

# Does Improved Technology Mean Progress?

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*Understanding the  
historical distinction between two  
contradictory concepts of progress helps  
explain the current disenchantment  
with technology.*

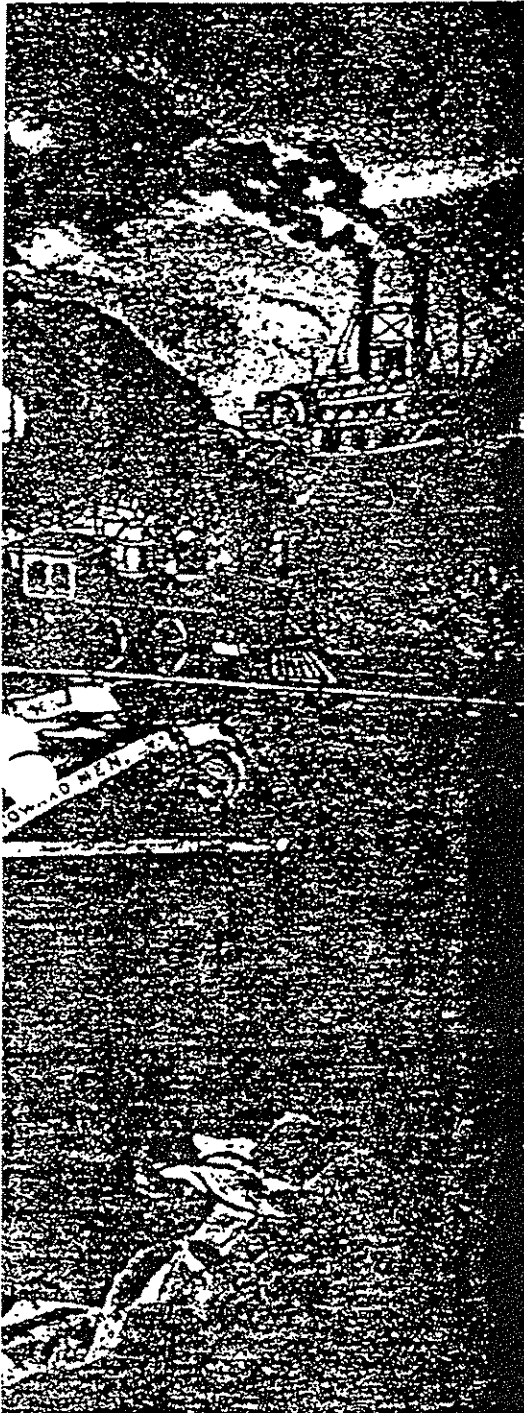
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BY LEO MARX

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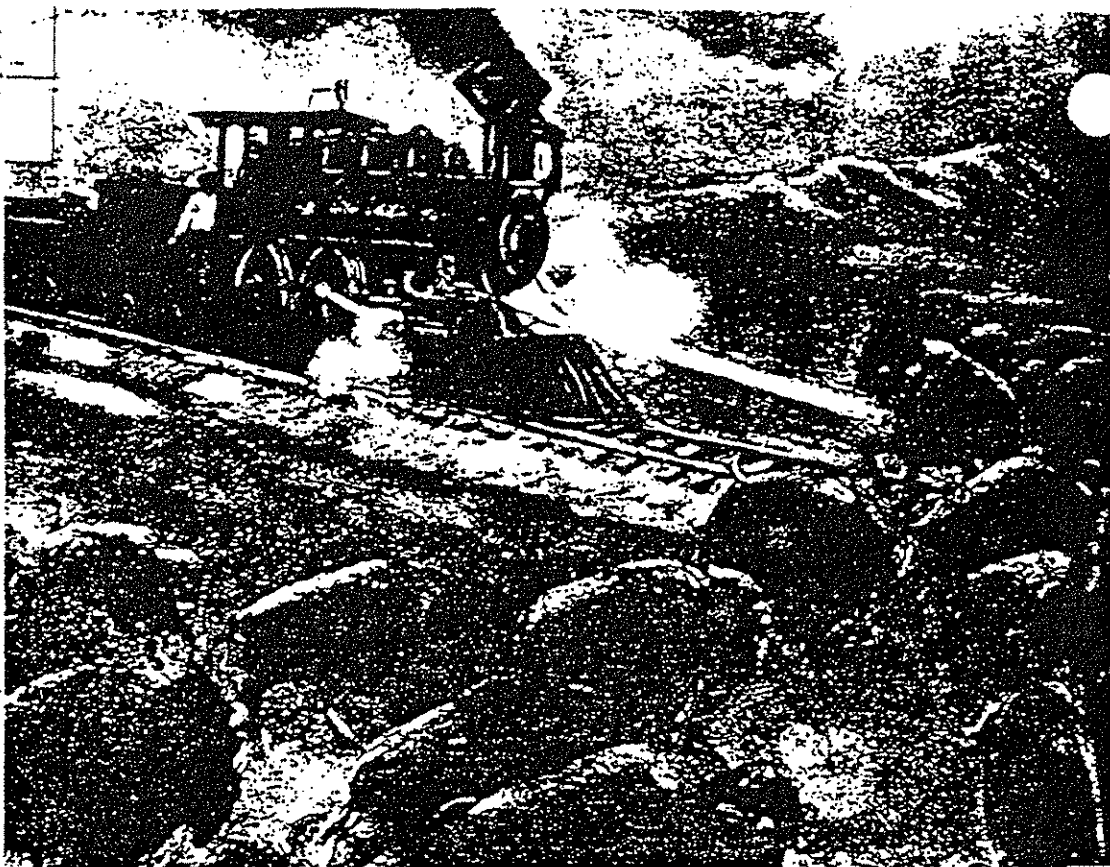
**D**OES improved technology mean progress? If some variant of this question had been addressed to a reliable sample of Americans at any time since the early nineteenth century, the answer of a majority almost certainly would have been an unequivocal "yes." The idea that technological improvements are a primary basis for—and an accurate gauge of—progress has long been a fundamental belief in the United States. In the last half-century, however, that belief has lost some of its credibility. A growing minority of Americans has adopted a skeptical, even negative, view of technological innovation as an index of social progress.

The extent of this change in American attitudes was brought home to me when I spent October 1984 in China. At that time the announced goal of the People's Republic was to carry out (in the popular slogan) "Four Modernizations"—agriculture, science and technology, industry, and the military. What particularly struck our group of Americans was the seemingly unbounded, largely uncritical ardor with which the Chinese were conducting their love affair with Western-style modernization—individualistic, entrepreneurial, or "capitalist," as well as scientific and technological. Like early nineteenth-century visitors to the United States, we were wit-





In the late eighteenth century, Enlightenment philosophers regarded science and technology not as ends in themselves but as instruments for transforming society. They expected scientific knowledge and technological power to make possible a comprehensive improvement in all the conditions of life.



nessing a society in a veritable transport of improvement: long pent-up, innovative energies were being released, everyone seemed to be in motion, everything was eligible for change. It was assumed that any such change almost certainly would be for the better.

Most of the Chinese we came to know best—teachers and students of American studies—explicitly associated the kind of progress represented by the four modernizations with the United States. This respect for American wealth and power was flattering but disconcerting, for we often found ourselves reminding the Chinese of serious shortcomings, even some terrible dangers, inherent in the Western mode of industrial development. Like the Americans whom European travelers met 150 years ago, many of the Chinese seemed to be extravagantly, almost blindly, credulous and optimistic.

Our reaction revealed, among other things, a change in our own culture and, in some cases, in our own personal attitudes. We came face to face with the gulf that separates the outlook of many contem-

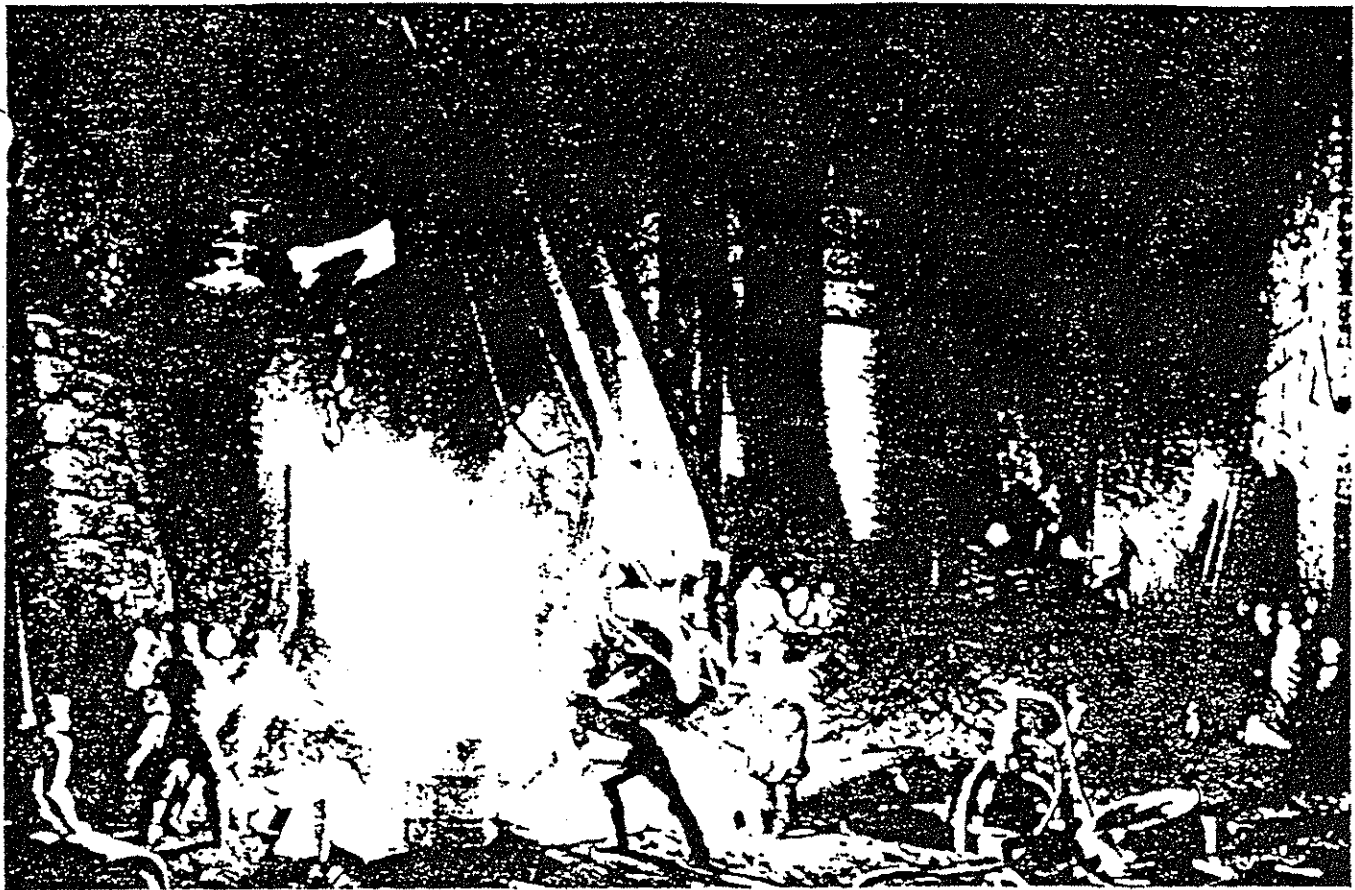
porary Americans from the old national faith in the advance of technology as the basis of social progress.

The standard explanation for this change includes that familiar litany of death and destruction that distinguishes the recent history of the West: two barbaric world wars, the Nazi holocaust, the Stalinist terror, and the nuclear arms race. It is striking to note how many of the fearful events of our time involve the destructive use or misuse, the unforeseen consequences, or the disastrous malfunction of modern technologies: Hiroshima and the nuclear threat; the damage inflicted upon the environment by advanced industrial societies; and spectacular accidents like Three Mile Island.

Conspicuous disasters have helped to undermine the public's faith in progress, but there also has been a longer-term change in our thinking. It is less obvious, less dramatic and tangible than the record of catastrophe that distinguishes our twentieth-century history, but I believe it is more fundamental. Our very conception—our chief criterion—of progress has undergone a subtle but decisive change since the founding of the Republic, and that change is at once a cause and a reflection of our current disenchantment with technology. To chart this change in attitude, we need to go back at least as far as the first Industrial Revolution.

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LEO MARX is the William R. Kovin Professor of American Cultural History at M.I.T. He is the author of *The Machine in the Garden: Technology and the Pastoral Ideal in America* (Oxford University Press, 1964). Oxford University Press will publish a collection of his essays, *The Pilot and the Passenger*, next year.



### The Enlightenment Belief in Progress

The development of radically improved machinery (based on mechanized motive power) used in the new factory system of the late eighteenth century coincided with the formulation and diffusion of the modern Enlightenment idea of history as a record of progress. This conception became the fulcrum of the dominant American worldview. It assumes that history, or at least modern history, is driven by the steady, cumulative, and inevitable expansion of human knowledge of and power over nature. The new scientific knowledge and technological power was expected to make possible a comprehensive improvement in all the conditions of life—social, political, moral, and intellectual as well as material.

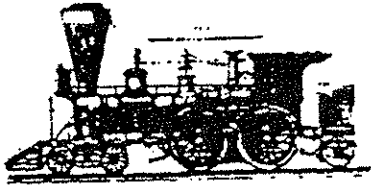
The modern idea of progress, as developed by its radical French, English, and American adherents, emerged in an era of political revolution. It was a revolutionary doctrine, bonded to the radical struggle for freedom from feudal forms of domination. To ardent republicans like the French philosopher Condorcet, the English chemist Priestley, and Benjamin Franklin, a necessary criterion of progress was the achievement of political and social liberation. They regarded the new sciences and technologies not as ends in themselves, but as instruments for carrying

out a comprehensive transformation of society. The new knowledge and power would provide the basis for alternatives to the deeply entrenched authoritarian, hierarchical institutions of *l'ancien régime*: monarchical, aristocratic, and ecclesiastical. Thus in 1813 Thomas Jefferson wrote to John Adams describing the combined effect of the new science and the American revolution on the minds of Europeans:

*Science had liberated the ideas of those who read and reflect, and the American example had kindled feelings of right in the people. An insurrection has consequently begun, of science, talents, and courage, against rank and birth, which have*



Although Thomas Jefferson was a committed believer in the benefits of science and technology, he rejected the idea of developing an American factory system. He thought that industrial cities and an industrial working class were incompatible with republican government and the happiness of the people.

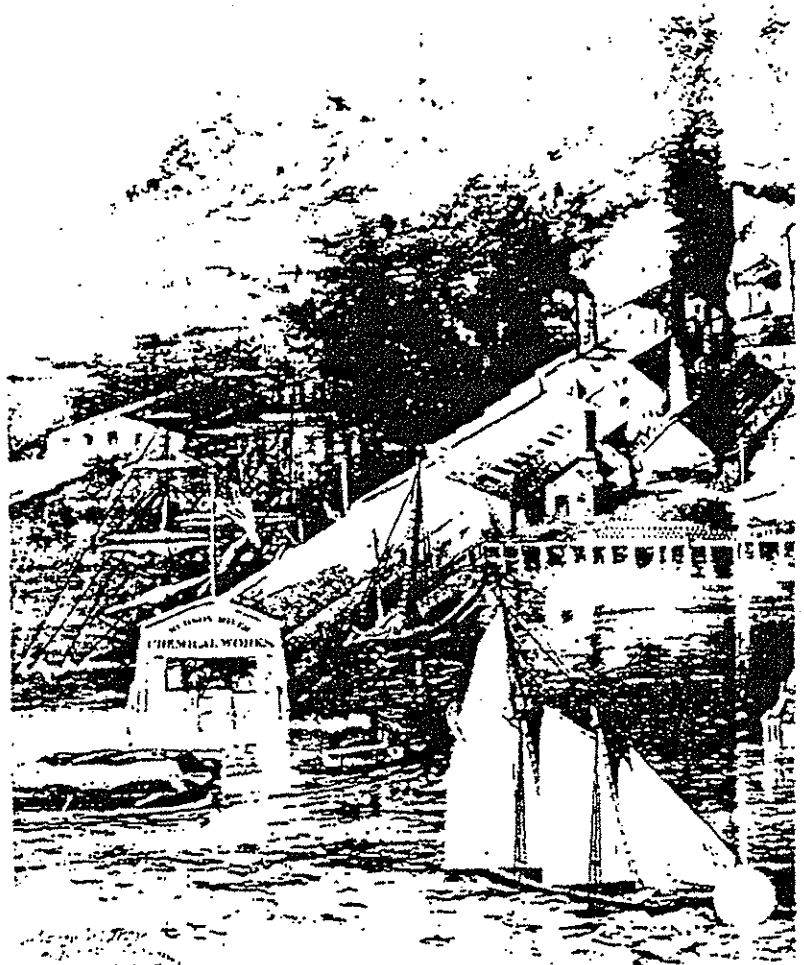


fallen into contempt. . . .  
Science is progressive.

Admittedly, the idea of history as endless progress did encourage extravagantly optimistic expectations, and in its most extreme form, it fostered some wildly improbable dreams of the "perfectability of Man" and of humanity's absolute mastery of nature. Yet the political beliefs of the radical republicans of the eighteenth century, such as the principle of making the authority of government dependent upon the consent of the governed, often had the effect of limiting those aspirations to omnipotence.



Like Jefferson, Benjamin Franklin exemplified how republican political ideals constrained the use of technology. He refused to exploit his inventions for private profit, considering them to be for the benefit of all.



The constraining effect of such ultimate, long-term political goals makes itself felt, for example, in Jefferson's initial reaction to the prospect of introducing the new manufacturing system to America. "Let our work-shops remain in Europe," he wrote in 1785.

Although a committed believer in the benefits of science and technology, Jefferson rejected the idea of developing an American factory system on the ground that the emergence of an urban proletariat, which he then regarded as an inescapable consequence of the European factory system, would be too high a price to pay for any potential improvement in the American material standard of living. He regarded the existence of manufacturing cities and an industrial working class as incompatible with republican government and the happiness of the people. He argued that it was preferable, even if more costly in strictly economic terms, to ship raw materials to Europe and import manufactured goods. "The loss by the transportation of commodities across the Atlantic will be made up in happiness and permanence of government." In weighing political, moral, and aesthetic costs against economic benefits, he anticipated the viewpoint of the environmentalists

and others of our time for whom the test of a technological innovation is its effect on the overall quality of life.

Another instance of the constraining effect of republican political ideals is Benjamin Franklin's refusal to exploit his inventions for private profit. Thus Franklin's reaction when the governor of Pennsylvania urged him to accept a patent for his successful design of the "Franklin stove":

*Governor Thomas was so pleased with the construction of this stove as described in . . . [the pamphlet] that . . . he offered to give me a patent for the sole vending of them for a term of years; but I declined it from a principle which has ever weighed with me on such occasions, namely; viz., that as we enjoy great advantages from the inventions of others, we should be glad of an opportunity to serve others by any invention of ours, and this we should do freely and generously [emphasis in original].*

What makes the example of Franklin particularly interesting is the fact that he later came to be regarded as the archetypal self-made American and the embodiment of the Protestant work ethic. When Max Weber sought out of all the world the exemplar



Left: This representation of Hudson River factories reflects a positive view of technology. Below: Winslow Homer's characterization of New England factory workers is more critical.



of that mentality for his seminal study, *The Protestant Ethic and the Spirit of Capitalism*, whom did he choose but our own Ben? But Franklin's was a principled and limited self-interest. In his *Autobiography*, he told the story of his rise in the world not to exemplify a merely personal success, but rather to illustrate the achievements of a "rising people." He belonged to that heroic revolutionary phase in the history of the bourgeoisie when that class saw itself as the vanguard of humanity and its principles as universal. He thought of his inventions as designed not for his private benefit but for the benefit of all.

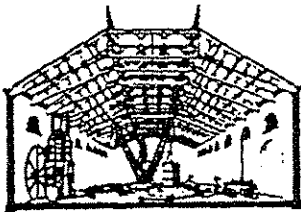
### The Technocratic Concept of Progress

With the further development of industrial capitalism, a quite different conception of technological progress gradually came to the fore in the United States. Americans celebrated the advance of science and technology with increasing fervor, but they began to detach the idea from the goal of social and political liberation. Many regarded the eventual attainment of that goal as having been assured by the

victorious American Revolution and the founding of the Republic.

The difference between this later view of progress and that of Jefferson's and Franklin's generation can be heard in the rhetoric of Daniel Webster. He and Edward Everett were perhaps the leading public communicators of this new version of the progressive ideology. When Webster decided to become a senator from Massachusetts instead of New Hampshire, the change was widely interpreted to mean that he had become the quasi-official spokesman for the new industrial manufacturing interests. Thus Webster, who was generally considered the nation's foremost orator, was an obvious choice as the speaker at the dedication of new railroads. Here is a characteristic peroration of one such performance in 1847:

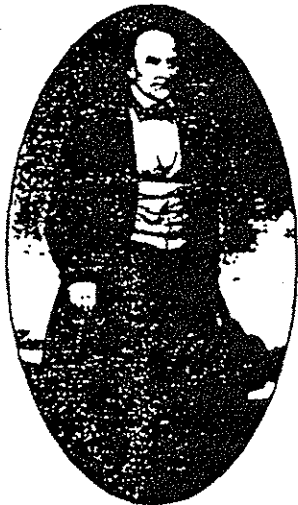
*It is an extraordinary era in which we live. It is altogether new. The world has seen nothing like it before. I will not pretend, no one can pretend, to discern the end; but everybody knows that the age is remarkable for scientific research into the heavens, the earth, and what is beneath the earth; and perhaps more remarkable still for the application of this scientific research to the pursuits of life. . . . We see the*



ocean navigated and the solid land traversed by steam power, and intelligence communicated by electricity. Truly this is almost a miraculous era. What is before us no one can say, what is upon us no one can hardly realize. The progress of the age has almost outstripped human belief; the future is known only to Omniscience.

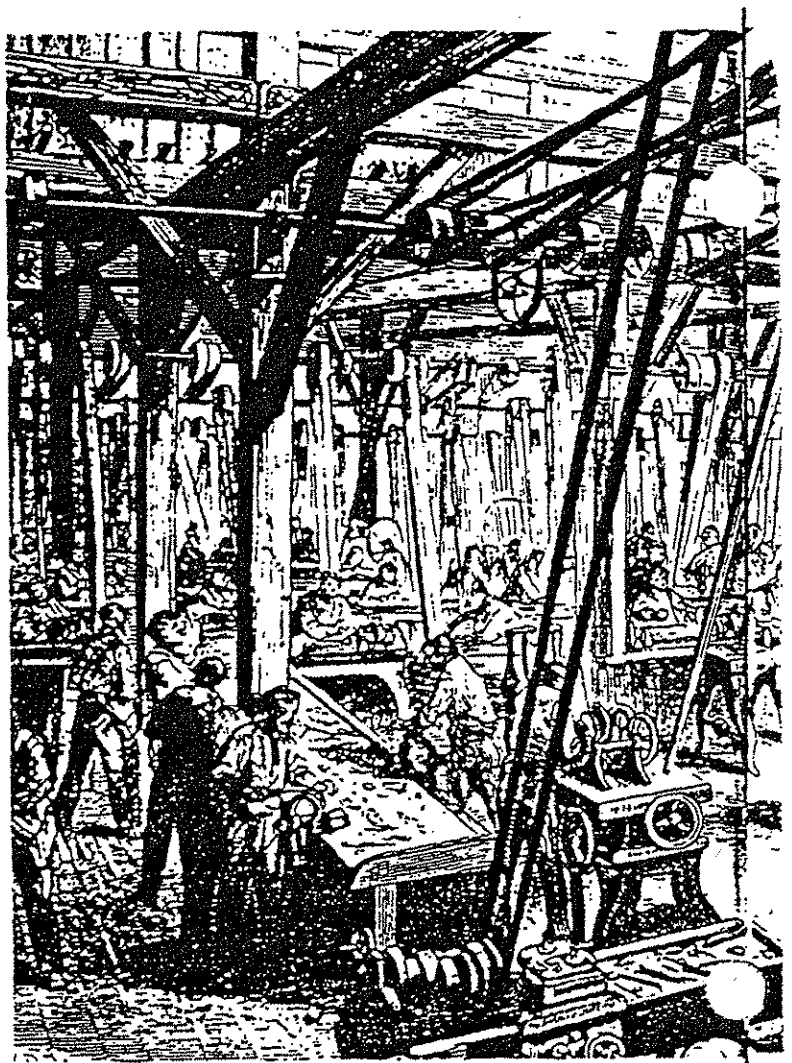
By the 1840s, as Webster's rhetoric suggests, the idea of progress was already being dissociated from the Enlightenment vision of political liberation. He invests the railroad with a quasi-religious inevitability that lends force to the characterization of his language as the rhetoric of the technological sublime. Elsewhere in the speech, to be sure, Webster makes the obligatory bow to the democratic influence of technological change, but it is clear that he is casting the new machine power as the prime exemplar of the overall progress of the age, quite apart from its political significance. Speaking for the business and industrial elite, Webster and Everett thus depict technological innovation as a sufficient cause, *in itself*, for the fact that history assumes the character of continuous, cumulative progress.

At the same time, discarding the radical political ideals of the Enlightenment allowed the idea of technological progress to blend with other grandiose national aspirations. Webster's version of the "rhetoric of the technological sublime" is of a piece with the



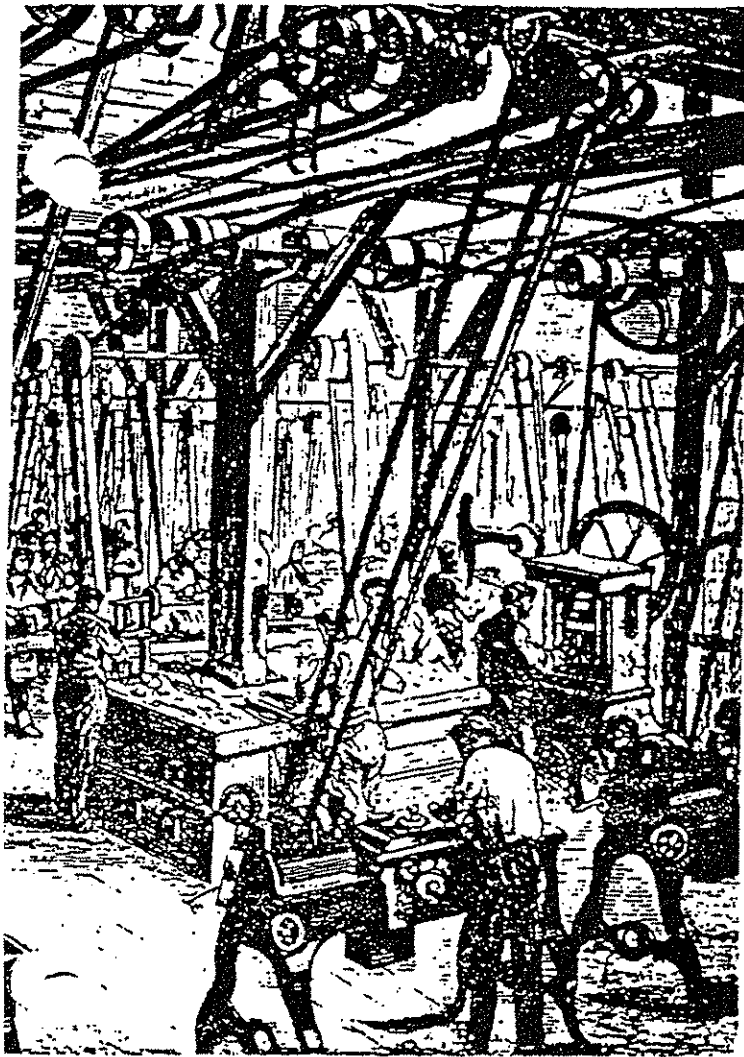
Daniel Webster cast machine power as the exemplar of progress, disregarding its political uses.

soaring imperial ambitions embodied in the slogan "Manifest Destiny," and by such tacit military figurations of American development as the popular notion of the "conquest of nature" (including Native Americans) by the increasingly technologized forces of advancing European-American "civilization." These future-oriented themes easily harmonized with the belief in the coming of the millenium that characterized evangelical Protestantism, the most popular American religion at the time. Webster indicates as much when, at the end of his tribute



to the new railroad, he glibly brings in "Omniscience" as the ultimate locus of the meaning of progress.

The difference between the earlier Enlightenment conception of progress and that exemplified by Webster is largely attributable to the difference between the groups they represented. Franklin, Jefferson, and the heroic generation of founding revolutionists constituted a distinct, rather unusual social class in that for a short time the same men possessed authority and power in most of its important forms: economic, social, political, and intellectual. The industrial capitalists for whom Daniel Webster spoke were men of a very different stripe. They derived their status from a different kind of wealth and power, and their conception of progress, like their economic and social aspirations, was correspondingly different. The new technology and the immense profits it generated belonged to them, and since they had every reason to assume that they would retain their property and power, they had a vested interest in technological innovation. It is not surprising, under the circumstances, that as indus-



Most Americans welcomed the factory of the nineteenth century, which is shown in this 1865 woodcut. But critics such as Hawthorne, Thoreau, and Melville prefigured environmentalists of the twentieth century.

those that had proved so successful when applied to physical objects.”

The technocratic idea of progress is a belief in the sufficiency of scientific and technological innovation as the basis for general progress. It says that if we can ensure the advance of science-based technologies, the rest will take care of itself. (The “rest” refers to nothing less than a corresponding degree of improvement in the social, political, and cultural conditions of life.) Turning the Jeffersonian ideal on its head, this view makes instrumental values fundamental to social progress, and relegates what formerly were considered primary, goal-setting values (justice, freedom, harmony, beauty, or self-fulfillment) to a secondary status.

In this century, the technocratic view of progress was enshrined in Fordism and an obsessive interest in economies of scale, standardization of process and product, and control of the workplace. This shift to mass production was accompanied by the more or less official commitment of the U.S. government to the growth of the nation's wealth, productivity, and global power, and to the most rapid possible rate of technological innovation as the essential criterion of social progress.

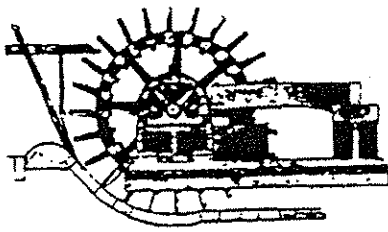


Along with Webster, Edward Everett espoused the view that technology is progressive in and of itself.

trialization proceeded these men became true believers in technological improvement as the primary basis for—as virtually tantamount to—universal progress.

This dissociation of technological and material advancement from the larger political vision of progress was an intermediate stage in the eventual impoverishment of that radical eighteenth-century worldview. This subtle change prepared the way for the emergence, later in the century, of a thoroughly technocratic idea of progress. It was “technocratic” in that it valued improvements in power, efficiency, rationality as ends in themselves. Among those who bore witness to the widespread diffusion of this concept at the turn of the century were Henry Adams and Thorstein Veblen, who were critical of it, and Andrew Carnegie, Thomas Edison, and Frederick Winslow Taylor and his followers, who lent expression to it. Taylor's theory of scientific management embodies the quintessence of the technocratic mentality, “the idea,” as historian Hugh Aitken describes it, “that human activity could be measured, analyzed, and controlled by techniques analogous to

But the old republican vision of progress—the vision of advancing knowledge empowering humankind to establish a less hierarchical, more just and peaceful society—did not disappear. If it no longer inspired Webster and his associates, it lived on in the minds of many farmers, artisans, factory workers, shopkeepers, and small-business owners, as well as in the beliefs of the professionals, artists, intellectuals, and other members of the lower middle and middle classes. During the late nineteenth century, a number of disaffected intellectuals sought new forms for the old progressive faith. They translated it into such political idioms as utopian socialism, the single-tax movement, the populist revolt, Progressivism in cities, and Marxism and its native variants.



## The Roots of Our Adversary Culture

Let me turn to a set of these late-eighteenth-century ideas that was to become the basis for a powerful critique of the culture of advanced industrial society. Usually described as the viewpoint of the "counter-Enlightenment" or the "romantic reaction," these ideas have formed the basis for a surprisingly long-lived adversarial culture.

According to conventional wisdom, this critical view originated in the intellectual backlash from the triumph of the natural sciences we associate with the great discoveries of Galileo, Kepler, Harvey, and Newton. Put differently, this tendency was a reaction against the extravagant claims for the universal, not to say exclusive, truth of "the Mechanical Philosophy." That term derived from the ubiquity of the machine metaphor in the work of Newton and other natural scientists ("celestial mechanics") and many of their philosophic allies, notably Descartes, all of whom tended to conceive of nature itself as a "great engine" and its subordinate parts (including the human body) as lesser machines.

By the late eighteenth century, a powerful set of critical, anti-mechanistic ideas was being developed by Kant, Fichte, and other German idealists, and by great English poets like Coleridge and Wordsworth. But in their time the image of the machine also was being invested with greater tangibility and social import. The Industrial Revolution was gaining momentum, and as power machinery was more widely diffused in Great Britain, Western Europe, and North America, the machine acquired much greater resonance: it came to represent both the new technologies based on mechanized motive power and the mechan-



In a satire of *Pilgrim's Progress*, Nathaniel Hawthorne likened a journey on a railroad, the symbol of technology, to a trip to hell.



Henry Thoreau's *Walden* may be read as an attack on a culture confused about the relationship between ends and means.

istic mindset of scientific rationalism. Thus the Scottish philosopher and historian Thomas Carlyle, who had been deeply influenced by the new German philosophy, announced in his seminal 1829 essay, "Signs of the Times," that the right name for the dawning era was the "Age of Machinery." It was to be the Age of Machinery, he warned, in every "inward" and "outward" sense of the word, meaning that it would be dominated by mechanical (utilitarian) thinking as well as by actual machines.

In his criticism of this new era, Carlyle took the view that neither kind of

"machinery" was inherently dangerous. In his opinion, indeed, they represented *potential* progress as long as neither was allowed to become the exclusive or predominant mode in its respective realm.

In the United States a small, gifted, if disaffected minority of writers, artists, and intellectuals adopted this ideology. Their version of Carlyle's critical viewpoint was labeled "romantic" in reference to its European strains, or "transcendentalist" in its native use. In the work of writers like Emerson and Thoreau, Hawthorne and Melville, we encounter critical responses to the onset of industrialism that cannot be written off as mere nostalgia or primitivism. These writers did not hold up an idealized wilderness, a pre-industrial Eden, as preferable to the world they saw in the making. Nor did they dismiss the worth of material improvement as such. But they did regard the dominant view, often represented (as in Webster's speech) by the appearance of the new machine power in the American landscape, as dangerously shallow, materialistic, and one-sided. Fear of "mechanism," in the several senses of that word—especially the domination of the individual by impersonal systems—colored all of their thought. In their work, the image of the machine-in-the-landscape, far from being an occasion for exultation,



Thomas Edison embodied the view that scientific and technological innovation is a sufficient basis for progress.



often seems to arouse anxiety, dislocation, and foreboding. Henry Thoreau's detailed, carefully composed account of the intrusion of the railroad into the Concord woods is a good example; it bears out his delineation of the new inventions as "improved means to unimproved ends."

This critical view of the relationship between technological means and social ends did not merely appear in random images, phrases, and narrative episodes. Indeed, the whole of *Walden* may be read as a sustained attack on a culture that had allowed itself to become confused about the relationship of ends and means. Thoreau's countrymen are depicted as becoming "the tools of their tools." Much the same argument underlies Hawthorne's satire, "The Celestial Railroad," a modern replay of *Pilgrim's Progress* in which the hero, Christian, realizes too late that his comfortable railroad journey to salvation is taking him to hell, not heaven. Melville incorporates a similar insight into his characterization of Captain Ahab, who is the embodiment of the

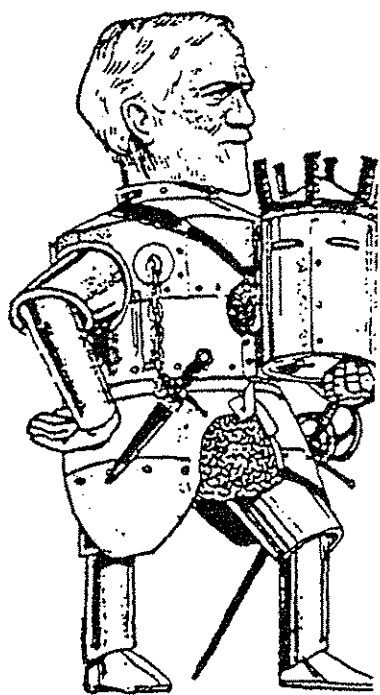
Faustian aspiration toward domination and total control given credence by the sudden emergence of exciting new technological capacities. Ahab exults in his power over the crew, and he explicitly identifies it with the power exhibited by the new railroad spanning the North American continent. In reflective moments, however, he also acknowledges the self-destructive nature of his own behavior: "Now in his heart, Ahab had some glimpse of this, namely, all my means are sane, my motive and my object mad."

Of course there was nothing new about the moral posture adopted by these American writers. Indeed, their attitude toward the exuberant national celebration of the

railroad and other inventions is no doubt traceable to traditional moral and religious objections to such an exaggeration of human powers. In this view, the worshipful attitude of Americans toward these new instruments of power had to be recognized for what it was: idolatry like that attacked by Old Testament prophets in a disguised, new-fashioned form. This moral critique of the debased, technocratic version of the progressive worldview has slowly gained adherents since the mid-nineteenth century, and by now it is one of the chief ideological supports of an adversary culture in the United States.

The ideas of writers like Hawthorne, Melville, and Thoreau were usually dismissed as excessively idealistic, nostalgic, or sentimental, hence impractical and unreliable. They were particularly vulnerable to that charge at a time when the rapid improvement in the material conditions of American life lent a compelling power to the idea that the meaning of history is universal progress. Only in the late twentieth century, with the growth of skepticism about scientific and technological progress, and with the emergence of a vigorous adversary culture in the 1960s, has the standpoint of that earlier eccentric minority been accorded a certain intellectual respect. To be sure, it is still chiefly the viewpoint of a relatively small minority, but there have been times, like the Vietnam upheaval of the 1960s, when that minority has won the temporary support of, or formed a tacit coalition with, a remarkably large number of other disaffected Americans. Much the same anti-technocratic viewpoint has made itself felt in various dissident movements and intellectual tendencies since the 1960s: the anti-nuclear movements (against both nuclear

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Andrew Carnegie, here garbed as a white knight, represented the technocratic ideal of progress.

power and nuclear weaponry); some branches of the environmental and feminist movements; the "small is beautiful" and "stable-state" economic theories, as well as the quest for "soft energy paths" and "alternative (or appropriate) technologies."

### Technocratic versus Social Progress

Perhaps this historical summary will help explain the ambivalence toward the ideal of progress expressed by many Americans nowadays. Compared with prevailing attitudes in the U.S. in the 1840s, when the American situation was more like that of China today, the current mood in this country would have to be described as mildly disillusioned.

To appreciate the reasons for that disillusionment, let me repeat the distinction between the two views of progress on which this analysis rests. The initial Enlightenment belief in progress perceived science and technology to be in the service of liberation from political oppression. Over time that conception was transformed, or partly supplanted, by the now familiar view that innovations in science-based technologies are in themselves a sufficient and reliable basis for progress. The distinction, then, turns on the apparent loss of interest in, or unwillingness to name, the social ends for which the scientific and technological instruments of power are to be used. What we seem to have instead of a guiding political goal is a minimalist definition of civic obligation.

The distinction between two versions of the belief in progress helps sort out reactions to the many troubling issues raised by the diffusion of high technology. When, for example, the introduction of some new labor-saving technology is proposed, it is useful to ask what the purpose of this new technology is. Only by questioning the assumption that innovation represents progress can we begin to judge its worth. The aim may well be to reduce labor costs, yet in our society the personal costs to the displaced workers are likely to be ignored.

The same essential defect of the technocratic mind-



Twentieth-century China seems to be having a love affair with technology just as nineteenth-century America did.

set also becomes evident when the president of the United States calls upon those who devise nuclear weapons to provide an elaborate new system of weaponry, the Strategic Defense Initiative, as the only reliable means of avoiding nuclear war. Not only does he invite us to put all our hope in a "technological fix," but he rejects the ordinary but indispensable method of international negotiation

and compromise. Here again, technology is thought to obviate the need for political ideas and practices.

One final word. I perhaps need to clarify the claim that it is the modern, technocratic worldview of Webster's intellectual heirs, not the Enlightenment view descended from the Jeffersonians, that encourages the more dangerous contemporary fantasies of domination and total control. The political and social aspirations of the generation of Benjamin Franklin and Thomas Jefferson provided *tacit limits to, as well as ends for, the progressive vision of the future*. But the technocratic version so popular today entails a belief in the worth of scientific and technological innovations as ends in themselves.

All of which is to say that we urgently need a set of political, social, and cultural goals comparable to those formulated at the beginning of the industrial era if we are to accurately assess the worth of new technologies. Only such goals can provide the criteria required to make rational and humane choices among alternative technologies and, more important, among alternative long-term policies.

Does improved technology mean progress? Yes, it certainly *could* mean just that. But only if we are willing and able to answer the next question: progress toward what? What is it that we want our new technologies to accomplish? What do we want beyond such immediate, limited goals as achieving efficiencies, decreasing financial costs, and eliminating the troubling human element from our workplaces? In the absence of answers to these questions, technological improvements may very well turn out to be incompatible with genuine, that is to say *social*, progress. □