the fourth annual report of the Harvard Program on Technology and Society, an interdisciplinary program of academic studies funded by a \$5 million grant from the IBM Corporation. Mesthene was the program's director, and this essay was his general statement of what the program had learned during its first four years about the implications of technological change for society.

According to Mesthene, technology appears to induce social change in two ways: by creating new opportunities and by generating new problems for individuals and for societies. "It has both positive and negative effects, and it usually has the two at the same time and in virtue of each other." By enlarging the realm of goal choice, or by altering the relative costs associated with different values, technology can induce value change. In all areas, technology is seen to have two faces, one positive and one negative.

Emmanuel G. Mesthene directed the Harvard Program on Technology and Society from 1964 through 1974, following eleven years with the Rand Corporation. He joined Rutgers University in 1974, serving as dean of Livingston College for several years, then as distinguished professor of philosophy and professor of management. Mesthene died in 1990. Among his books are *Technological Change: Its Impact on Man and Society* (1970) and *How Language Makes Us Know* (1964).

## SOCIAL CHANGE

### Three Unhelpful Views about Technology

While a good deal of research is aimed at discerning the particular effects of technological change on industry, government, or education, systematic inquiry devoted to seeing these effects together and to assessing their implications for contemporary society as a whole is relatively recent and does not enjoy the strong methodology and richness of theory and data that mark more established fields of scholarship. It therefore often has to contend with facile or one-dimensional views about what technology means for society. Three such views, which are prevalent at the present time, may be mildly caricatured somewhat as follows.

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The first holds that technology is an unalloyed blessing for man and society. Technology is seen as the motor of all progress, as holding the solution to most of our social problems, as helping to liberate the individual from the clutches of a complex and highly organized society, and as the source of permanent prosperity; in short, as the promise of utopia in our time. This view has its modern origins in the social philosophies of such nineteenth-century thinkers as Saint Simon, Karl Marx, and Auguste Comte. It tends to be held by many scientists and engineers, by many military leaders and aerospace industrialists, by people who believe that man is fully in command of his tools and his destiny, and by many of the devotees of modern techniques of "scientific management."

A second view holds that technology is an unmitigated curse. Technology is said to rob people of their jobs, their privacy, their participation in democratic government, and even, in the end, their dignity as human beings. It is seen as autonomous and uncontrollable, as fostering materialistic values and as destructive of religion, as bringing about a technocratic society and bureaucratic state in which the individual is increasingly submerged, and as threatening, ultimately, to poison nature and blow up the world. This view is akin to historical "back-to-nature" attitudes toward the world and is propounded mainly by artists, literary commentators, popular social critics, and existentialist philosophers. It is becoming increasingly attractive to many of our youth, and it tends to be held, understandably enough, by segments of the population that have suffered dislocation as a result of technological change.

The third view is of a different sort. It argues that technology as such is not worthy of special notice, because it has been well recognized as a factor in social change at least since the Industrial Revolution, because it is unlikely that the social effects of computers will be nearly so traumatic as the introduction of the factory system in eighteenth-century England, because research has shown that technology has done little to accelerate the rate of economic productivity since the 1880s, because there has been no significant change in recent decades in the time periods between invention and widespread adoption of new technology, and because improved communications and higher levels of education make people much more adaptable than heretofore to new ideas and to new social reforms required by technology.

While this view is supported by a good deal of empirical evidence, however, it tends to ignore a number of social, cultural, psychological, and political effects of technological change that are less easy to identify with precision. It thus reflects the difficulty of coming to grips with a new or broadened subject matter by means of concepts and intellectual categories designed to deal with older and different subject matters. This view tends to be held by historians, for whom continuity is an indispensable methodological assumption, and by many economists, who find that their instruments measure some things quite well while those of the other social sciences do not yet measure much of anything.

Stripped of caricature, each of these views contains a measure of truth and reflects a real aspect of the relationship of technology and society. Yet they are oversimplifications that do not contribute much to understanding. One can find empirical evidence to support each of them without gaining much knowledge

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about the actual mechanism by which technology leads to social change or significant insight into its implications for the future. All three remain too uncritical or too partial to guide inquiry. Research and analysis lead to more differentiated conclusions and reveal more subtle relationships.

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### How Technological Change Impinges on Society

It is clearly possible to sketch a more adequate hypothesis about the interaction of technology and society than the partial views outlined [here]. Technological change would appear to induce or "motor" social change in two principal ways. New technology creates new opportunities for men and societies, and it also generates new problems for them. It has both positive and negative effects, and it usually has the two at the same time and in virtue of each other. Thus, industrial technology strengthens the economy, as our measures of growth and productivity show. . . . However, it also induces changes in the relative importance of individual supplying sectors in the economy as new techniques of production alter the amounts and kinds of materials, parts and components, energy, and service inputs used by each industry to produce its output. It thus tends to bring about dislocations of businesses and people as a result of changes in industrial patterns and in the structure of occupations.

The close relationship between technological and social change itself helps to explain why any given technological development is likely to have both positive and negative effects. The usual sequence is that (1) technological advance creates a new opportunity to achieve some desired goal; (2) this requires (except in trivial cases) alterations in social organization if advantage is to be taken of the new opportunity; (3) which means that the functions of existing social structures will be interfered with; (4) with the result that other goals, which were served by the older structures, are now only inadequately achieved.

As the Meyer-Kain<sup>1</sup> study has shown, for example, improved transportation technology and increased ownership of private automobiles have increased the mobility of businesses and individuals. This has led to altered patterns of industrial and residential location, so that older unified cities are being increasingly transformed into larger metropolitan complexes. The new opportunities for mobility are largely denied to the poor and black populations of the core cities, however, partly for economic reasons, and partly as a result of restrictions on choice of residence by blacks, thus leading to persistent black unemployment despite a generally high level of economic activity. Cities are thus increasingly unable to perform their traditional functions of providing employment opportunities for all segments of their populations and an integrated social environment that can temper ethnic and racial differences. The new urban complexes are neither fully viable economic units nor effective political organizations able to upgrade and integrate their core populations into new economic and social structures. The resulting instability is further aggravated by modern mass communications technology, which heightens the expectations of the

poor and the fears of the well-to-do and adds frustration and bitterness to the urban crisis. . . .

In all such cases, technology creates a new opportunity and a new problem at the same time. That is why isolating the opportunity or the problem and constructing it as the whole answer is ultimately obstructive of, rather than helpful to, understanding.

### How Society Reacts to Technological Change

The heightened prominence of technology in our society makes the interrelated tasks of profiting from its opportunities and containing its dangers a major intellectual and political challenge of our time.

Failure of society to respond to the opportunities created by new technology means that much actual or potential technology lies fallow, that is, is not used at all or is not used to its full capacity. This can mean that potentially solvable problems are left unsolved and potentially achievable goals unachieved, because we waste our technological resources or use them inefficiently. A society has at least as much stake in the efficient utilization of technology as in that of its natural or human resources.

There are often good reasons, of course, for not developing or utilizing a particular technology. The mere fact that it can be developed is not sufficient reason for doing so. . . .

But there are also cases where technology lies fallow because existing social structures are inadequate to exploit the opportunities it offers. . . . Community institutions wither for want of interest and participation by residents. City agencies are unable to marshal the skills and take the systematic approach needed to deal with new and intensified problems of education, crime control, and public welfare. Business corporations, finally, which are organized around the expectation of private profit, are insufficiently motivated to bring new technology and management know-how to bear on urban projects where the benefits will be largely social. All these factors combine to dilute what may otherwise be a genuine desire to apply our best knowledge and adequate resources to the resolution of urban tensions and the eradication of poverty in the nation. . . .

### Containing the Negative Effects of Technology

The kinds and magnitude of the negative effects of technology are no more independent of the institutional structures and cultural attitudes of society than is realization of the new opportunities that technology offers. In our society, there are individuals or individual firms always on the lookout for new technological opportunities, and large corporations hire scientists and engineers to invent such opportunities. In deciding whether to develop a new

technology, individuals weigh the benefits and expected costs to the latter. Their calculations of benefits and costs are to society generally, and costs.

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technology, individual entrepreneurs engage in calculations of expected benefits and expected costs to themselves and proceed if the former are likely to exceed the latter. Their calculations do not take adequate account of the probable benefits and costs of the new developments to others than themselves or to society generally. These latter are what economists call external benefits and costs.

The external benefits potential in new technology will thus not be realized by the individual developer and will rather accrue to society as a result of deliberate social action, as has been argued above. Similarly with the external costs. In minimizing only expected costs to himself, the individual decision-maker helps to contain only some of the potentially negative effects of the new technology. The external costs and therefore the negative effects on society at large are not of principal concern to him and, in our society, are not expected to be.

Most of the consequences of technology that are causing concern at the present time — pollution of the environment, potential damage to the ecology of the planet, occupational and social dislocations, threats to the privacy and political significance of the individual, social and psychological malaise — are negative externalities of this kind. They are with us in large measure because it has not been anybody's explicit business to foresee and anticipate them. They have fallen between the stools of innumerable individual decisions to develop individual technologies for individual purposes without explicit attention to what all these decisions add up to for society as a whole and for people as human beings. This freedom of individual decision making is a value that we have cherished and that is built into the institutional fabric of our society. The negative effects of technology that we deplore are a measure of what this traditional freedom is beginning to cost us. They are traceable, less to some mystical autonomy presumed to lie in technology, and much more to the autonomy that our economic and political institutions grant to individual decision making. . . .

Measures to control and mitigate the negative effects of technology, however, often appear to threaten freedoms that our traditions still take for granted as inalienable rights of men and good societies, however much they may have been tempered in practice by the social pressures of modern times; the freedom of the market, the freedom of private enterprise, the freedom of the scientist to follow truth wherever it may lead, and the freedom of the individual to pursue his fortune and decide his fate. There is thus set up a tension between the need to control technology and our wish to preserve our values, which leads some people to conclude that technology is inherently inimical to human values. The political effect of this tension takes the form of inability to adjust our decision-making structures to the realities of technology so as to take maximum advantage of the opportunities it offers and so that we can act to contain its potential ill effects before they become so pervasive and urgent as to seem uncontrollable.



To understand why such tensions are so prominent a social consequence of technological change, it becomes necessary to look explicitly at the effects of technology on social and individual values.

## VALUES

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### Technology as a Cause of Value Change

Technology has a direct impact on values by virtue of its capacity for creating new opportunities. By making possible what was not possible before, it offers individuals and society new options to choose from. For example, space technology makes it possible for the first time to go to the moon or to communicate by satellite and thereby adds those two new options to the spectrum of choices available to society. By adding new options in this way, technology can lead to changes in values in the same way that the appearance of new dishes on the heretofore standard menu of one's favorite restaurant can lead to changes in one's tastes and choices of food. Specifically, technology can lead to value change either (1) by bringing some previously unattainable goal within the realm of choice or (2) by making some values easier to implement than heretofore, that is, by changing the costs associated with realizing them. . . .

One example related to the effect of technological change on values is implicit in our concept of democracy. The ideal we associate with the old New England town meeting is that each citizen should have a direct voice in political decisions. Since this has not been possible, we have elected representatives to serve our interests and vote our opinions. Sophisticated computer technology, however, now makes possible rapid and efficient collection and analysis of voter opinion and could eventually provide for "instant voting" by the whole electorate on any issue presented to it via television a few hours before. It thus raises the possibility of instituting a system of direct democracy and gives rise to tensions between those who would be violently opposed to such a prospect and those who are already advocating some system of participatory democracy.

This new technological possibility challenges us to clarify what we mean by democracy. Do we construe it as the will of an undifferentiated majority, as the resultant of transient coalitions of different interest groups representing different value commitments, as the considered judgment of the people's elected representatives, or as by and large the kind of government we actually have in the United States, minus the flaws in it that we would like to correct? By bringing us face to face with such questions, technology has the effect of calling society's bluff and thereby preparing the ground for changes in its values.

In the case where technological change alters the relative costs of implementing different values, it impinges on inherent contradictions in our value system. To pursue the same example, modern technology can enhance the values we associate with democracy. But it can also enhance another American value — that of "secular rationality," as sociologists call it — by facilitating the use of scientific

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and technical expertise in the process of political decision making. This can in turn further reduce citizen participation in the democratic process. Technology thus has the effect of facing us with contradictions in our value system and of calling for deliberate attention to their resolution.

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## ECONOMIC AND POLITICAL ORGANIZATION

### The Enlarged Scope of Public Decision Making

When technology brings about social changes (as described in the first section of this essay) that impinge on our existing system of values (in ways reviewed in the second section), it poses for society a number of problems that are ultimately political in nature. The term "political" is used here in the broadest sense: It encompasses all of the decision-making structures and procedures that have to do with the allocation and distribution of wealth and power in society. The political organization of society thus includes not only the formal apparatus of the state but also industrial organizations and other private institutions that play a role in the decision-making process. It is particularly important to attend to the organization of the entire body politic when technological change leads to a blurring of once-clear distinctions between the public and private sectors of society and to changes in the roles of its principal institutions.

It was suggested above that the political requirements of our modern technological society call for a relatively greater public commitment on the part of individuals than in previous times. The reason for this, stated most generally, is that technological change has the effect of enhancing the importance of public decision making in society, because technology is continually creating new possibilities for social action as well as new problems that have to be dealt with.

A society that undertakes to foster technology on a large scale, in fact, commits itself to social complexity and to facing and dealing with new problems as a normal feature of political life. Not much is yet known with any precision about the political imperatives inherent in technological change, but one may nevertheless speculate about the reasons why an increasingly technological society seems to be characterized by enlargement of the scope of public decision making.

For one thing, the development and application of technology seems to require large-scale, and hence increasingly complex, social concentrations, whether these be large cities, large corporations, big universities, or big government. In instances where technological advance appears to facilitate reduction of such first-order concentrations, it tends to instead enlarge the relevant system of social organization, that is, to lead to increased centralization. Thus, the physical dispersion made possible by transportation and communications technologies, as Meyer and Kain have shown, enlarges the urban complex that must be governed as a unit.

A second characteristic of advanced technology is that its effects cover large distances, in both the geographical and social senses of the term. Both its positive



and negative features are more extensive. Horse-powered transportation technology was limited in its speed and capacity, but its nuisance value was also limited, in most cases to the owner and to the occupant of the next farm. The supersonic transport can carry hundreds across long distances in minutes, but its noise and vibration damage must also be suffered willy-nilly by everyone within the limits of a swath 3,000 miles long and several miles wide.

The concatenation of increased density (or enlarged system) and extended technological "distance" means that technological applications have increasingly wider ramifications and that increasingly large concentrations of people and organizations become dependent on technological systems. . . . The result is not only that more and more decisions must be social decisions taken in public ways, as already noted, but that, once made, decisions are likely to have a shorter useful life than heretofore. That is partly because technology is continually altering the spectrum of choices and problems that society faces, and partly because any decision taken is likely to generate a need to take ten more.

These speculations about the effects of technology on public decision making raise the problem of restructuring our decision-making mechanisms — including the system of market incentives — so that the increasing number and importance of social issues that confront us can be resolved equitably and effectively.

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### The Promise and Problems of Scientific Decision Making

There are two further consequences of the expanding role of public decision making. The first is that the latest information-handling devices and techniques tend to be utilized in the decision-making process. This is so (1) because public policy can be effective only to the degree that it is based on reliable knowledge about the actual state of the society, and thus requires a strong capability to collect, aggregate, and analyze detailed data about economic activities, social patterns, popular attitudes, and political trends, and (2) because it is recognized increasingly that decisions taken in one area impinge on and have consequences for other policy areas often thought of as unrelated, so that it becomes necessary to base decisions on a model of society that sees it as a system and that it is capable of signaling as many as possible of the probable consequences of a contemplated action.

As Professor Alan F. Westin points out, reactions to the prospect of more decision making based on computerized data banks and scientific management techniques run the gamut of optimism to pessimism mentioned in the opening of this essay. Negative reactions take the form of rising political demands for greater popular participation in decision making, for more equality among different segments of the population, and for greater regard for the dignity of individuals. The increasing dependence of decision making on scientific and technological devices and techniques is seen as posing a threat to these goals, and pressures are generated in opposition to further "rationalization" of decision-making processes. These pressures have the paradoxical effect, however, not of deflecting the supporters of technological decision making from their course, but of spurring them

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The paradox goes that we are witnessing extensive ramifications of social processes increasingly widespread and difficult. Techniques are increasingly formulated policies and modern decision making depends on the collection of devices and scientific information. There is an increasing debate to professionalize almost independently that process has been and national security

This "logic" of modernization is an element of traditional participation in the political process above. If it turns out becoming less relevant, effects are long and complex in other words — elaborate processes more adequate to the major intellectual

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The paradox goes further and helps to explain much of the social discontent that we are witnessing at the present time. The greater complexity and the more extensive ramifications that technology brings about in society tend to make social processes increasingly circuitous and indirect. The effects of actions are widespread and difficult to keep track of, so that experts and sophisticated techniques are increasingly needed to detect and analyze social events and to formulate policies adequate to the complexity of social issues. The "logic" of modern decision making thus appears to require greater and greater dependence on the collection and analysis of data and on the use of technological devices and scientific techniques. Indeed, many observers would agree that there is an "increasing relegation of questions which used to be matters of political debate to professional cadres of technicians and experts which function almost independently of the democratic political process."<sup>2</sup> In recent times, that process has been most noticeable, perhaps, in the areas of economic policy and national security affairs.

This "logic" of modern decision making, however, runs counter to that element of traditional democratic theory that places high value on direct participation in the political processes and generates the kind of discontent referred to above. If it turns out on more careful examination that direct participation is becoming less relevant to a society in which the connections between causes and effects are long and often hidden — which is an increasingly "indirect" society, in other words — elaboration of a new democratic ethos and of new democratic processes more adequate to the realities of modern society will emerge as perhaps the major intellectual and political challenge of our time.

## The Need for Institutional Innovation

The challenge is, indeed, already upon us, for the second consequence of the enlarged scope of public decision making is the need to develop new institutional forms and new mechanisms to replace established ones that can no longer deal effectively with the new kinds of problems with which we are increasingly faced. Much of the political ferment of the present time — over the problems of technology assessment, the introduction of statistical data banks, the extension to domestic problems of techniques of analysis developed for the military services, and the modification of the institutions of local government — is evidence of the need for new institutions. . . .

## CONCLUSION

As we review what we are learning about the relationship of technological and social change, a number of conclusions begin to emerge. We find, on the one hand, that the creation of new physical possibilities and social options by technology

tends toward, and appears to require the emergence of, new values, new forms of economic activity, and new political organizations. On the other hand, technological change also poses problems of social and psychological displacement.

The two phenomena are not unconnected, nor is the tension between them new: Man's technical prowess always seems to run ahead of his ability to deal with and profit from it. In America, especially, we are becoming adept at extracting the new techniques, the physical power, and the economic productivity that are inherent in our knowledge and its associated technologies. Yet we have not fully accepted the fact that our progress in the technical realm does not leave our institutions, values, and political processes unaffected. Individuals will be fully integrated into society only when we can extract from our knowledge not only its technological potential but also its implications for a system of values and a social, economic, and political organization appropriate to a society in which technology is so prevalent. . . .

#### NOTES

1. Unless otherwise noted, studies referred to in this article are described in the *Fourth Annual Report (1967-68) of the Harvard University Program on Technology and Society*.
2. Harvey Brooks, "Scientific Concepts and Cultural Changes," in G. Holton, ed., *Science and Culture* (Boston: Houghton Mifflin, 1965), p. 71.

## 11. Tech of the Inte

JOHN McDERMOTT

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## 11. Technology: The Opiate of the Intellectuals

JOHN McDERMOTT

*Several months after the report containing Emmanuel Mesthene's article was published by Harvard, a sharply critical review-essay by John McDermott appeared in The New York Review of Books. McDermott's essay, which follows here, is not a point-by-point analysis or rebuttal of the Mesthene work. Rather, it is McDermott's attempt to critique the entire point of view that he sees as epitomized by Mesthene — "not of a new but of a newly aggressive right-wing ideology in this country." McDermott focuses on a notion he calls laissez innover, which holds that technology is a self-correcting system. Mesthene, he claims, finds this principle acceptable because he defines technology abstractly. McDermott himself, however, rejects laissez innover because he claims to see specific characteristics in contemporary technology that contradict the abstraction.*

*Concentrating on the application of technology to the war in Vietnam, McDermott examines its nature and concludes that "technology, in its concrete, empirical meaning, refers fundamentally to systems of rationalized control over large groups of men, events, and machines by small groups of technically skilled men operating through organized hierarchy." Using this definition, he proceeds to discuss the social effect of modern technology in America, concluding that the ideology of laissez innover is attractive to those in power since they are in a position to reap technology's benefits while avoiding its costs.*

*John McDermott is professor emeritus of labor studies at the State University of New York at Old Westbury.*

### I

... If religion was formerly the opiate of the masses, then surely technology is the opiate of the educated public today, or at least of its favorite authors. No other single subject is so universally invested with high hopes for the improvement of mankind generally and of Americans in particular. . . .

These hopes for mankind's, or technology's, future, however, are not unalloyed. Technology's defenders, being otherwise reasonable men, are also aware that the world population explosion and the nuclear missile race are also the fruit of the enormous advances made in technology during the past half-century or so. But here, too, a cursory reading of their literature would reveal widespread though qualified optimism that these scourges, too, will fall before technology's

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From "Technology: The Opiate of the Masses," from *The New York Review of Books*, July 31, 1969. Copyright © 1969 by John McDermott. Reprinted by permission of the author.

might. Thus, population (and genetic) control and permanent peace are sometimes added to the already imposing roster of technology's promises. What are we to make of such extravagant optimism?

In early 1968, Harvard University's Program on Technology and Society . . . issued its Fourth Annual Report to the accompaniment of full front-page coverage in *The New York Times* (January 18). Within the brief (fewer than 100) pages of that report, and most clearly in the concluding essay by the Program's director, Emmanuel G. Mesthene, one can discern some of the important threads of belief that bind together much current writing on the social implications of technology. Mesthene's essay is worth extended analysis, because these beliefs are of interest in themselves and, of greater importance, because they form the basis not of a new but of a newly aggressive right-wing ideology in this country, an ideology whose growing importance was accurately measured by the magnitude of the *Times's* news report.

. . . Mesthene believes there are two distinct problems in technology's relation to society, a positive one of taking full advantage of the opportunity it offers and the negative one of avoiding unfortunate consequences that flow from the exploitation of those opportunities. Positive opportunities may be missed because the costs of technological development outweigh likely benefits (e.g., Herman Kahn's "Doomsday Machine"). Mesthene seems convinced, however, that a more important case is that in which

. . . technology lies fallow because existing social structures are inadequate to exploit the opportunities it offers. This is revealed clearly in the examination of institutional failure in the ghetto carried on by [the Program]. . . .

His diagnosis of these problems is generous in the extreme:

All these factors combine to dilute what may be otherwise a genuine desire to apply our best knowledge and adequate resources to the resolution of urban tensions and the eradication of poverty in the nation.

Moreover, because government and the media "are not yet equipped for the massive task of public education that is needed," if we are to exploit technology more fully, many technological opportunities are lost because of the lack of public support. This, too, is a problem primarily of "institutional innovation."

Mesthene believes that institutional innovation is no less important in combating the negative effects of technology. Individuals or individual firms that decide to develop new technologies normally do not take "adequate account" of their likely social benefits or costs. His critique is anticapitalist in spirit, but lacks bite, for he goes on to add that

[most of the negative] consequences of technology that are causing concern at the present time — pollution of the environment, potential damage to the ecology of the planet, occupational and social dislocations, threats to the privacy and political significance of the individual, social and psychological malaise — are *negative externalities of this kind*. They are with us in large measure because it has not been anybody's explicit business to foresee and anticipate them. [Italics added.]

Mesthene's abstract "institutional innovation." If existing social structures or if, on the other hand, nobody's business to foresee and anticipate them. . . . apply technology to the problems of institutional innovation. . . . the appropriate organizational principle, Mesthene is problems, whether positive or negative, is the theme of the technological

Technology, in their "negative externalities." Attempts to restrict the use of the case, self-defeating to work for the general

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Mesthene's abstract analysis and its equally abstract diagnosis in favor of "institutional innovation" place him in a curious and, for us, instructive position. If existing social structures are inadequate to exploit technology's full potential, or if, on the other hand, so-called negative externalities assail us because it is nobody's business to foresee and anticipate them, doesn't this say that we should apply technology to this problem, too? That is, we ought to apply and organize the appropriate *organizational* knowledge for the practical purpose of solving the problems of institutional inadequacy and "negative externalities." Hence, in principle, Mesthene is in the position of arguing that the cure for technology's problems, whether positive or negative, is still more technology. This is the first theme of the technological school of writers and its ultimate First Principle.

Technology, in their view, is a self-correcting system. Temporary oversight or "negative externalities" will and should be corrected by technological means. Attempts to restrict the free play of technological innovation are, in the nature of the case, self-defeating. Technological innovation exhibits a distinct tendency to work for the general welfare in the long run. *Laissez innover!*

I have so far deliberately refrained from going into any greater detail than does Mesthene on the empirical character of contemporary technology, for it is important to bring out the force of the principle of *laissez innover* in its full generality. Many writers on technology appear to deny in their definition of the subject — organized knowledge for practical purposes — that contemporary technology exhibits distinct trends, which can be identified or projected. Others, like Mesthene, appear to accept these trends, but then blunt the conclusion by attributing to technology so much flexibility and "scientific" purity that it becomes an abstraction infinitely malleable in behalf of good, pacific, just, and egalitarian purposes. Thus, the analogy to the *laissez-faire* principle of another time is quite justified. Just as the market or the free play of competition provided in theory the optimum long-run solution for virtually every aspect of virtually every social and economic problem, so too does the free play of technology, according to its writers. Only if technology or innovation (or some other synonym) is allowed the freest possible reign, they believe, will the maximum social good be realized.

What reasons do they give to believe that the principle of *laissez innover* will normally function for the benefit of humankind rather than, say, merely for the belief of the immediate practitioners of technology, their managerial cronies, and for the profits accruing to their corporations? As Mesthene and other writers of his school are aware, this is a very real problem, for they all believe that the normal tendency of technology is, and ought to be, the increasing concentration of decision-making power in the hands of larger and larger scientific-technical bureaucracies. *In principle*, their solution is relatively simple, though not often explicitly stated.<sup>1</sup>

Their argument goes as follows: The men and women who are elevated by technology into commanding positions within various decision-making bureaucracies exhibit no generalized drive for power such as characterized by, say, the landed gentry of pre-industrial Europe or the capitalist entrepreneur of the last century, for their social and institutional position and its supporting culture as well are defined solely by the fact that these men are problem-solvers. (Organized



knowledge for practical purposes again.) That is, they gain advantage and reward only to the extent that they can bring specific technical knowledge to bear on the solution of specific technical problems. Any more general drive for power would undercut the bases of their usefulness and legitimacy.

Moreover, their specific training and professional commitment to solving technical problems creates a bias against ideologies in general, which inhibits any attempts to formulate a justifying ideology for the group. Consequently, they do not constitute a class and have no general interests antagonistic to those of their problem-beset clients. We may refer to all of this as the disinterested character of the scientific-technical decision-maker, or, more briefly and cynically, as the principle of the Altruistic Bureaucrat. . . .

This combination of guileless optimism with scientific tough-mindedness might seem to be no more than an eccentric delusion were the American technology it supports not moving in directions that are strongly antidemocratic. To show why this is so, we must examine more closely Mesthene's seemingly innocuous distinction between technology's positive opportunities and its "negative externalities." In order to do this, I will make use of an example drawn from the very frontier of American technology: the war in Vietnam.

## II

\* \* \*

Advanced technological systems such as those employed in the bombardment of South Vietnam make use not only of extremely complex and expensive equipment but, quite as important, of large numbers of relatively scarce and expensive-to-train technicians. They have immense capital costs: a thousand aircraft of a very advanced type; literally hundreds of thousands of spare parts; enormous stocks of rockets, bombs, shells, and bullets; in addition to tens of thousands of technical specialists — pilots, bombardiers, navigators, radar operators, computer programmers, accountants, engineers, electronic and mechanical technicians, to name only a few. In short, they are "capital intensive."

Moreover, the coordination of this immense mass of esoteric equipment and its operators in the most effective possible way depends upon an extremely highly developed technique both in the employment of each piece of equipment by a specific team of operators and in the management of the program itself. Of course, all large organizations standardize their operating procedures, but it is peculiar to advanced technological systems that their operating procedures embody a very high degree of information drawn from the physical sciences, while their managerial procedures are equally dependent on information drawn from the social sciences. We may describe this situation by saying that advanced technological systems are both "technique intensive" and "management intensive." It should be clear, moreover, even to the most casual observer, that such intensive use of capital, technique, and management spills over into almost every area touched by the technological system in question. An attack program delivering 330,000 tons of munitions more or less selectively to several

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thousand different targets monthly would be an anomaly if forced to rely on sporadic intelligence data, erratic maintenance systems, or a fluctuating and unpredictable supply of heavy bombs, rockets, jet fuel, and napalm tanks. Thus, it is precisely because the bombing program requires an intensive use of capital, technique, and management that the same properties are normally transferred to the intelligence, maintenance, supply, coordination, and training systems that support it. Accordingly, each of these supporting systems is subject to sharp pressures to improve and rationalize the performance of its machines and men, the reliability of its techniques, and the efficiency and sensitivity of the management controls under which it operates. Within integrated technical systems, higher levels of technology drive out lower, and the normal tendency is to integrate systems.

From this perverse Gresham's Law of Technology follow some of the main social and organizational characteristics of contemporary technological systems: the radical increase in the scale and complexity of operations that they demand and encourage; the rapid and widespread diffusion of technology to new areas; the great diversity of activities that can be directed by central management; an increase in the ambition of management's goals; and, as a corollary, especially to the last, growing resistance to the influence of so-called negative externalities.

Complex technological systems are extraordinarily resistant to intervention by persons or problems operating outside or below their managing groups, and this is so regardless of the "politics" of a given situation. Technology creates its own politics. The point of such advanced systems is to minimize the incidence of personal or social behavior that is erratic or otherwise not easily classified, of tools and equipment with poor performance, of improvisory techniques, and of unresponsiveness to central management. . . .

To define technology so abstractly that it obscures these observable characteristics of contemporary technology — as Mesthene and his school have done — makes no sense. It makes even less sense to claim some magical malleability for something as undefined as "institutional innovation." Technology, in its concrete, empirical meaning, refers fundamentally to systems of rationalized control over large groups of men, events, and machines by small groups of technically skilled men operating through organizational hierarchy. The latent "opportunities" provided by that control and its ability to filter out discordant "negative externalities" are, of course, best illustrated by extreme cases. Hence, the most instructive and accurate example should be of a technology able to suppress the humanity of its rank-and-file and to commit genocide as a by-product of its rationality. The Vietnam bombing program fits technology to a "T."

\* \* \*

#### IV

Among the conventional explanations for the rise and spread of the democratic ethos in Europe and North America in the seventeenth, eighteenth, and nineteenth centuries, the destruction of the gap in political culture between the mass of the population and that of the ruling classes is extremely important. . . .

Similarly, it is often argued that with the expansion and improvement of road and postal systems, the spread of new tools and techniques, the growth in the number and variety of merchants, the consequent invigoration of town life, and other numerous and familiar related developments, the social experience of larger numbers of people became richer, more varied, and similar in fact to those of the ruling class. . . .

The same period also witnessed a growth in the organized means of popular expression. . . .

This description by no means does justice to the richness and variety of the historical process underlying the rise and spread of what has come to be called the democratic ethos. But it does, I hope, isolate some of the important structural elements and, moreover, it enables us to illuminate some important ways in which the new technology, celebrated by Mesthene and his associates for its potential contributions to democracy, contributes instead to the erosion of that same democratic ethos. For if, in an earlier time, the gap between the political cultures of the higher and lower orders of society was being widely attacked and closed, this no longer appears to be the case. On the contrary, I am persuaded that the direction has been reversed and that we now observe evidence of a growing separation between ruling- and lower-class culture in America, a separation that is particularly enhanced by the rapid growth of technology and the spreading influence of its *laissez innover* ideologues.

Certainly, there has been a decline in popular literacy, that is to say, in those aspects of literacy that bear on an understanding of the political and social character of the new technology. Not one person in a hundred is even aware of, much less understands, the nature of technologically highly advanced systems such as are used in the Vietnam bombing program. . . .

Secondly, the social organization of this new technology, by systematically denying to the general population experiences that are analogous to those of its higher management, contributes very heavily to the growth of social irrationality in our society. For example, modern technological organization defines the roles and values of its members, not vice versa. An engineer or a sociologist is one who does all those things but only those things called for by the "table of organization" and the "job description" used by his employer. Professionals who seek self-realization through creative and autonomous behavior without regard to the defined goals, needs, and channels of their respective departments have no more place in a large corporation or government agency than squeamish soldiers in the army. . . .

However, those at the top of technology's most advanced organizations hardly suffer the same experience. For reasons that are clearly related to the principle of the Altruistic Bureaucracy, the psychology of an individual's fulfillment through work has been incorporated into management ideology. As the pages of *Fortune*, *Time*, or *Business Week* . . . serve to show, the higher levels of business and government are staffed by men and women who spend killing hours looking after the economic welfare and national security of the rest of us. The rewards of this life are said to be very few: The love of money would be demeaning and, anyway, taxes are said to take most of it; its sacrifices are many, for failure brings economic depression to the masses or gains for communism as well as disgrace to the erring

managers. Even the essence of the reward, for the public, is no reward, for the public. Hence, for these "real" managers, self-fulfillment through the managerial process is seen as a right, and the right to it an inalienable right.

In addition to all this, the managers have a crushing responsibility, and a crushing responsibility, technology's managers. . . .

It seems fundamental that the quality of the social level of technology growth process feeds on itself, and the usefulness of local popular influence, their own.

The normal life of modern American society now means and distant social means adjusted. But it is from adjusting that social rationality becomes the irrationality becomes the

Mesthene himself r increase. His list includes the ecology of the plan, the ecology and political significance of the malaise." Minor matters, the *laissez innover* ho, supersonic transports, tion, and the millennium.

This brings us finally to the relation to what I have said. The lower and upper class principles of *laissez innover* as the organization of the primary and really created change is reserved for the discoverers and organizers and their indispensable (ing and altruistic) elements. The common mass of people, the implication which is the quotation from an article written by Zbigniew Brzezinski is described (the word, like the common society will be characterized

managers. Even the essential high-mindedness or altruism of our managers earns no reward, for the public is distracted, fickle, and, on occasion, vengeful. . . . Hence, for these "real revolutionaries of our time," as Walt Rostow has called them, self-fulfillment through work and discipline is the only reward. The managerial process is seen as an expression of the vital personalities of our leaders and the right to it an inalienable right of the national elite.

In addition to all this, their lonely and unrewarding eminence in the face of crushing responsibility, etc., tends to create an air of mystification around technology's managers. . . .

It seems fundamental to the social organization of modern technology that the quality of the social experience of the lower orders of society declines as the level of technology grows no less than does their literacy. And, of course, this process feeds on itself, for with the consequent decline in the real effectiveness and usefulness of local and other forms of organization open to easy and direct popular influence, their vitality declines still further, and the cycle is repeated.

The normal life of men and women in the lower and, I think, middle levels of American society now seems cut off from those experiences in which near social means and distant social ends are balanced and rebalanced, adjusted and re-adjusted. But it is from such widespread experience with effective balancing and adjusting that social rationality derives. To the degree that it is lacking, social irrationality becomes the norm, and social paranoia a recurring phenomenon. . . .

Mesthene himself recognizes that such "negative externalities" are on the increase. His list includes "pollution of the environment, potential damage to the ecology of the planet, occupational and social dislocations, threats to the privacy and political significance of the individual, social and psychological malaise." Minor matters all, however, when compared to the marvelous opportunities *laissez innover* holds out to us: more GNP, continued free-world leadership, supersonic transports, urban renewal on a regional basis, institutional innovation, and the millennial promises of his school.

This brings us finally to the ideologies and doctrines of technology and their relation to what I have argued is a growing gap in political culture between the lower and upper classes in American society. Even more fundamentally than the principles of *laissez innover* and the altruistic bureaucrat, technology in its very definition as the organization of knowledge for practical purposes assumes that the primary and really creative role in the social processes consequent on technological change is reserved for a scientific and technical elite, the elite that presumably discovers and organizes that knowledge. But if the scientific and technical elite and their indispensable managerial cronies are the really creative (and hardworking and altruistic) elements in American society, what is this but to say that the common mass of people are essentially drags on the social weal? This is precisely the implication which is drawn by the *laissez innover* school. Consider the following quotations from an article that appeared in *The New Republic* in December 1967, written by Zbigniew Brzezinski, one of the intellectual leaders of the school.

Brzezinski is describing a nightmare that he calls the "technetronic society" (the word, like the concept, is a pastiche of technology and electronics). This society will be characterized, he argues, by the application of "the principle of

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equal opportunity for all but . . . special opportunity for the singularly talented few." It will thus combine "continued *respect* for the popular will with an increasing *role* in the key decision-making institutions of individuals with special intellectual and scientific attainments." [Italics added.] Naturally, "the educational and social systems [will make] it increasingly attractive and easy for those meritocratic few to develop to the fullest of their special potential."

However, while it will be "necessary to require everyone at a sufficiently responsible post to take, say, two years of [scientific and technical] retraining every ten years" the rest of us can develop a new "interest in the cultural and humanistic aspects of life, *in addition to purely hedonistic preoccupations*." [Italics added.] The latter, he is careful to point out, "would serve as a social valve, reducing tensions and political frustration."

Is it not fair to ask how much respect we carefree pleasure lovers and culture consumers will get from the hardworking bureaucrats, going to night school two years in every ten, while working like beavers in the "key decision-making institutions"? The altruism of our bureaucrats has a heavy load to bear.

Stripped of their euphemisms, these are simply arguments that enhance the social legitimacy of the interests of new technical and scientific elites and detract from the interests of the rest of us. . . .

As has already been made clear, the *laissez innover* school accepts as inevitable and desirable the centralizing tendencies of technology's social organization, and they accept as well the mystification that comes to surround the management process. Thus, equality of opportunity, as they understand it, has precious little to do with creating a more egalitarian society. On the contrary, it functions as an indispensable feature of the highly stratified society they envision for the future. For in their society of meritocratic hierarchy, equality of opportunity assures that talented young meritocrats (the word is no uglier than the social system it refers to) will be able to climb into the "key decision-making" slots reserved for trained talent and thus generate the success of the new society and its cohesion against popular "tensions and political frustration."

The structures that formerly guaranteed the rule of wealth, age, and family will not be destroyed (or at least not totally so). They will be firmed up and rationalized by the perpetual addition of trained (and, of course, acculturated) talent. In technologically advanced societies, equality of opportunity functions as a hierarchical principle, in opposition to the egalitarian social goals it pretends to serve. To the extent that it has already become the kind of "equality" we seek to institute in our society, it is one of the main factors contributing to the widening gap between the cultures of upper- and lower-class America.

## V

. . . *Laissez innover* is now the premier ideology of the technological impulse in American society, which is to say, of the institutions that monopolize and profit from advanced technology and of the social classes that find in the free exploitation of their technology the most likely guarantee of their power, status, and wealth.

This said, it is important to say what has in fact been said. Humanities and negative "education" for everything else that has the meaning of that distinctive meaning suggested, those technologies and those that are excluded by the fact that advanced technological managers themselves. extremely powerful organizational factors, which tend by constituting for them the "technological rationality" is a century ago. . . .

This analysis lends substance to a number of wide-ranging analyses and the directions in which they point.

First, and most important, the system, not more and not less inadequate, for it obscures their political and cultural advanced technological social system per se, the a group of linked institutions statement of the case for a decision attendant on such capitalism as, a century ago, the time. . . .

A second major hypothesis advanced technological agencies of highly centralized nature, as the saying goes it demands a very high the work force. The attempt not serve to obscure from that are employed (such as indebtedness through capital)

Advanced technology many of them requiring motivate this training, which these occupational life. It must win passive rationality had a simple physical object increasingly employed

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This said, it is important to stress both the significance and limitations of what has in fact been said. Here, Mesthene's distinction between the positive opportunities and negative "externalities" inherent in technological change is pivotal; for everything else that I've argued follows inferentially from the actual social meaning of that distinction. As my analysis of the Vietnam bombing program suggested, those technological effects that are sought after as positive opportunities and those that are dismissed as negative externalities are decisively influenced by the fact that this distinction between positive and negative within advanced technological organizations tends to be made among the planners and managers themselves. Within these groups there are, as was pointed out, extremely powerful organizational, hierarchical, doctrinal, and other "technical" factors, which tend by design to filter out "irrational" demands from below, substituting for them the "rational" demands of technology itself. As a result, technological rationality is as socially neutral today as market rationality was a century ago. . . .

This analysis lends some weight (though perhaps no more than that) to a number of wide-ranging and unorthodox conclusions about American society today and the directions in which it is tending. . . .

First, and most important, technology should be considered as an institutional system, not more and certainly not less. Mesthene's definition of the subject is inadequate, for it obscures the systematic and decisive social changes, especially their political and cultural tendencies, that follow the widespread application of advanced technological systems. At the same time, technology is less than a social system per se, though it has many elements of a social system, viz., an elite, a group of linked institutions, an ethos, and so forth. Perhaps the best summary statement of the case resides in an analogy — with all the vagueness and imprecision attendant on such things: today's technology stands in relation to today's capitalism as, a century ago, the latter stood to the free market capitalism of the time. . . .

A second major hypothesis would argue that the most important dimension of advanced technological institutions is the social one, that is, the institutions are agencies of highly centralized and intensive social control. Technology conquers nature, as the saying goes. But to do so it must first conquer man. More precisely, it demands a very high degree of control over the training, mobility, and skills of the work force. The absence (or decline) of direct controls or of coercion should not serve to obscure from our view the reality and intensity of the social controls that are employed (such as the internalized belief in equality of opportunity, indebtedness through credit, advertising, selective service channeling, and so on).

Advanced technology has created a vast increase in occupational specialties, many of them requiring many, many years of highly specialized training. It must motivate this training. It has made ever more complex and "rational" the ways in which these occupational specialties are combined in our economic and social life. It must win passivity and obedience to this complex activity. Formerly, technical rationality had been employed only to organize the production of rather simple physical objects, for example, aerial bombs. Now, technical rationality is increasingly employed to organize all of the processes necessary to the utilization

These are brief and, I believe, barely adequate reviews of extremely complex hypotheses. But, in outline, each of these contradictions appears to bear on roughly the same group of the American population: a technological underclass. If we assume this to be the case, a fourth hypothesis would follow, namely that technology is creating the basis for new and sharp class conflict in our society. That is, technology is creating its own working and managing classes, just as earlier industrialization created its working and owning classes. Perhaps this suggests a return to the kind of class-based politics that characterized the U.S. in the last quarter of the nineteenth century, rather than the somewhat more ambiguous politics that was a feature of the second quarter of this century. I am inclined to think that this is the case, though I confess the evidence for it is as yet inadequate. This leads to a final hypothesis, namely that *laissez innover* should be frankly recognized as a conservative or right-wing ideology. . . .

## NOTE

The comparison between Emmanuel Mesthene and twenty-first-century deconstructionist chapters is a remarkable one. It changed during the period of the 1970s with the period that T

To this mix we have the perspective of Ray Kurzweil, winner of the Lemelson-MIT Technology Award, who is "not aware" [of the danger on his side of the story]. But he sees them differently. Rather than threats to humanity, he sees the development of c

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