Marcuse

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The Critique of Technology: From Dystopia to Interaction

The task to be accomplished is not the conservation of the past, but the redemption of the hopes of the past.¹

—Theodor Adorno and Max Horkheimer

Prologue: Obstinacy as a Theoretical Virtue

As a good Hegelian, Marx considered any merely moral critique of capitalism to be arbitrary. He measured the system instead by reference to an immanent criterion, the unsatisfied needs of the population. Although the argument was persuasive for its time, it becomes no longer relevant after capitalism proves itself capable of delivering the goods. Then the (fulfilled) needs of the individuals legitimate the established order. Radicalism means opposition, not just to the failures and deficiencies of that system, but to its very successes.

From what standpoint can society be judged once it has succeeded in feeding its members? It takes astonishing nerve to persist in radical social criticism at this point. But, as Marcuse once wrote, “obstinacy [is] a genuine quality of philosophical thought.”² To be obstinate means to reject the easy reconciliation with society, to keep a sense of reality based on longer time spans, deeper tensions, higher expectations and goals.

Marcuse’s solution to the problem had two parts. First, he believed that the historically evolved ideals of peace, freedom, and happiness still provide criteria for measuring the existing society. These ideals are not to be dismissed as merely subjective, because they have roots in the very nature of the human psyche. They drive the historical process forward through the formation of new needs reflecting as-yet-unrealized human potential. New needs are not arbitrary or willful in Hegel’s sense because—and this is the second part of Marcuse’s solution—the unrealized technical poten-
tial of advanced industrialism provides a basis on which to concretize them as historical projects. Advanced society, Marcuse argued, is capable of “pacifying” existence but artificially maintains competition and violence as the basis for domination and inequality. That society is, in a certain sense, technologically outmoded by its own achievements. As he put it in his last speech on ecology, “The specter which haunts advanced industrial society today is the obsolescence of full-time alienation.” Moreover, radical political struggle today consists in “existential revolts against an obsolete reality principle.”

The revolutionary historical judgment has always been made in the future anterior tense, as when Saint-Just imagined what “cold posterity” will have said concerning the absurdity of monarchy. Marcuse’s concept of “obsolescence” gave that judgment a technological twist. Thus he was not merely complaining about a system he didn’t like. He was imagining how it will appear to a backward glance rooted in the wider context of values evolved over past centuries and destined to achieve realization in the very technology of a future society. The obsolescence of the present system will be obvious in this hypothetical future, justifying the obstinacy of those who persisted in critique through these difficult times.

With the collapse of Soviet communism, the last apologia of historicist opposition to capitalism has died. We can no longer rest our case for change, if we ever did, on historical necessity or the achievements of “socialism.” We are one step closer to a world in which only Marcuse’s type of principled opposition is available. His thought has never been more relevant, but its limitations have also become more obvious. In particular, it has become increasingly clear that Marcuse had no adequate account of how historical ideals are to be effectively realized in technical potential.

In this chapter, I will explore Marcuse’s contribution to the question of technology, which he, more than anyone in the last thirty years, placed on the agenda of political discussion. In an earlier article, I presented a detailed account of his theory of technology. Here I will attempt to situate that theory in the larger framework of the emergence of a mass critical culture of technology, to which he contributed so significantly. I will also sketch a new approach, linking the tradition of radical critique with a new “interactivist” perspective emerging in recent years as an alternative to both the Old and the New Left.
Marcuse's radical critique of technology had a tremendous impact on the New Left. Much of it has been so thoroughly confirmed by subsequent experience that he would no doubt feel right at home in contemporary discussions of technology, far more so than in the atmosphere of the 1960s when his ideas were often rejected as reactionary and irrationalist. Marcuse would agree, for example, with the now-commonplace view that despite its grandiose achievements, scientific-technical rationality has endowed us with an extraordinarily destructive way of life. And he would surely applaud us for losing our naive faith in the disinterestedness, competence, and relevance of expertise.

These developments have opened a space for public debate about technical issues that were long thought to be above—or beneath—politics. But the recent news from the East seemed to close down the debate before it began: If in fact there is no alternative to capitalism as we know it, then, for better or worse, technology is destiny and social critique is as outdated as alchemy. History, in the words of one recent commentator, is over. Once again, Marcuse would not be surprised to find us confronting a one-dimensional rationality that forecloses the alternatives.

Other recent developments might awaken disturbing memories of the 1930s for someone with Marcuse's background. As the Left collapses and hope for a more rational administration of technological societies fades, a variety of fundamentalisms and nationalisms flourish, all too often with war and civil war on the horizon. These reactionary attacks on modernity are usually characterized by total technical conformism: Duplicating the pattern of early Japanese and Russian industrialization, anti-Western regimes busily import Western technology and install it unchanged while denouncing the civilization that produced it. The chances of anything truly original emerging from such a combination of resentment and imitation are slim.

In sum, although old assumptions about progress are losing ground, no equally convincing new ones have appeared to replace them. This situation is not merely a function of historical events, confusing though these are, but reflects deeper problems in the very foundation of modernity, that is, in the project of building a rational society. This project, in all its various forms—political, economic, technological—is in crisis today.
Formerly, the distinction between modernity and tradition was supported by a naive faith in rationality. Modernity was said to be rational in the strong sense that its cognitive foundations—science and technology—were superior to those of any earlier society. According to positivism, rationality was beyond any social or historical conditioning and was therefore a true universal. To question or criticize it was not only to challenge the legitimacy of the modern age but to undermine the only reliable standpoint from which to make judgments about nature and history.

But in recent years, that legitimacy has appeared more and more doubtful, and rationality is increasingly explained as a product of culture and society. New social interpretations of science and technology flourish today amid the shattered technocratic illusions of an earlier generation. Tradition, insofar as it supports cultural variety against the “false universality” of the West, is now granted a dubious reprieve. Differences of race and gender recover an importance they had lost in the melting pot of rational universality.

To understand Marcuse, we must disregard this startling breakdown of Enlightenment assumptions and transport ourselves back in thought to an earlier time when rationality went practically unchallenged. His position comes into focus against the backdrop of those assumptions and the sparse and necessarily eccentric attacks on them by marginal writers and social critics like himself.

Until recently all but a few cranky social critics took it for granted that humanity was in control of its technologies. I will call this consensus view the instrumental theory of technology, or instrumentalism. Instrumentalism holds that technology is neutral: As a transparent medium, it adds nothing substantive to the activities it serves but merely accelerates those activities, or realizes them on a larger scale or under new conditions. Because technology is neutral, the decision to employ it can be made on purely rational grounds, such as measurable, verifiable improvements in efficiency.

This view has political implications. Rationality has always been considered a basis for truly free association; when common goals emerge from debate and argument, people cooperate without coercion. Modern life has taught us how difficult it is to share goals, but efficiency too is a kind of universal value and, as such, subject to rational agreement. And as concern with efficiency spreads to more and more domains, its con-
straints supply a common framework for social life. Perhaps, the argument goes, consensus can be reached over means despite the unresolvable contention over goals characteristic of the modern world. That would at least make for a well-ordered society in which the areas of disagreement were reduced to manageable proportions. Instrumentalists therefore hold out the hope of general reconciliation—social integration—in an advanced society.

The proposal sounds innocuous in this form, but taken to the limit, it describes a technocracy in which expertise replaces citizenship as the basis of the political order. The idea has been around for over a century in one form or another, but only in the 1960s did it become the legitimation of actually existing historical states. Ideology was supposed to be exhausted; the emerging “Great Society” was to be justified by its success in delivering the goods. At that point, the critique of technocracy, already adumbrated in Dostoyevski (see Notes from Underground), was transformed from a conceit of a few literary intellectuals into a mass cultural phenomenon.

Long before this period, science fiction had articulated the fear of technocracy with particular effectiveness in stories that depicted the horrors of life in a perfectly rationalized society. At stake in “dystopias” (negative utopias) like Brave New World or 1984 is the destiny of the human spirit in a world based on scientific enlightenment. The issue is not simply the destructive misuse of scientific discoveries but the fate of individuality in a scientized world. The successful integration of modern mass society provokes a nostalgic backward glance toward lost freedoms. The isolated individualistic hero of these tales stands for the human values inevitably ground under foot by the march of reason.

From this dystopian standpoint, technical progress is not just a value-neutral increase in efficiency but a whole new way of life. This is also the view of philosophers who propose what I will call substantive theories of technology. They reject the notion that technology is neutral and argue that it is actually a distinct cultural framework embodying its own particular values. This new form of critique is present in the background of Marcuse’s work. As Heidegger put it, “The outstanding feature of modern technology lies in the fact that it is not at all any longer merely ‘means’ and no longer merely stands in ‘service’ for others, but instead . . . unfolds a specific character of domination.”

212
The grounds for substantive critique vary. Some social critics claim that technology as such is limited and biased by its Prometheanism or abstraction; others argue that technology is neutral in its own sphere but distorts essentially noninstrumental domains such as the family or the public sphere. Heidegger, Jacques Ellul, and Ivan Illich are the most prominent representatives of the first view, and they are joined by feminists who criticize modern technology as an inherently “masculinist” enterprise. Jürgen Habermas has become the best known defender of the second view. All these critics agree that technology fundamentally transforms activities hitherto regulated by tradition and human values, so much so that its specific accomplishments matter little by comparison. The content of the choices made under the rule of efficiency is less important than the fact that efficiency criteria play a role in making those choices. That in itself creates a new kind of society, not simply a streamlined version of the old.

The flavor of these various theories can best be gathered from Heidegger, who was in fact Marcuse’s teacher. Consider, for example, his formulation of the distinction between traditional tools and modern technologies. As noted before, means are supposed to operate not on the substance of desire but on the pace, scale, and conditions of its fulfillment. But beyond a certain point, changes in pace, scale, and conditions transform means into contexts independent of the particular ends they serve. Heidegger called this the “giganticism” of modern technology.

A city traversed by freeways is not the same place as the old pre-automotive urban center. This obvious fact indicates the limits of the neutrality of technology. Of course, the automobile is indifferent to its driver’s destination, but it requires infrastructural preconditions in order to be operated at all. Supplying those preconditions actually reshapes the world in which destinations are chosen, transforming fields and neighborhoods into roadbeds. This example is characteristic: What in modern societies we call progress in efficiency is precisely the employment of means with such massive impacts. Our world is in the grip of them, “enframed,” in Heidegger’s terms.

Now it is true that premodern artifacts are also occasionally gigantic—for example, late medieval architecture. But they usually leave nature as they found it, and their social reach depends less on their technical than on their symbolic power. Today the sheer size and pervasiveness of our
machines makes it impossible to confine their effects to particular applications. Devices that were supposed to transparently realize preexisting ends have become so massive that they assault the natural landscape and impose their own requirements on the human beings they were made to serve. Tradition can flourish in the shadow of a Gothic cathedral, but not under a freeway overpass.

Thus, modern means already change the world “immanently,” independent of the purpose for which they are employed. Our tools have become the environment in which we live; increasingly, we are incorporated into the apparatus that we have created, and we are subordinated to its rhythms and demands. Heidegger called this the “peril” of the age.

Radical Critique of Technological Society

Dystopian literature and the substantive critique of technology opened the space within which we speculate today about the meaning and nature of modernity. From them we learn that we are inside the machine, that technology is not merely a tool extending our capabilities. This realization is a necessary condition for understanding contemporary culture.

Traditional Marxism, if not Marx himself, appears hopelessly beside the point in this context. However, radical social criticism does not disappear as technology advances but instead becomes ever more uncompromising and eventually inspires resistance to the dystopian universe it denounces. The Frankfurt School, and especially Marcuse, enjoyed real popularity in the one-dimensional society that, it charged, had made critique all but impossible. Both the American and German New Left were influenced by its dystopian perspectives. Somewhat later, after the May events of 1968, French social theory also turned antidystopian in the work of Deleuze and Foucault. Today’s “new social movements” grew out of these currents of the 1960s and 1970s.

Although strongly influenced by substantive critique, Marcuse and Foucault did not despair of the future in technological societies. Rather than identifying an essence of technology that condemned human beings eternally to servitude, they sought historical causes for the undesirable effects of technical progress. They concluded that technology-based domination is contingent and might be overthrown in a process involving not
only political change but also fundamental shifts in the form of rationality.

This approach marked a sharp break with traditional Marxism. Marxists had denounced capitalism as inefficient; the new radicals rejected the authoritarian consequences of the very pursuit of efficiency in modern societies. These societies, they claimed, have made a bargain with the devil: their increasing order and prosperity are invariably accompanied by new forms of control from above. That control does not depend on traditional social distinctions in status, wealth, age, or gender but employs social technologies of training, therapy, medicine, advertising, management, administration, etc. The new authority system is rooted in the gap between the operators of these technologies and their human objects.

The nexus between efficiency and authority suggested to Marcuse a new interpretation of Marxism as an antidystopian critique of rationality. This in turn led him back to the work of Weber, the great theorist of rationalization, whose conception of modernity was influenced by Marx but who probably did more than anyone to dash hope in a socialist solution to its problems. Weber defined modernity in terms of the spread of markets, formal law, democracy, bureaucracy, and technology. He called these “rationalized” institutions because they share certain qualities normally associated with reason: They appear more abstract, more exact, more value- and context-free, better grounded in scientific knowledge, and more efficient than traditional institutions.

Weber founded an influential sociological tradition in which the notion of rationality has continued to play a central role. In the work of Talcott Parsons, for example, history culminates in the substitution of “universalistic” values for older “particularistic” ones as science and democracy replace traditional forms of belief and politics. In the postcolonial era, theories of modernization extended the range of such arguments, cheerfully predicting the passage to modernity on a global scale. It is this view, suitably modified to take into account neoliberal economics, that has become the common sense of the West and the passionate hope of the East.

The concept of “formal rationality,” which was the distinguishing trait of modernity in the work of Weber and his successors, suggests a pejorative evaluation of the “irrationality” of tradition. Although rationality/modernity has not eradicated inequality and injustice, liberals and most
Andrew Feenberg

Marxists split with dystopian radicals over the cause: Is it the incomplete rationalization of modern societies a consequence of such rationalization that has occurred? Marcuse defended the latter view and in the process called attention to aspects of Marx's thought that had been largely forgotten.

Traditional societies do not hide the substantive consequences of the exercise of authority, the inequalities it inevitably creates, the favoritism that is its prerogative. But modern formal rationality serves similar social purposes under an appearance of neutrality. No longer does the monarch decide fates by tipping his fan toward this or that subject. Instead, purely objective criteria, such as examinations, hearings, or measurements, discriminate between individuals. Markets know no persons but only commodities and money. Scientific and technological discovery depends on objective proof, not subjective preferences. Yet science and technology form the basis of a new type of social hierarchy in which new inequalities in the distribution of social power replace the traditional order.

It was Marx who first discovered how to construct an effective critique of this new hierarchy. He argued that markets are not merely neutral mediators between those who have and those who need; their generalization submits society to a new power, the power of capital. What is true of markets is equally true of the labor process. Capitalism reshapes production technology to reinforce its control of workers. Marx argued that external supervision of work only emerges when ownership and management are separated from the work itself. Soon discipline is tightened through deskilling labor, i.e., replacing skilled workers performing traditional crafts with unskilled workers each of whom performs a tiny fraction of the whole job. In the industrial era, control functions are transferred to machines, the design of which is determined by the preexisting division of labor and authority into which they are inserted. Mechanization finally perfects the hitherto clumsy, personalized techniques of industrial discipline by objectifying the split between conception and execution.16

Marcuse concluded from Marx's analysis that the capitalist technical system is not universal but reflects particular class interests.17 Needless to say, it was not a conclusion many Marxists reached before the 1960s. Marcuse was one of the first to take this dimension of Marx seriously. He argued that science, technology, and indeed all the formally rational, supposedly neutral structures of modern society are politically biased. He
The Critique of Technology

emphasized the practical dimension of what are usually taken to be essentially theoretical activities, such as scientific and technical research. If one sees modern rationality as a social activity, then it is plausible to ask what else this activity entails besides the pursuit of pure knowledge. The answer to this question tells us something important about how power is accumulated and applied in modern societies through the acquisition and control of knowledge and technology.

Why does formal rationality have such consequences once it escapes the narrow confines of natural science and technique and begins to shape a whole society? Marcuse argued that in splitting up its objects analytically into manipulable parts a rationality of this type predestines these objects to domination. Hence the organization of advanced societies around such a rationality is politically loaded. This can be seen in the very structure of Weber’s theory of rationalization. Weber never questioned the extension of formal rationality from technology to administration. It did not occur to him that there might be a more appropriate form of rationality for handling human relations than technical control. In this regard, he uncritically adopted the capitalist point of view. As Marcuse concluded, “The highly material, historical fact of the private-capitalist enterprise thus becomes . . . a formal structural element . . . of rational economic activity itself.”

Weber smuggled a whole system of domination into his definition of rationality. Today, what Marcuse called a one-dimensional society extends the same sort of mystification to an ever-larger number of rationalized spheres, including leisure, education, sexual life, and so on.

Here we have the intuition that informs Habermas’s theory of the “colonization of the lifeworld.” Modern societies are threatened by the measureless expansion of technically rational means, a process that is not itself rational because it obliterates the all-important distinction between the communicative and the technical dimensions of human experience. Unlike Marcuse, Habermas was no critic of science and technology per se, rejecting only their institutionalization as the foundation of a total social order. He argued that this totalization of technique is irrational even though our society’s sciences are true and its technologies neutral.

Despite his success in reviving critical Marxism and undermining rationalistic justifications of social hierarchy, Marcuse lacked an adequate account of how change might be brought about. Although sometimes ac-
Andrew Feenberg

Cursed of technophobia, he never called for the dismantling of modern industrial society. On the contrary, he argued that

if the completion of the technological project involves a break with the prevailing technological rationality, the break in turn depends on the continued existence of the technical base itself. For it is this base which has rendered possible the satisfaction of needs and the reduction of toil—it remains the very base of all forms of human freedom. The qualitative change rather lies in the reconstruction of this base—that is, in its development with a view of different ends. . . . The new ends, as technical ends, would then operate in the project and in the construction of the machinery, and not only in its utilization.\textsuperscript{21}

But how can this be achieved? Marcuse advocated uncompromising opposition to racist violence and imperialist war, but nothing comparable makes sense in the technical sphere. He occasionally mentioned such notions as the “long march through the institutions” and working within the “interstices” of the system, but he never developed them in any detail or applied them to technology. Marcuse’s most explicit remarks on the transformation of technology consist in interesting but very abstract claims for aestheticizing the technical sphere.\textsuperscript{22}

Thus his critique of capitalist technological rationality contained a kind of promissory note on which he failed to deliver. We ought to be able to extract an alternative theory of rationality from it that would show how human values could be incorporated in the very structure of technicity. Unfortunately, his gestures in this direction were so sketchy that they cannot easily be linked to any concrete practice. And as practical attempts to grapple with technology in fact proliferate, this flaw seems more and more fatal. Nevertheless, there are certain recent theoretical shifts that may help to carry the critical movement Marcuse did so much to initiate beyond the limitations of his position.

Interactive Strategies of Change

The dystopian model inspired what Marcuse called a “Great Refusal” of advanced industrial society, but today the idea of such uncompromising
opposition rings false. Notwithstanding the growing distrust of technocracy, dependence on technology continues to increase. There is no disguising the alienation but no getting away from the system, no psychic or political retreat from which to assemble and mobilize the disalienating energies of a subject of history. What is more, the breakdown of faith in rationality, already apparent in Marcuse, has proceeded much further in the work of Foucault and the recent constructivist sociology of science and technology. Thus we are drawn to a different type of strategy that plays on the tensions in modernity. The aim is not to destroy the system by which we are enframed but to alter its direction of development from within through a new kind of technical politics. Such strategies have appeared both globally and locally. They characterize certain non-Western encounters with modernity (e.g., the Japanese) and are also beginning to appear in the West itself, most obviously around environmental problems but also in domains such as computers and medicine in which the technocratic conception of modern life is increasingly contested by what I call an interactive politics of technology.23

Foucault's critique of the social limits of rationality is one of the key theoretical innovations that lies in the background of current technical struggles. Foucault claimed that the imposition of a rational order gives rise to "subjugated knowledges": particular, local standpoints from which the dominated perceive aspects of reality obscured by the universalizing standpoint of the hegemonic sciences.24 These subjugated knowledges offer a basis for progressive change. Thus like Marcuse, Foucault distinguished at least implicitly between a particular form of hierarchical rationalization, which was characteristic of modernity until now, and a variety of subversive rationalizations adapted to a more humane and democratic society.25 However, Marcuse's critique aimed at total transformation; Foucault called only for new forms of local action without any overall plan.

Although apolitical so far in its brief history, constructivism in the sociology of science and technology offers support for Foucault's position by linking all types of scientific-technical achievements to a social background. Roughly sketched, the constructivist argument holds that the route from a bright idea to a successful application is long and winding, strewn with inherently viable alternatives abandoned for reasons having more to do with local circumstances than with the intrinsic technical su-
priority of the final choice. This position marks a sharp break with instrumentalism, which generally assumes that technical development provides uniquely efficient solutions to clearly defined problems rooted in basic human needs. In this view, social factors intervene in the technical sphere only marginally, deciding, for example, the pace of development or the priority assigned to different types of problems. Constructivism argues, on the contrary, that development involves negotiation and struggle between a variety of social interests with different conceptions of both problems and solutions. The choice of each gear or lever, the form of each circuit or program, are determined not just by an inherent technical logic but by some configuration of social agents and their culturally specific needs. At issue is not simply the pace of technical progress or who benefits from it but the very content and meaning of progress itself.

Constructivism is a “network” theory of technical development that exposes the reciprocal relations and interconnections between social alliances and technical systems. It counts among significant technological actors not merely inventors and engineers but also managers, workers, government agencies, consumers, users, everyone involved with technology. Effective alliances are bound together by the very structure of the artifacts they create, which provide in turn a kind of platform for further activities.

Technology is neither the neutral tool of instrumental theory nor the autonomous power of substantive theory but is just as social as other institutions. If this is so, it should be possible to give a precise account of the social dimension of technology and hence its role in modern hierarchies, which are supported by networks of technical artifacts and associated practices rather than by myths and rituals, or by ideologies and the exercise of coercive power, as in premodern societies. This would be the ultimate refutation of one-dimensionality: the illusion that there is a unique form of technical rationality that sanctions domination under the rule of efficiency.

But most constructivist research is so narrowly focused on the specific local groups involved in particular cases of technological development that it lacks any sense of the larger social context in which these cases may play a politically significant role. And as Donna Haraway remarks, studies in the history of science and technology are distorted by the view, now widely accepted, that the break with positivism was due to a purely
internal scholarly evolution beginning with Kuhn. She notes that this ignores the contributions of the various antitechnocratic struggles of the 1960s and, I would add, of radical thinkers such as Marcuse.23 Ironically, the currently dominant social theory of science and technology seems to have no grasp of the social conditions of its own credibility.

Yet precisely because the rise of constructivism is so closely, if unconsciously, linked to increased resistance to the dominant technological institutions of our society, it can help to sharpen oppositional thinking about technology. Both Foucault and constructivism focus on what makes the “System” a system, on the manifold ways in which it integrates human beings into the technological conditions of their social reproduction. This analysis suggests strategic possibilities Marcuse overlooked.

In the 1960s, the conception of resistance was shaped by peak struggles and large-scale simultaneous political mobilizations, such as May 1968, the waves of urban rioting in the United States, and the national student strike against the invasion of Cambodia. In this context, the struggle against technocratic oppression was conceived in terms drawn from the history of political revolutions. Technology was the enemy in the way the state had been in an earlier era; to revolt was to reclaim humanity against the machine.

Today’s political movements are dispersed across traditional boundaries between the political, the social, and the personal. Arguably, today more people than ever before are actually influenced by the Left regarding issues of race, gender, and the environment. But simultaneous mobilizations have become few and far between in the advanced capitalist world. At the same time, we have learned to recognize politics in small interventions that modify the life environment without directly confronting the state. This approach is sometimes called “micropolitics,” a situational politics based on local knowledge and action. It presupposes no overall strategy, no global challenge to the society, only a multitude of converging activities that have long-term subversive impact.

Although it is surely not a sufficient response to all the manifold problems of our society, micropolitics has promise in the technical sphere because it is particularly difficult to conceive totalizing strategies there. It describes new forms of concrete political protest that aim to transform technologies one by one through pressure from the grass-roots activities of users, clients, victims. This is rather different from Marcuse’s view. He
Andrew Feenberg concluded that technologically advanced societies were so successfully integrated that opposition could only come from their margins, for example, from minorities, students, or the Third World. By contrast, technical micropolitics is based on the assumption that marginality is one aspect of everyone's condition in a technological society. Opposition must be "immanent," implied somehow in the very contradictions of the system. The way out must be a way through.

Micropolitics works because the technical environment of our daily lives is not the inhuman oppressor we imagined it to be in the 1960s, but a "soft machine," a loosely organized and highly vulnerable structure that includes us. Although we are integral parts of a social machinery and cannot separate ourselves from it to challenge it through the classic gestures of revolutionary politics, we are not helpless: We are discovering how to perform as inter-actors in society's technical systems.

I have studied several cases that reveal just how vulnerable technical systems are to transformation from within. However, the movements I discuss are so different from traditional political ones that they are easily overlooked. They are not based on ideologies or clienteles but on technical networks. Technocratic hierarchies are founded on such networks by restricting and channeling communication. The stakes in these struggles are thus also unexpected: not wealth or administrative power, but control of the technical procedures and designs structuring communicative practice.

Let me briefly offer three examples to concretize my argument.

1. The environmental movement has had a major impact on the understanding of technology, transforming privately held, supposedly neutral "technical" information into grist for public controversy. "Right to know" legislation, leaks from concerned technical personnel, the skillful use of publicity, such as for Environmental Protection Agency hearings, have all opened access, and corporations and government agencies are gradually losing the veil of secrecy under which they escaped responsibility for their actions in the past. Increasingly, questions of technological design in such domains as nuclear power and toxic waste disposal are subject to public discussion. As individuals redefine themselves as potential victims of pollution, they close the political circle by claiming their right to control industrial processes in which they are unwittingly involved.

2. The evolution of the computer offers a striking instance of new types
of public participation in technical development. In the past decade, two large-scale computer networks involving millions of users have been created. They are Internet, an international research network, and Teletel, the French domestic videotext network. Both networks were intended by their creators to facilitate the flow of such information as research data and airline schedules. Both networks were hacked by their users and transformed into media of personal communication. These users have literally changed the meaning of the computer as a technology and affected the type of society it is gradually creating. The strategy was not a "Great Refusal" but a subtle hybridization that gave an unexpected twist to the technical system.

3. The medical field offers abundant examples of patients modifying medical practice and technique from within the medical system itself. The revolution in childbirth education that occurred in the early 1970s resulted in significant changes in the role of women in childbirth, although these changes have been eroded by a new technological offensive in recent years. From passive patients, isolated, anesthetized, and controlled, women became for a time active participants in childbirth. More recently, AIDS patients have demanded improved access to experimental treatments and in the process have challenged the organization and rationale of clinical research. In both these instances, patients have altered their roles in the medical system, demanding information and control in ways subversive of the established technocratic hierarchy of medicine.

It may seem that movements of the sort described here result merely in dystopian co-optation, since they do not extract us from the machine and restore our autonomy. No doubt certain values and spheres of life need to be saved from pointless technologization, but general hostility to technology is not only futile but disarms any less totalizing critique. The new interactive politics of technology, on the contrary, reveals the human implications of different technological designs and strategies of development. It defines us as moral and political subjects in the midst of the devices and systems that form our daily environment and shape our future. From that standpoint, the demand for communication represented by these movements is so fundamental that it can serve as a touchstone for a concept of politics adequate to the technological age.

Although Marcuse was right to argue that technical networks of the sort constructed everywhere by advanced societies expose their members
to new forms of control, these networks are themselves exposed to transformation by the human groups they enroll. We are interactive subjects in the midst of our technologies, where we represent their still unrealized potential. Immanent resistances arising in the technical sphere are significant bearers of new values, imposing a new form on technical institutions. These transformations can accumulate and build on one another, altering the direction of development and resolving the dystopian crisis.

Notes

12. Foucault also developed a critique of the social limits of dystopian rationality in the 1970s. He analyzed the technical basis of social domination in several different institutions and concluded that industrial alienation is a variation on a more general cultural theme: the emergence of a “disciplinary” society. In that society, science and technology are not simply instrumental but play their part in the institutionalization of new forms of social hierarchy. See Michel Foucault, *Discipline and Punish*, trans. Alan Sheridan (New York: Vintage, 1979), 221. For a comparison of Foucault and Marcuse, see Feenberg, *Critical Theory of Technology*, chap. 4.
13. Weber's concept of rationalization is ambiguous. On the one hand, he frequently writes as though modern societies were in fact more rational than their predecessors. This is the Enlightenment view according to which modern methods are better than traditional ones and modern individuals are free from the ancient prejudices of their ancestors, better informed and educated, and so on. But on the other hand, Weber seems to say that "rationality" attaches more to the sociologists' "ideal-type" of modern society than to its messy realities. See Weber, The Methodology of the Social Sciences, trans. Edward A. Shils and Henry A. Finch (New York: The Free Press, 1949), 39. And he worries that bureaucratic rationality becomes increasingly ritualized with time. Weber concluded that we are headed not toward enlightenment but toward "mechanized petrification" interrupted periodically by charismatic convulsions. Weber, The Protestant Ethic and the Spirit of Capitalism, trans. Talcott Parsons (New York: Scribners, 1958), 182.


18. Ibid., 212.


20. Habermas's position on the neutrality of technology has by now worn pretty thin. But when he first proposed it, so strong was the prejudice in favor of instrumentalism that a number of critical theorists followed him in beating a hasty retreat from Marcuse's daring call for a reform of scientific-technical rationality. Recent work in social constructivism, described later, finally brings this episode to a close by removing any reason to concede the autonomy and neutrality of scientific-technical rationality.


23. For a theory of cultural influences on technology, see Don Ihde, Technology and the Lifeworld (Bloomington and Indianapolis: Indiana University Press, 1990), chapters 6 and 7.


