

Technology and Human Existence

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Men have been debating the proper place of machines in their lives for several centuries now, and there are no reliable signs that the debate is about to be terminated. But it does begin to appear that the focus of the debate is now shifting from a moral to a metaphysical question. In the days of the Luddites and long after, people concerned themselves with whether some machine or machines were to be allowed to coexist with humans. But as one new machine after another has found its way into the workings of human society, any serious effort at censorship borders on futility, even if done in the name of technology assessment. We have, in a word, become dependent on the machines we have made.

This dependency, furthermore, may be not just a matter of luxury or even convenience but even one of necessity. Consider, for example, the case of any human being who is dependent on one or another artifact of medical technology for survival—be it for dialysis of the kidney or chemical regulation of the heartbeat, an endocrine gland, or whatever. Popular interest in the various legal issues associated with artificial support systems or with artificial life-saving systems makes it a commonplace that some people simply would not exist were it not for machines. This awareness, in turn, suggests the general question: Can any people exist without machines? Or, to state the question more abstractly and without reference to cultural differences, *can man exist any more without machines?*

Our species has come to depend greatly on machines of once unimaginable complexity. But we have nonetheless continued to nurture the illusion that any such dependency is no more than circumstantial and discretionary on the part of the human component. Not even bumper-to-bumper traffic jams discourage acceptance of the automobile as the principal mode of transportation. Not even brownouts and blackouts have any lasting effect on our consumption of energy. The OPEC oil embargo, on the other hand, was somewhat unique in that it showed people in developed countries how completely dependent they are upon petroleum-based technology. But the embargo is over, the cars are still running, and plastic bags are still available for the garbage. So the illusion continues to thrive.

Our complacency has been moderately shaken by the articulate warnings of such neo-Malthusians as Garrett Hardin, Paul Ehrlich, and the MIT—Club of Rome group. But the thrust of their concern is that technology cannot provide adequately for an inordinately expanding population. Implicit in this position is the assumption that, quality of life remaining constant, the need for technology varies in direct proportion to the *size* of our population, not that it would be needed by any population regardless of size.

Somewhat closer to the general question here posed is the view of a number of anthropologists that modern man would not have evolved from lower forms but for the latter's ongoing attempts to use and make tools. According to this view, tool making did not merely follow upon the attainment of rationality but was a necessary precondition for development of the physical component thereof.¹ It is, of course, no accident that technophiles of various kinds like to draw upon this etiological theory in support of their particular predilections about the need for ever more technology.² But neither the available data nor their anthropological interpreters have very much to tell us about fully evolved man's need for technology. For toolmaking functions in this anthropological theory in about the way a gantry functions on a rocket launching pad: out of sight, out of mind.

Others, however, take up where anthropologists leave off, most to say that technology is not essential to man, but some to say the contrary. In the latter category, for example, is one of President Jimmy Carter's advisers, Zbigniew Brzezinski. Brzezinski appeals to a theory of evolution to defend the superior humanity of the technological elite over less fully evolved people who rely less on fancy gadgetry:

[Who] is the truer repository of that indefinable quality we call human? The technologically dominant and conditioned technetron, increasingly trained to adjust to leisure, or the more "natural" and backward agrarian, more and more dominated by racial passions and continually exhorted to work harder, even as his goal of the good life becomes more elusive?³

What is most instructive about this self-congratulatory technophilia is not so much its content as its two principal assumptions, namely, that there has been a discernible evolution in man's use of technology and that the front edge of that evolution is to be found with those who use more rather than less technology. These two assumptions are common to almost all analyses of the rise of technology, their differences being found usually in the value they place on the end result. What is almost unique about Brzezinski's view is that he not only approves the end

result but interprets it as even constituting a (desirable) transformation in human nature as such. By contrast, most other analysts tend to view these evolutionary changes as cultural rather than natural.

The view that technological evolution is essentially cultural has been nicely articulated by Weston La Barre:

Since man's machines evolve now, not anatomical man, he has long since gone outside his own individual skin in his functional relatedness to the world. The real evolutionary unit now is not man's mere body; it is "all mankind's-brains-together-with-all-the-extrabodily-materials-that-come-under-the-manipulation-of-their-hands." Man's physical ego is expanded to encompass everything within reach of his manipulating hands, within sight of his searching eyes, and within the scope of his restless brain.⁴

Similar views have been espoused by many writers, including, for example, Teilhard de Chardin,⁵ Lewis Mumford,⁶ Marshall McLuhan,⁷ Harold Sackman,⁸ John McHale,⁶ and James Feibleman," as well as others yet to be considered. Still other writers have called attention to the psychological impact on human beings of a technology-intensive culture. And for the most part their conclusions tend to be negative. Bruno Bettelheim's case study of "Joey, a Mechanical Boy" has become something of a classic for purposes of viewing-with-alarm anthologies." Yet another writer fears that we may all become "Robopaths" if we do not struggle actively against mechanization of our psyche," which latter problem has recently been blamed on the kind of thinking fostered by technology." The American writer Norman Mailer came to a very different conclusion when he studied Project Apollo. In a chapter of his report entitled "The Psychology of Machines," Mailer seems to suggest that technophilia is practically essential to the male ego." Still more broadly, behaviorists such as B. F. Skinner are totally dedicated to the proposition that psychological well-being in modern society depends on the deliberate utilization of technological modes of problem solving."

Entirely consistent with the behaviorist psychology of technology is Bruce Mazlich's contention that the cultural evolution of technology is so far advanced that it is therapeutically important for men to interiorize a positive attitude with regard to machines. Drawing upon an idea of Sigmund Freud which had been recently reformulated by Jerome Bruner, Mazlich puts the need to adjust to machines on the same level of importance with man's earlier adjustment to such monumental changes in outlook as those effected by the Copernican revolution in astronomy, the theory of evolution in biology, and the theory of psychoanalysis in psychology. Characterizing these transformations as

the overcoming of "discontinuities," Mazlich says of "the fourth discontinuity" which he is adding to the list: "We cannot think any longer of man without a machine. . . . [T]he sharp discontinuity between man and machines is no longer tenable, in spite of the shock to our egos."¹⁶

Buckminster Fuller seems not to have gotten this message. For he has long been accustomed to thinking, and encouraging his audiences to think, of man without machines. Thus has he been spreading his own familiar message about the direct relationship between the utilization of machines and the numerical size of the human population. As he puts it, the state of affairs would not change discernibly if all the politicians in the world were to be sent into outer space; but if all the machines were dumped into the ocean, in two weeks half the population would be dead.¹⁷

An almost identical estimate of the effect of machines on population was made a century earlier by Samuel Butler in his novel *Erewhon*. But Butler, unlike Fuller, had the characters decide in "The Book of the Machines" that not even a drastic decline in population would be too great a price to pay to avoid becoming enslaved by machines. Their reasoning was as follows:

To withdraw steam power suddenly. . . will be as though our population were suddenly doubled, with no additional means of feeding the increased number. The air we breathe is hardly more necessary for our animal life than the use of any machine; on the strength of which we have increased our numbers, is to our civilization; it is the machines which act upon man and make him man as much as man has acted upon and made the machines; but we must choose between the alternative of undergoing much present suffering or seeing ourselves gradually superseded by our own creatures 'til we rank no higher in comparison with them than the beasts of the field with ourselves.¹⁸

This early manifestation of technophobia has, of course, been reiterated many times since in various forms most of which are by now fairly familiar. Details aside, what is characteristic of all such anti-technological attitudes is (in contrast to those that are supportive) the assumption that technology, or the machine, is essentially distinct from man—in other words, that it is "a thing apart." Given this underlying dualism, one could relate to it by way of attitudes ranging from aloofness to concern and, if the latter, from anger to despair.

A recent example of an aloof posture with regard to technology is that

of Martin Heidegger, who recommends in his *Discourse on Thinking* that we somehow adopt a noncommittal "yes-and-no" attitude toward technology. By so doing, he claims, "Our relation to technology will become wonderfully simple and relaxed. We let technical devices enter our daily life, and at the same time leave them outside, that is, let them alone, as things which are nothing absolute but remain dependent on something higher."¹⁹ The attitudinal simplicity of such a view is immediately evident to anyone who has ever had to wrestle with the excruciating complexity that accompanies any serious effort at technology assessment.²⁰ So from this point of view even the concerns of a Gabriel Marcel or of a Jacques Ellul about the impact of technology on the elegant perquisites of a threatened life-style seem more perceptive. Ellul, however, seems to see technology as having an equal impact on all sectors of society, whereas Marcel, like many cultured Europeans, felt that it was especially the elite who would suffer at the hands of technology.²¹ Such class-specific concern is, of course, more commonly associated with leftist ideology, especially that of Karl Marx, who was rightly indignant at how differentially destructive the industrial revolution was being to the working class.²²

Such man-machine dualism has, of course, been taken into account by commentators in the United States; but here there has been a tendency to blunt the sharp edges of European dialectic. Technological advancement brings with it a loss of innocence which is nostalgically decried; but the increased availability of gadgets to the poor as well as if not as extensively as to the rich encourages a bittersweet ambivalence about what is really happening to us. Compare, for example, the following interpretations of the impact of technology on American society. First, a poem by Stephen Vincent Benet which exalts primitive self-sufficiency as against technological dependency:

They are our last frontier.
They shot the railway-train when it first came.
And when the Fords first came, they shot the Fords.
It could not save them. They are dying now
Of being educated, which is the same.
One need not weep romantic tears for them,
But when the last moonshiner buys his radio,
And when the last, lost, wild-rabbit of a girl
Is civilized with a mail-order dress,
Something will pass that was American
And all the movies will not bring it back.²³

The second is rather a technophilic "put-down" of the technophobic

purist who, as it were, cannot even acknowledge the benefits he derives from technology:

He sat in an air-conditioned studio. Behind him was a high-fidelity phonograph and record library that brought him the choicest music of three centuries. On the desk before him was the microfilm of an ancient Egyptian papyrus that he had obtained by a routine request through his university library. He described a ten-day (airplane) trip he had just taken to London, Paris and Cairo to confer on recent archaeological discoveries. When I asked him what he was working on at the moment, the professor said: "An essay for a literary journal on the undiluted evils of modern technology."²⁴

The obvious implication here, of course, is that opponents of technology tend to think of technology as some sort of abstract force rather than as shorthand for the concrete tools and machines which are routinely utilized and attitudinally simply taken for granted as we go about the many tasks that confront us in our everyday lives. Proponents of technology, on the other hand, prefer to emphasize the supportive role of modern gadgetry, notably by such positive images of the man-machine relationship as that of an extended central nervous system (McLuhan), an amplification of organic power (McHale et al.), a complexification of matter in and through human ingenuity (Teilhard de Chardin and Paolo Soleri), a prosthesis to correct for organic limitations (La Barre), a synergistic surpassing of the capabilities of either man or machine taken separately (Wiener and Fuller).

What is important to note in this regard is that in these alternative characterizations of the man-machine relationship neither 'man' nor 'machine,' nor for that matter 'technology,' is being used univocally by all participants in the debate. As a general rule proponents tend to think atomistically and nominalistically of the man-machine relationship, whereas opponents tend to think abstractly and holistically. But an even more determining factor in their attitudinal divergence is whether they locate *control* of the man-machine relationship in man or in the machine.²⁵ If, like Ellul, they think of machines as controlling, then they will tend to lend credence to the notion of "autonomous technology."²⁶ If on the other hand, they think of man as being in control of the machines, then the relationship will generally be characterized as at least predominantly benevolent and beneficial.

Except, however, for people with inordinately limited vocabularies or experience, no human component will be thought of as being involved *in* only one man-machine relationship, nor, inversely, will any given machine or set of machines be thought of as being involved in

only one such relationship. And as a corollary of this acknowledgment of multiplicity and diversity of relationships, a bold, unqualified assertion about the center of power would be practically meaningless. I, for example, as one human organism, consider myself to be quite in control of things when I take up my hammer or saw, even though I remain tangentially aware that I could not easily duplicate either artifact without the assistance of the steel industry. Similarly, I feel myself to be in control of a considerable variety of electronic gadgets that have become available to me in my life, but I would not be prepared to undertake the manufacture of a microcircuit or the safeguarding of everyone's individual privacy against the incursions of electronic surveillance. On the other hand, it is at least imaginable that somewhere on this planet there lives a brilliant industrialist who is in full control of highly complex manufacturing processes but who, nonetheless, would experience considerable discomfort if called upon to pound a nail into a board. For him, accordingly, it would be as easy to think of his vast industrial empire as an extension of his own powers as it is for me to think in this way of my relationship to my hammer.

Perhaps the most frequently cited example of such individual powers in the face of technology is that of the so-called robber barons of the nineteenth century." But both the structure and the context of industrial entrepreneuring have changed by at least an order of magnitude since those comparatively primitive days. In particular, essentially all technology is developed, managed, and utilized in and through highly complex *corporate* structures. And as a result it is no longer obvious that any individual, however powerful and well placed, can truly control technology. Concluding in the negative on this question are such writers as John Kenneth Galbraith." But the affirmative still survives in analyses that are willing to equate some secondary advantage such as financial wealth²⁹ or governmental regulatory prerogatives³⁰ with an actual capacity to control the corporation and its activities. It goes without saying that not every analyst of the current situation is prepared to make any such assumption.³¹ In particular, there are good reasons for questioning whether government can be sufficiently free of corporate influence to exercise an effective regulatory function.³² But most serious studies are in agreement that the controllability of technology is now largely a function of the controllability of corporations.

The point of all this is simply that we fear what we do not and perhaps cannot control. And it just so happens that the list of uncontrolled if not uncontrollable technologies has been expanding prolifically in the last century or so. But to be accurate about this list, one would have to distinguish within it those technologies which cannot be controlled by

any single individual, those that cannot be controlled by any single group or institution, and those that cannot be controlled by the human race as a whole. The proliferation of agencies both private and public dedicated to controlling one or more technologies is testimony to man's confidence that he can through collective responsibility control many of the emerging technologies. That this goal cannot be achieved by individuals acting in isolation goes without saying. The focus of attention for pessimistic evaluation of the man-machine relationship, however, is on the third category, namely, technologies which are of their very nature not amenable to human control at all. Whether there are in fact any such technologies cannot be proved or disproved by logic alone. But the sense that there are such technologies in our midst is clearly an important ingredient of modern human consciousness.³³

This sense of despair in the face of seemingly intractable, or autonomous, technologies may be dated, as is commonly done, from the appearance of the atomic bomb at the end of World War II.³⁴ But since that time many other comparable causes of alarm have also made their appearance, including, to name just a few broad general areas, many carcinogenic processes and products, diminishing natural resources upon which the economies of developed countries are dependent, and obsolete but overgrown technologies in which economies are so heavily invested as not to be able to extricate themselves even for the sake of something manifestly more appropriate.

The foregoing kinds of technology-related problems may in the long run prove to be the most difficult to solve. But the problems which have received the most attention in recent years (and which are most often mentioned in support of a claim that technology is running wild) are those associated with environmental degradation. With the coming of age of the environmental movement, the ambivalence toward technology described above has become incalculably complex and involuted. For now it is recognized as never before that even a *prima facie* "good" technology may be the source of various "bad" consequences, and vice versa. As a result it is now as difficult to sort out the benefits and the liabilities of a technology as it is to identify pure heroes and villains in contexts other than the late show on television. This new dimension of what Mazlich would call the fourth discontinuity was well illustrated by a set of "poems" presented at a conference on the environment some twenty years ago and reprinted by Kenneth Boulding:

. A Conservationist's Lament

The world is finite, resources are scarce,
Things are bad and will be worse.

Coal is burned and gas exploded,
Forests cut and soils eroded.
Wells are dry and air's polluted,
Dust is blowing, trees uprooted.
Oil is going, ores depleted, Drains
receive what is excreted. Land is
sinking, seas are rising, Man is far
too enterprising. Fire will rage
with Man to fan it. Soon we'll
have a plundered planet. People
breed like fertile rabbits, People
have disgusting habits.

Moral:

The evolutionary plan
Went astray by evolving Man.

2. The Technologist's Reply

Man's potential is quite terrific,
You can't go back to the Neolithic.
The cream is there for us to skim it,
Knowledge is power, and the sky's the limit.
Every mouth has hands to feed it,
Food is found when people need it.
All we need is found in granite
Once we have the men to plan it.
Yeast and algae give us meat,
Soil is almost obsolete.
Men can grow to pastures greener
Till all the earth is Pasadena.

Moral:

Man's a nuisance, Man's a crackpot,
But only Man can hit the jackpot.³⁵

Human goals made operative tend, in a word, to have consequences neither anticipated nor necessarily even desired. Still more to the point, the setting of goals and the undergoing of consequences do not often take place on the same level, nor are they participated in or even necessarily even experienced by the same members of society." For decision-making power is unevenly and, often enough, inequitably distributed. Thus, elegant images of man with accentuated powers notwithstanding, for the vast majority of people on this planet, it is not "we" but "they"

who make decisions and reap the greatest benefits therefrom. This imbalance causes a sense of powerlessness, that is, a sense of inability to control one's own destiny which is conducive not to a heightened but to a diminished estimate of one's dignity and worth. Such reactions as the counterculture, as it was called, and the consumer movement constitute valuable albeit limited correctives. Much more is needed before the human race as a whole, or even a significant part of it, can think of itself, individually or even collectively, as "Man Plus." Our species is indeed undergoing changes, arguably even changes in some way in our very nature. But so long as we feel alienated from the centers of power—political, mercantile, military, medical, scientific, or whatever—little of this will enhance our image of ourselves as adults, in Eric Beme's terminology, but only that of ourselves as children. The child may well be *changed* by what is done for it. But none of this will contribute to his maturation except to the extent that he participates directly in bringing about these changes and experiences them as growth toward full potential.

An illustration may be helpful to bring home this point. I am not necessarily enhanced as an individual human being just because I own and use an electronic calculator the inner workings of which are totally incomprehensible to me. I might feel a sense of awe and admiration of the person or persons who invented such a useful device, but I would feel more fulfilled as a person if I were able to learn to perform all the basic mathematical operations "in my head" and without recourse to such sophisticated gadgetry. The human race, in a word, may be somehow bettered by virtue of an individual inventor's accomplishment, but the importance of all other individuals may, as a result, be correspondingly diminished.

The most widely discussed aspect of this "double effect" is that associated with the impact of automation on unskilled and semiskilled labor. But the process repeats itself in all kinds of ways with regard to people in all walks of life. The symbol of this situation is perhaps the "fireman" on the diesel locomotive. The issue thus symbolized is the possibility that the human race might become obsolete as a result of the emergence of machines. Though often proposed, this hypothesis is given little credence. But it is serious enough as a symptom to call into question the thesis that "human nature" is somehow being enhanced by technology. To those who prefer to base their speculations on Platonic ideas, the thesis can be cheerfully entertained. To hard-nosed Aristotelians who prefer to find their essences only in individual entities, the thesis makes about as much sense as to say, as did an American officer in Vietnam, "We had to destroy the town in order to save it."

The point here is not that pessimistic antitechnologists have the best of these arguments, but only that proponents of technology attempt to prove too much when they go beyond the reality of a technological development to graft it conceptually onto the very nature of those human organisms which are benefiting from the cleverness of its more inventive fellows. I can indeed go farther in a car than I could conveniently go on foot, but one long walk might well be more fulfilling to me as a person than all the miles that I have traveled by automobile. People, like children, really would rather do it themselves. For, after all, that is what growing up is all about.

There is, however, more to growing up than just learning to do for oneself, especially in a complex developed society such as our own. Most notable by way of addition is a recognition of one's individual limitations, an openness to cooperation, and a genuine pride in accomplishments that are, and that by their very nature must be, collectively effected and enjoyed. Thus it may well be that technological alienation, so commonly considered endemic to a capitalist system, is due not to capitalism as such but rather to such capitalist baggage as its longstanding romance with an inappropriate and unrealistic form of individualism.³⁷ From all indications, however, it does not seem that collectivist totalization is an adequate alternative, given the importance of self-fulfillment. So hope for the future of human well-being in the face of technology must lie in the development of intermediate forms of social existence.

What these new forms will be cannot be clearly predicted as yet. But there are indications that perhaps they may already exist, at least inchoatively, in any of the various approaches to workers' self-management that are developing around the world in countries of every political persuasion.³⁸ A precondition for this latest phase of socioeconomic evolution is probably the appearance of better-educated and more highly skilled workers who may be said to constitute a new working class." One major catalyst for this development, however, has surely been the impact of automation on all kinds of traditional jobs.

Short-term solutions such as ever more subtle forms of behavior or job modification⁴⁰ or even sincere efforts to "humanize" the workplace remain inevitably in the elitist tradition of Frederick Taylor and the "scientific managers."⁴² What workers through their unions found unacceptable about that approach⁴³ they will continue to challenge in the face of ever more humanly disruptive technological change. Economists will, of course, continue to debate the finer points of theory that, they hope, will account for if not actually inspire whatever changes are made.⁴⁴ But their theorizing will fall short of the mark if it disregards

the uncanny ability of people whose lives and livelihood are threatened to find ways of protecting themselves—not against "machines" as such but against insensitive decision makers who continue to operate as if employees are by definition just a temporary bulge in the cost of production. Traditionally unions were expected to respond to such challenges by winning for their members some form of protectionist "job control." But far more mutually satisfactory solutions can be arrived at, as can be seen from the extraordinary agreement entered into by long-shoremen and their employers to accommodate more efficient methods of loading and unloading ships.^o

Whether any of these examples of *responsible* accommodation to technological change will prove to be the basis for new forms of social existence remains to be seen. Whether such new forms, if and when they arrive on the scene, will constitute anything as awesome as a modification of human nature depends more on the locus and scope assigned to this hallowed expression than to any data-substantiated proclamation about what has been taking place. In the meantime we can all perhaps derive some sense of direction from a wise old saying recently recalled to our attention: "If you meet the Buddha on the road, kill him."⁴⁶

NOTES

1. See Clifford Geertz, "The Impact of the Concept of Culture on the Concept of Man," in *New Views of the Nature of Man*, ed. John R. Platt (Chicago: University of Chicago Press, 1965), pp. 93-118; Sherwood L. Washburn, "Tools and Human Evolution," *Scientific American* 2.03 (September 1960): 63-75.

2. See, for example, Zbigniew Brzezinski, "America in the Technetronic Age," *Encounter*, January 1968; Emmanuel Mesthene, "How Technology Will Shape the Future," *Science* 161 (July 12, 1968) : 135-43; Arthur C. Clarke, *Profiles of the Future* (New York: Bantam, 1964), pp. 212-27; Richard R. Landers, *Man's Place in the Dybosphere* (Englewood Cliffs, N.J.: Prentice-Hall, 1966). Compare Lewis R. Mumford, *The Myth of the Machine: Technics and Human Development* (New York: Harcourt, Brace Jovanovich, 1967), pp. 14-29.

3. "American in the Technetronic Age," in *Philosophy for a New Generation*, ed. A. K. Bierman and James A. Gould (New York: Macmillan, 1970), p. 429. See also Zbigniew Brzezinski, *Between Two Ages* (New York: Viking, 1970).

4. Weston La Barre, *The Human Animal* (Chicago: University of Chicago Press, 1954), p. 92.

5. Pierre Teilhard de Chardin, *The Phenomenon of Man* (New York: Harper & Row, 1959).

6. See especially Mumford, *The Myth of the Machine*.

7. Marshall McLuhan, *The Gutenberg Galaxy* (Toronto: University of Toronto Press, 1962); and *Understanding Media: The Extensions of Man* (New York: McGraw-Hill, 1964) .

8. Harold Sackman, *Computers, System Science, and Evolving Society* (New York: Wiley, 1967). Compare John David Garcia, *The Moral Society* (New York: Julian, 1971).
9. John McHale, *The Future of the Future* (New York: Ballantine, 1971).
so. See especially James Feibleman, *Understanding Human Nature* (New York: Horizon, 1978).
11. Originally published in *Scientific American*, March 1959, this article will be found, for example, in *Man Alone: Alienation in Modern Society*, ed. Eric Josephson and Mary Josephson (New York: Dell Laurel, 1962), pp. 437-46.
12. Lewis Yablonsky, *Robopaths (Indianapolis: Bobbs-Merrill, 1972).*
13. Charles Hampden-Turner, *Radical Man* (New York: Doubleday Anchor, 1971), chap. 11, "The Crypto-Conservatism of Technological Thinking," pp. 361-4¹⁰.
14. Norman Mailer, *Of a Fire on the Moon* (New York: New American Library Signet, 1971), p. 163.
15. The author of *Walden Two* remains a dedicated technophile, especially in such later works as *Beyond Freedom and Dignity* (New York: Knopf, 1971).
16. Bruce Mazlich, "The Fourth Discontinuity," in *Perspectives on the Computer Revolution*, ed. Z. W. Pylyshyn (Englewood Cliffs, N.J.: Prentice-Hall, 1970), pp. 205-206.
17. See, for example, Buckminster Fuller, *Utopia or Oblivion: The Prospects for Humanity* (New York: Bantam, 1969), pp. 157, 242-43, 270.
18. Samuel Butler, *Erewhon* (New York: Airmont, 1967), p. 160. See also Langdon Winner, *Autonomous Technology* (Cambridge, Mass.: MIT Press, 1977) •
19. Martin Heidegger, *Discourse on Thinking* (New York: Harper & Row, 1966), p. 54. A somewhat comparable attitude is recommended by Robert Pirsig in his novel *Zen and the Art of Motorcycle Maintenance* (New York: Morrow, 1974) •
- zo. See Francois Hetman, *Society and the Assessment of Technology* (Paris: OECD, 1973).
21. For Gabriel Marcel's concerns see his *Man Against Mass Society* (Chicago: Regnery Gateway, 1962), pp. 76-101, 193-210.
22. For a current review of this tradition, see Bernard Gendron, *Technology and the Human Condition* (New York: St. Martin's Press, 1977). See also Ben Seligman, *Most Notorious Victory* (New York: Free Press, 1966), pp. 3-4.
23. Quoted by Stuart Chase, *Men and Machines* (New York: Macmillan, 1929), p. 267. For the more recent thoughts of Chase himself on the topic of this earlier work, see his *The Most Probable World* (New York: Harper & Row), 1968.
24. In his *The Future of the Future*, McHale attributes this anecdote to John Gardner's *Self-Renewal*, in which book I failed to find it. The point, however, still stands.
25. As a tool for analyzing this question, I have found it useful to distinguish between those men-machine relationships that are "prosthetic" and those that are "cyborgian" in character. See my "Humanization of Technology: Slogan or Ethical Imperative?" in *Research in Philosophy and Technology*, Vol. I, ed. Paul T. Durbin (Greenwich, Conn.: JAI Press, 1978), pp. 151-60.
26. This notion has, of course, been fully explored by Langdon Winner in his work of that title (*Autonomous Technology*), in which he seems to find that man has lost control (pp. 279-305) but nonetheless finds some reason to hope that

"Luddism as Epistemology" (pp. 325-35) might afford man some remedy against dependency on machines.

27. See Peter d'A. Jones, ed., *The Robber Barons Revisited* (Boston: Heath, 1968); and Earl Latham, ed., *John D. Rockefeller: Robber Baron or Industrial Statesman?* (Boston: Heath, 1949).

28. John Kenneth Galbraith, *The New Industrial State* (Boston: Houghton Mifflin, 1968). See also William Rodgers, *Think: A Biography of the Watsons and IBM* (New York: Stein and Day, 1969) .

29. Ferdinand Lundberg, *The Rich and the Super-Rich* (New York: Lyle Stuart, 1968); Richard Ney, *The Wall Street Jungle* (New York: Grove, 1970) . An interesting variation on this theme is Daniel Jay Baum and Ned B. Stiles, *The Silent Partners: Institutional Investors and Corporate Control* (Syracuse, N.Y.: Syracuse University Press, 1965) .

30. Victor C. Ferkiss, *Technological Man* (New York: Braziller, 1969); and John David Garcia, *The Moral Society* (New York: Julian, 1971).

31. For a sweeping statement of pessimism about the individual, see Martin Pawley, *The Private Future* (New York: Random House, 1974) .

32. See Morton Mintz and Jerry S. Cohen, *America, Inc.* (New York: Dial Press, 1971); Walter J. Hickel, *Who Owns America?* (New York: Paperback Library, 1971); and William Rodgers, *Corporate Country* (Emmaus: Rodale, 1973) . A useful review in this regard is Henry Adler Einhorn and William Paul Smith, *Economic Aspects of Anti-Trust: Readings and Cases* (New York: Random House, 1968). See also Ida M. Tarbell, *The History of the Standard Oil Company*, ed. D. M. Chalmers (New York: Harper & Row, 1966) .

33. So clear does this seem at least to me that I can only express surprise at the failure of Peter Berger and others to take note of it in their otherwise valuable study *The Homeless Mind: Modernization and Consciousness* (New York: Random House, 1973) . This lacuna may be related to the equally surprising willingness of the authors to identify greater individual autonomy as an effect of "modernization" (pp. 195-200). See also Winner, *Autonomous Technology*, p. 56.

34. It is interesting to note in this regard that at least one writer at the dawn of the atomic age remained hopeful that an outstanding leader could effectively control the situation. See Karl Jaspers, *The Future of Mankind* (Chicago: University of Chicago Press, 1961) .

35. *Man's Role in Changing the Face of the Earth*, ed. W. C. Thomas, Jr. (Chicago: University of Chicago Press, 1956), p. 1087.

36. See E. J. Mishan, *Technology and Growth: The Price We Pay* (New York: Praeger, 1970) .

37. See note 34.

38. See Gerry Hunnius et al., eds., *Workers' Control: A Reader on Labor and Social Change* (New York: Random House, 1973); David Jenkins, *Job Power: Blue and White Collar Democracy* (Garden City, N.Y.: Doubleday, 1973).

39. See Bertram Silverman and Murray Yanowitch, eds., *The Worker in "Post-Industrial" Capitalism: Liberal and Radical Responses* (New York: Free Press, 1974).

40. See, for example, Robert A. Sutermeister, ed., *People and Productivity*, 2d ed. (New York: McGraw-Hill, 1969); Jerome M. Rosow, ed., *The Worker and the Job: Coping with Change* (Englewood Cliffs, N.J.: Prentice-Hall, 1974); and, in general, *Work in America: Report of a Special Task Force to the Secretary of HEW*, (Cambridge, Mass. MIT Press, 1973) .

41. Roy P. Fairfield, ed., *Humanizing the Workplace* (Buffalo, N.Y.: Prometheus, 1974).
42. See Frederick Winslow Taylor, *Scientific Management* (New York: Harper, 1911).
43. See Milton J. Nadworny, *Scientific Management and the Unions, 1900-1932: A Historical Analysis* (Cambridge, Mass.: Harvard University Press, 1955).
44. See Arnold Heertje, *Economics and Technical Change* (New York: Wiley, 1977); and Alexander Gourvitch, *Survey of Economic Theory on Technological Change and Employment* (New York: Augustus M. Kelley, 1966).
45. See Paul T. Hartman, *Collective Bargaining and Productivity: The Long-shore Mechanization Agreement* (Berkeley: University of California Press, 1969).
46. Sheldon B. Kopp, *If You Meet the Buddha on the Road, Kill Him!* (New York: Bantam, 1976).