

*CRITICAL
THEORY
OF
TECHNOLOGY*

ANDREW FEENBERG

CRITICAL THEORY OF TECHNOLOGY

CRITICAL THEORY OF TECHNOLOGY

ANDREW FEENBERG

New York Oxford
Oxford University Press
1991

P05165

Oxford University Press

Oxford New York Toronto
Delhi Bombay Calcutta Madras Karachi
Petaling Jaya Singapore Hong Kong Tokyo
Nairobi Dar es Salaam Cape Town
Melbourne Auckland

and associated companies in
Berlin Ibaden

Copyright © 1991 by Oxford University Press, Inc.

Published by Oxford University Press, Inc.,
200 Madison Avenue, New York, New York 10016

Oxford is a registered trademark of Oxford University Press

All rights reserved. No part of this publication may be reproduced,
stored in a retrieval system, or transmitted, in any form or by any
means, electronic, mechanical, photocopying, recording, or otherwise,
without the prior permission of Oxford University Press.

Library of Congress Cataloging-in-Publication Data
Feenberg, Andrew.

Critical theory of technology / Andrew Feenberg.
p. cm. Includes index.

ISBN 0-19-506854-8.—ISBN 0-19-506855-6 (pbk.)

1. Technology—Philosophy. 2. Critical theory. I. Title.
T14.F43 1991 601—dc20 90-24412

Coventry University

3 5 7 9 8 6 4 2

Printed in the United States of America
on acid-free paper

PREFACE

Must human beings submit to the harsh logic of machinery, or can technology be redesigned to better serve its creators? This is the question on which the future of industrial civilization depends. It is not primarily a technical question but concerns a fundamental issue in social philosophy: the neutrality of technology and the related theory of technological determinism. If technology is neutral, then its immense and often disturbing social and environmental impacts are accidental side effects of progress. Much current debate polarizes around the question of whether these side effects outweigh the benefits. The advocates of further progress claim "reason" as their ally while the adversaries defend "humanity" and "nature" against machines and mechanistic social organizations. The stage is set for a struggle for and against technology.

The *Critical Theory of Technology* rejects this alternative and argues that the real issue is not technology or progress per se but the variety of possible technologies and paths of progress among which we must choose. Modern technology is no more neutral than medieval cathedrals or the Great Wall of China; it embodies the values of a particular industrial civilization, especially those of elites that rest their claims to hegemony on technical mastery. We must articulate and judge these values in a cultural critique of technology. By so doing, we can begin to grasp the outlines of another possible industrial civilization based on other values. This project requires a different sort of thinking from the dominant technological rationality, a critical rationality capable of reflecting on the larger context of technology. I address these issues from several different angles in the chapters that follow.

The Introduction defines critical theory of technology and situates it in relation to other approaches to technology. Part I argues that for all its insight Marx's critique of industrialism lacks a plausible strategy of change. The historical experience of communism shows that states are not the primary agents of radical technological transformation, as Marx believed. Part II addresses the alternative in a discussion of the relationship of human initiative to technical systems, both in general and specifically in the field of computers. Since modern hegemonies are increasingly organized around technology, this relationship is central to the exercise of political power. Part III considers the larger cultural

context of technological change. Too often technology and culture are reified and opposed to each other in arguments about the "trade-offs" between efficiency and substantive goals such as participation or environmental compatibility. A better understanding of the relation of technology and culture dissolves these apparent contradictions. The Conclusion develops this argument further through a discussion of technology's democratic potentialities. Although suppressed today, these potentialities may become the basis for a society that reconciles wider freedoms with more meaningful forms of material well-being.

* * *

Portions of this book are adapted from the following articles with the permission of the publishers: "Transition or Convergence: Communism and the Paradox of Development," in Frederick Fleron, ed., *Technology and Communist Culture* (Praeger Publishers, 1977); "Technology Transfer and Cultural Change in Communist Societies," *Technology and Culture*, April 1979; "The Bias of Technology," Pippin, Feenberg, Webel, eds., *Marcuse: Critical Theory and the Promise of Utopia* (Bergin & Garvey Press, 1987); "The Ambivalence of Technology," *Sociological Perspectives*, Spring 1990; "The Critical Theory of Technology," *Capitalism, Nature, Socialism*, Fall, 1990; "Democratic Socialism and Technological Change," in P. Durbin, ed., *Philosophy of Technology: Broad and Narrow Interpretations, Philosophy and Technology*, Vol. 7 (Dordrecht and Kluwer, 1990); "Post-Industrial Discourses," *Theory and Society*, 1990. Reviewers for these journals gave me much good advice. Chapter 4 is based on a paper written with Andreas Huyssen and presented in 1980 to the conference on the "Rhetorics of Technology," Center for the Study of Linguistics and Semiotics, University of Urbino. We received precious help from Michel de Certeau in the preparation of that paper.

The first essays on which this work is based were written at the suggestion of Frederick Fleron, Jr. I am grateful to him for introducing me to the problems treated here. Gerald Doppelt read through so much of the background material to this book over the years that it is impossible to thank him enough for his many contributions. The complete manuscript was read by Robert Pippin, Marc Guillaume, Douglas Kellner, James Merod, and Mark Poster. Their comments, especially those of Pippin and Guillaume who discussed their impressions with me at length, have made a great difference in the final result. My wife, Anne-Marie Feenberg, also read everything and helped me to better formulate my

ideas. Matthew Robbins's editorial advice was invaluable. I am more grateful than I can say to my assistant throughout this project, Yoko Arisaka. Individual chapters, in various stages of disarray, were read by so many colleagues over the years that I fear I will overlook some here. In any case I want to thank Ellen Comisso, Frank Cunningham, Jean-Pierre Dupuy, Henry Ehrmann, David Harvey, Sharon Helsel, Martin Jay, Kathleen Jones, Michael Levin, Robert Marotto, James O'Connor, Thomas Rockmore, and Langdon Winner. Thanks are also due to Ruth Heifitz, Paul Thomas, and Sandra Dijkstra.

This book was written at the Western Behavioral Sciences Institute where I have enjoyed the encouragement and support of Richard Farson over the years. I would like my gratitude to WBSI to extend also to the staff with whom I have worked on many projects that brought me a practical understanding of the nature of technology. The patience of my colleagues in the Philosophy Department at San Diego State University is once again warmly acknowledged.

La Jolla, Calif.

A. F.

CONTENTS

1. Introduction: The Parliament of Things, 3

- Technology and the End of History, 3
- Instrumental and Substantive Theories of Technology, 5
- Technology Bound and Unbound, 8
- Critical Theory of Technology, 13
- Civilizational Change, 15
- The Critical Alternatives, 18

PART I MARXISM

2. Minimalist Marxism, 23

- Exploitation or Domination, 23
- Labor Process Theory, 25
- Three Critiques of Technology, 30
- The Preconditions of Socialism, 36
- Critique and Transition, 39

3. Contradictions of the Transition, 42

- The Concept of Ambivalence, 42
- From Social to Political Revolution, 45
- The Origins of "Substitutionism", 50
- Rethinking the Transition, 55
- Technical Politics, 57
- The Limits of Marxism, 60

PART II ACTION

4. The Bias of Technology, 65

- Means and Ends, 65
- Marcuse and Foucault, 68

- Dystopian Paradoxes, 72
- The Technical Code, 78
- Technological Figurations, 83

5. Postindustrial Discourses, 91

- The Ambivalence of the Computer, 91
- Automation and Ideology, 93
- Computers, Communication, and Artificial Intelligence, 96
- Toward a New Paradigm, 101
- The Myth of Automatism, 108
- Technology and Finitude, 111

PART III CULTURE

6. The Dilemma of Development, 117

- The Thesis of Convergence, 117
- Technological Determinism, 121
- The Cultural Perspective, 127
- The Soviet System, 131
- A Pluralistic Model of Change, 134

7. The Promise of Civilizational Change, 140

- The Transition to Socialism, 140
- Ethics and Economics, 143
- Technology and the Distribution of Culture, 148
- Socialization, 151
- Democratization, 154
- Innovation, 157

PART IV CONCLUSION

8. The Critical Theory of Technology, 163

- The Critique of Scientific-Technical Rationality, 163
- Reason and Domination, 166
- Toward a Successor Techno-Science? 171

Habermas and the Neutrality of Technology, 176
The Theory of Formal Bias, 179
Decontextualizing Practice, 183
The Dialectic of Technology, 188
The Concretization of Technology, 191
Forward to Nature, 195

Notes, 199

Index, 225

4

The Bias of Technology

Means and Ends

Instrumentalist theory of technology (in both its Marxist and non-Marxist forms) shares the common sense assumption that the subject of action—for example, the socialist state—can be defined independently of its means. But in reality subjects and means are dialectically intertwined: the carpenter and the hammer appear accidentally related only so long as one does not consider carpentry as a vocation shaping the carpenter through a relation to the tools of the trade. Hence, the division of labor is a civilizational issue, affecting not merely workers' productivity and working conditions but their very identity.

The dialectic of subjects and means is still more obvious in the case of collective action: the army is not merely accidentally related to its weapons, but is structured around the activities they support. Similarly, the school does not "use" its teachers or their knowledge as means to its educational goals, but is constituted qua actor by these "means." In such cases, the agent *is* its means of action viewed from another angle; they are not accidentally related.

If this is true, socio-technical transformation cannot be conceived in terms of instrumental categories because the very act of using technology reproduces what is supposed to be transformed. Hence the well known limitations of liberal management techniques such as job enrichment and quality circles. This is the *paradox of reform from above*: since technology is not neutral but fundamentally biased toward a particular hegemony, all action undertaken within its framework tends to reproduce that hegemony.¹

Traditional Marxism founders on this paradox. It claims that a workers' state can instrumentalize the inherited technological base in the creation of a new republic of skill. But this program involves a conceptually incoherent interaction between a social actor and the very division of labor which forms it as such in the first place. A similar contradiction

refutes the claim that "postindustrial" capitalism will evolve spontaneously into a participatory, skill-oriented society. Both authoritarian socialism and reformist capitalism can release tendencies toward a new organization of society only within the rather narrow limits of the conditions for reproducing top down control. But what alternative is there to these discredited formulations? How can social actors alter the system which defines their very being?

The previous chapters suggested an answer to these questions in terms of new theories of design, ambivalence, and technical politics. These theories are based on the notion that technologies "condense" social and technical functions. The design critique explains this condensation as it affects technologies shaped in the past by the power of the ruling groups, while the theory of ambivalence asserts that technical features primarily determined by a social function are subject to political change. Technical politics embraces both prerevolutionary resistance to the dominant technological system and action to change its inheritance under socialism. In the conception sketched above, socialist rule might create a more favorable political environment but would not by itself resolve the tensions in the industrial system. These can only be grasped from "within," by individuals immediately engaged in technically mediated activities and able to actualize ambivalent potentialities previously suppressed by an authoritarian technological rationality.

Ideas such as these could have provided the basis for understanding the transitional role of workers' councils in the period after World War I. Today, adapted to a situation in which technology is no longer just a labor issue, these ideas can still revive the critical theory of society. The purpose of this chapter is to reach a coherent formulation of this radical alternative to instrumentalist versions of Marxism.

As we have seen, Marx's design critique agrees with the substantive theory of technology that machines and artifacts embody values. But there is an important difference. Substantive theory identifies the values embodied in current designs with the essence of technology as such. From that standpoint, the transitional employment of inherited technology would simply reproduce the civilization that created it. But because the Marxist design critique relates these values to a specific hegemony, it implies the possibility of changing them. This is where the theory of ambivalence fits in.

The major attempts to work out a critical theory of technology are to be found in the early Marxist Lukács, the Frankfurt School, and Foucault. For reasons that will be explained, they treated technology

as an expression of the historical development of rationality, and reconceptualized social conflict as the result of internal tensions in the current paradigm of rationality. The idea of internal tensions promises to fulfill Marx's original hopes for a theory of social revolution, but it needs a great deal of further refinement before it can replace instrumentalist notions of political change.

In Lukács's theory of social revolution, working class consciousness is in itself a new form of historical practice. According to Lukács, workers transcend the reified structure of their class being by becoming socially self-conscious, and as they do so, their place in society is ipso facto altered. The theory can be generalized in a way that has interesting implications for our understanding of contemporary struggles over gender and race. To the extent that social subjects distance themselves from their roles, they can withdraw from the commonly accepted practices which flow from and reproduce those roles. In this way they become available for political action through a more fundamental reflexive practice of self-definition which itself achieves the most important social change of all. Applied to the technical relation, this account suggests a theory of resistance that overcomes the fatalism of substantive theory without falling back into naive instrumentalism.²

But to the extent that later theorists lose Lukács's confidence in working class revolution, they find it difficult to present a convincing case for such immanent resistances to technological society. For example, both Marcuse and Foucault conceive society as a gigantic machinery regimenting its members. Presumably, liberation depends on reversing the balance of power between repressive system and individual resistance. But whether and how this is possible remains unclear. Marcuse wavers between instrumental and substantive interpretations of his "one-dimensionality" thesis, and Foucault's theory of resistance is vaguer still. There is, furthermore, a methodological confusion here: individual and society are not distinct "things" located on the same ontological level and interacting with each other.³ A coherent conception of radical change must identify contradictions and potentialities traversing both society and its individual members in ways specific to each. This is the promise of the theory of ambivalence as developed in the following pages.

Despite these problems, Marcuse and Foucault have presented the most powerful accounts of modern forms of technological domination. I will examine their formulations of critical theory in the next two sections, and extend them in an account of radical change in the remainder of this chapter.

Marcuse and Foucault

Marcuse formulated his theory of technological rationality under the influence of and in reaction against the Weberian theory of rationalization. Weber distinguished two different types of rationality corresponding to two different types of social thought and action.⁴ Rationality is "substantive" to the extent that it realizes a specific value such as feeding a population, winning a war, or maintaining the social hierarchy. The "formal" rationality of capitalism refers to those economic arrangements which optimize calculability and control. Formally rational systems lie under technical norms that have to do with the efficiency of means rather than the choice of ends.

Weber's concept of the "rationalization" of modern societies refers to the generalization of formal rationality at the expense of traditional substantively rational modes of action. This is a cultural change with important social consequences. Weber recognizes that rationalization is favorable to the ambitions of capitalists and bureaucrats, who rise to the top in any rationalized society. Yet he wants us to believe that only substantive rationality contains valuative biases, that formal rationality is in itself value-free.

Weber's sociology of rationality appears to open a whole new field, but no sooner does he offer us a glimpse of this exciting realm than he shuts the door. Substantive rationality remains a vague, practically contentless concept, while Weber's attention is focused on formal rationality which, because it is value-free, is not really subject to sociological explanation.

It is puzzling that the generalization of a neutral form of rationality should produce a socially biased outcome. Today, in a completely rationalized society, this puzzle is no longer just a scientific curiosity. As technical mediations spread into every nook and cranny of social life, mastery of the machine becomes the principle source of power. Is it simply an accident of "progress" that rationalization concentrates that power in a few hands?

Technological Rationality

The critical theory of technology is suspicious of the advantages the beneficiaries of technological advance derive from the claim that, like justice, technology is socially blind. This suspicion motivates Marcuse's attack on Weber. Marcuse argues that the prevailing forms of technology are subject to the same sort of demystifying critique that Marx applied

to the market. Like market rationality, "technological rationality" constitutes the basis for elite control of society. That control is not simply an extrinsic purpose served by neutral systems and machines but is internal to their very structure. The concept of technological rationality

presupposes the separation of the workers from the means of production [as] a *technical* necessity requiring the individual and private direction and control of the means of production. . . . The highly *material*, historical fact of the private-capitalist enterprise thus becomes . . . a *formal* structural element of capitalism and of *rational* economic activity itself.⁵

Technological rationality is indelibly marked by the presupposition that production requires social domination. The trace of this presupposition can be found in economic thought, managerial methods, and the very design of technology. The concept of "efficiency," for example, is usually applied against a background of unexamined sociological assumptions about worker resistance to work. The point is not that these assumptions are false; they are often true, the result of unquestioned structures of ownership and control that exclude workers from any interest in the firm, resulting in difficult problems of labor discipline. But insofar as this background is ignored or suppressed, the concept of efficiency becomes ideological in the application.

The concept of technological rationality expresses the condensation of social and technical functions implicit in Marx's design critique of technology. It explains how rules and procedures that achieve a certain kind of universality may also represent private interests through the assumptions that form their horizon. The presence of social interests is overlooked because they are not expressed in orders or commands, but are technically embodied, for example, in apparently neutral management rules or technical designs.

One-Dimensional Man discusses the ideological function of this capitalist-distorted rationality. Marcuse argues that it is not just biased in its operational employment, but also legitimates social domination. This carries us well beyond the original Marxian critique of the technical inefficiency of capitalism. Marx believed that alienation was not only inhumane but was also an obstacle to the growth of the productive forces; therefore, the normative demand for a more humane society was congruent with the purely technical goal of increasing productivity. Marcuse argues that the economic success of contemporary capitalism has invalidated Marx's position. Technological rationality no longer serves, as it still did for Marx, as the basis of a critique of the relations of

production, but becomes the legitimating discourse of the society. Habermas summarizes this aspect of Marcuse's theory:

At the stage of their scientific-technical development, then, the forces of production appear to enter a new constellation with the relations of production. Now they no longer function as the basis of a critique of prevailing legitimations in the interest of political enlightenment, but become instead the basis of legitimation. *This is what Marcuse conceives of as world-historically new.*⁶

Under these conditions, the condensation of social and technical determinations in a single technological rationality tends more and more to appear as the very definition of rationality. Not only is technical progress distorted by the requirements of capitalist control, but the "universe of discourse," public and eventually even private speech and thought, is limited to posing and resolving technical problems. "When technics becomes the universal form of material production, it circumscribes an entire culture; it projects a historical totality—a 'world.'"⁷ There is no place for critical consciousness in this world: it is "one-dimensional." The normative critique is thus forced to appear explicitly and independently; it can no longer hide behind the Marxian demand for a liberation of the productive forces. This explains why Marcuse not only attacks the dominant social interests, but also criticizes technology in a major shift away from the traditional radical faith in progress.⁸

Power/Knowledge

Marcuse's theory of rationality provides a general framework for a discussion of the condensation of technical and social functions. Once rationality is treated as a social phenomenon its concrete sociological forms are open to study. Like much of Frankfurt School social theory, Marcuse's account contains brilliant insights but remains very general. In this respect, Foucault provides a useful corrective. Although he does not appear to have been directly influenced by either Weber or Critical Theory, his approach is similar. He, too, argues that power is organized, exercised, and legitimated through forms of rationality that are open to historical investigation.

Foucault applied this approach to studying the origins of the modern social, administrative, and medical sciences in various new practices of social control that emerged more or less spontaneously from the seventeenth century on. He calls these practices "microtechniques," punctual controls that spread without any overall decision or plan. They

include examining, drilling, measuring individual growth patterns, isolating individuals for inspection, developing dossiers and files, and so on. These practices first develop in settings as diverse as armies, convents, hospitals, schools, prisons, and factories. A "disciplinary power" arises from their proliferation.

Foucault rejects the neutrality thesis: knowledge and technology are not value-free tools that may be put to good or bad use. That conception sees truth and power as two independent things that meet contingently in the moment of application. But historically, social sciences such as psychology and criminology are outgrowths of specific institutions such as hospitals or prisons. The connection between new forms of knowledge and new forms of social control is there at the origin. Foucault's clearest example of this connection is Bentham's Panopticon, an architectural solution to the problem of placing large numbers of subjected individuals under the gaze of a few supervisors. Here the glance that examines and judges reveals the "truth" in constraining its object. The "regime of truth" is the logic of this inextricable relation between knowledge and power.

This theory has a Kuhnian twist. For Kuhn, scientific paradigms include not only concepts and theories, but also standard procedures which define objects in measuring and controlling them. Similarly, for Foucault the social sciences are rooted in paradigmatic ways of observing and collecting data.⁹ But Foucault claims that in the social sciences, where the object of investigation is another human being, such procedures are not and cannot be socially neutral. For example, what the psychologist calls "observing the subject," the subject experiences as forced confinement for nonconformity to the psychologist's standards of behavior. Knowledge, at least of human affairs, is obtained through cognitive procedures that are also elementary forms of power. The dual nature of such procedures, at once cognitive and social, resembles the social/technical duality that Marcuse identifies in the repressive rationality of ostensibly neutral tools such as the assembly line.

According to Foucault, power/knowledge is a web of social forces and tensions in which everyone is caught as both subject and object. This web is constructed around techniques, some of them materialized in machines, architecture, or other devices, others embodied in standardized forms of behavior that do not so much coerce and suppress the individuals as guide them toward the most productive use of their bodies. On this account, technology is just one among many similar mechanisms of social control, all based on pretensions to neutral knowledge, all having asymmetrical effects on social power.

This explains why the social requirements of capitalism are experienced as technical constraints rather than as political intrusions. Surveillance, disciplinary power, normalization, all make possible the factory system and the capitalist society founded upon it. They "condense" technical and social functions at the level of everyday behavior, even before that functional duality is transferred to the design of machinery. Eventually these socio-technical constraints are embodied in mechanical structures that determine workers' action more effectively than rules and commands by determining their reflexes, skills, and attitudes.

The exercise of power is not added on from the outside, like a rigid, heavy constraint, to the functions it invests, but is so subtly present in them as to increase their efficiency by itself increasing its own points of contact. The panoptic mechanism is not simply a hinge, a point of exchange between a mechanism of power and a function; it is a way of making power relations function in a function, and of making a function function through those power relations.¹⁰

Dystopian Paradoxes

Although frequently accused of irrationalism, Foucault and the Frankfurt School claim to make "a rational critique of rationality."¹¹ This position implies that rationality is not singular but plural. Accordingly, they favor "isolating the form of rationality presented as dominant, and endowed with the status of the one-and-only reason, in order to show that it is only *one* possible form among others."¹² The critical theory of technology applies this approach to the analysis of technical design and so recapitulates many of the familiar problems in the wider ranging social critiques of rationality of Foucault and Marcuse. Two of these problems are discussed in this section:

1. Both Foucault and Marcuse have a difficult time sustaining our belief in the possibility of resistance even as they appeal to us to oppose the closed world they describe.
2. Neither Foucault nor Marcuse is a "nihilist" or irrationalist, yet they find it difficult to grant any sort of validity to knowledge, having demystified its social neutrality.

One-Dimensionality

Marcuse and Foucault share a system theory of capitalist alienation. Capitalists and workers are not the primary units of explanation in this

theory, but are, rather, the *bearers* of the procedures underlying the system. Workers produce capital and, in turn, "Personified capital, the capitalist, takes care that the labourer does his work regularly and with the proper degree of intensity."¹³ Capitalism is a kind of collective automaton, the parts of which are human beings organized into a self-reproducing, self-expanding web of dependencies.

We are far indeed from the classic account that explains how one group of historical actors, capitalists, gains control over another group, workers, *using* the division of labor and machinery as its instrument. On the contrary, here capitalists and workers are defined by their place in the division of labor, which is a more fundamental *structure* establishing the conditions of their existence. The ruling class is not the origin of the system of social domination but must be located in a preexisting field of instrumentalities it exploits. The emphasis here is not on the deeds and misdeeds of classes but on what Foucault calls a "machinery of power," an order of ideas and practices which creates a network of constraints and opportunities within which individual and collective subjects emerge as actors.¹⁴

Both Foucault and Marcuse support this system theory with a new conception of the relation of individual to society. Their accounts aim to show, as Foucault explains it, that power is not merely repressive but constructs a productive subjectivity in the dominated. Foucault emphasizes the role of "normalization" in achieving this result, while Marcuse has a fundamentally similar theory, the "integration" of the individual through "repressive desublimation." (Despite the ritual claims for Foucault's uniqueness and originality, this theory signifies Marcuse's abandonment of Reichian style Freud-Marxism and the introduction of a new approach to domination as the mobilization of socially constructed forms of self-expression.)¹⁵

But there is a difficulty with this position that Marcuse and Foucault do not squarely face: having abandoned naive notions of individuality and natural instinct, neither can identify the locus of resistance to the system, the flaws of which they analyze so persuasively. Their theory opens no space within which opposition could emerge; it provides no structural basis for understanding the operations in which the dominated might resist domination. Hence, they have no way to block the closure toward which the system tends, which Marcuse called its "one-dimensionality."

Foucault's overly ambitious theory of power ends in this impasse. He argues that subjects emerge as individuals through subjection to modern forms of social power. In Foucault's terminology, subjection is "sub-

jection." "The individual . . . is not the *vis-a-vis* of power; it is, I believe, one of its prime effects."¹⁶ But if subjects do not preexist subjugation, but are created by it, then the very word "power" loses any meaning because it has nothing to which to oppose itself.

Deleuze attempts to save Foucault from this difficulty by asking: "Is not the force that comes from outside a certain idea of Life, a certain vitalism, in which Foucault's thought culminates?"¹⁷ One can only hope the answer to this question is negative. The reference to an amorphous subject of resistance constituted prior either to nature or to the cultural encoding of individuality offers only a prerational basis for opposition: schizophrenia or chaos as a metaphor to political opposition.

Foucault believed for a time that a lingering dialectical prejudice explained our tendency to dismiss such spontaneous resistances.¹⁸ Presumably, if society does not form a "totality," the opposition need not be totalizing either and so need not possess a rational grasp of the whole. Foucault hoped to valorize the particularism of local struggles by abandoning the dialectical requirement that action transcend the system.

This new orientation was undoubtedly liberating for the French Left, obsessively focused on the state. But so involved was Foucault in a polemic against the Communist Party's conception of the intellectual that his spontaneist strategy ignored important aspects of his own theory. That theory not only analyzes microtechniques against which spontaneous local resistance is inevitable, but also recognizes a level of strategic coordination by hegemonies that instrumentalize and integrate the elementary forms of resistance. These hegemonies construct "metapowers," such as corporations and the state, which perpetually colonize the available microtechniques in the construction of a rationalized system of domination. Thus Foucault writes:

One must rather conduct an *ascending* analysis of power, starting, that is, from its infinitesimal mechanisms, which each have their own history, their own trajectory, their own techniques and tactics, and then see how these mechanisms of power have been—and continue to be—invested, colonised, utilised, involuted, transformed, displaced, extended etc., by ever more general mechanisms and by forms of global domination.¹⁹

To counter this constructive movement of hegemony, resistance must operate not merely on the level of microtechniques, but at the level of the metapowers. This is not a task for the unaided lifeforce.

Marcuse confronts the problem directly. He admits that most forms of resistance, vital or not, can be absorbed by the system, and that far from threatening it they contribute to its dynamism. Capitalism no longer

merely promises ideal compensations for real miseries, but "delivers the goods" to a working class that is effectively incorporated into the system. The constellation formed by authoritarian management, a technology adapted to its needs, and a ready supply of consumer products cannot be broken. The essential sources of opposition have dried up, and so Marcuse seeks validation for his critique among marginal groups, the weakness of which he acknowledges in principle. The theory subverts itself by canceling the idea of transcending action and appears to re-instate the fatalism of a Heidegger or an Ellul.²⁰

Despite his sympathy with new social movements Marcuse was never a spontaneist. Revolution requires not an end to culture and individuality but their reappropriation. It is not outside power but is a transformation operated in the field of power.²¹ Foucault himself recognizes this when he writes that "there are many different kinds of revolution, roughly speaking as many kinds as there are possible subversive recodifications of power relations."²² On these terms, "life," if indeed that is the correct word for the force against which hegemonies impose themselves, is not preindividual but represents an alternative form of individuality elaborated in a variety of social activities, not the least of which is resistance to social domination. Foucault's later work, with its emphasis on "self-mastery," appears to support this reading and draws it close in spirit to Marcuse's.²³

Irrationalism

Marcuse's critique of rationality is formulated in a dangerous flirtation with a substantive theory of technology. Marcuse approaches substantivism from Marxism by extending the critique of ideology. Traditionally that critique refutes the claim to rational universality of superstructures such as art or law, but Marcuse applies it to technology as well. When he writes, for example, that science is "political" or that technology is "ideological," he makes the strong point that "technology as such cannot be isolated from the use to which it is put."²⁴ Yet in making his point in this way, he might be taken to mean that, as ideology, science and technology are merely expressions of the interests of the ruling class. Then radical opposition would include the utopian demand that capitalist "techno-science" be quite simply junked along with capitalist politics and ideology. This is not at all Marcuse's intent. Despite his sharp criticism of "technological rationality," he still maintains the old Marxist faith in the liberating potential of the technological inheritance.

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.²⁵

As can be seen from this passage, Marcuse only avoids irrationalism by offering correctives to his strongest critical claims. Here the correctives hint at a theory of ambivalence, but elsewhere he ends up asserting the neutrality, validity, and instrumental effectiveness of science and technology despite their “ideological” character. At one point he seems to state that a computer or a cyclotron can equally serve capitalism and socialism, a truism one would expect to find in an argument *against* his views. At another point he writes that “basic needs” will continue to be served under socialism by the very “technological rationality” he condemns elsewhere for its connection to domination.²⁶ But this contradicts his claim that a reconstructed technology can contribute to freedom precisely through serving basic needs in a new way. That means a new direction for progress, not the addition of a thin veneer of “humanized” technology on the surface of a world engineered in all its essential features to the destruction of man and nature.

Marcuse’s contradictions are summed up in two brief remarks that assert with equal assurance that “technology has become the great vehicle of *reification*” and that “science and technology are the great vehicles of liberation.”²⁷ The mutually canceling formulae do actually add up to a theory, but it is buried in the interplay of the inadequate concepts used to present it. In any case, Marcuse’s rhetorical strategy is clear enough: from a variant of the Marxist position, he extracts results that one would expect from the substantivist position. He has his conceptual cake and eats it, making the strongest possible critique of technology without paying the “Luddist” price. The ambiguous results reveal the limitations of Marcuse’s approach.

Like Marcuse, Foucault strays into puzzling epistemological difficulties. He argues that “truth is a thing of this world,” and identifies power and knowledge without worrying much about the reflexive paradox into which this position precipitates his own theory: if all truth merely reflects a position of power, then Foucault’s argument appears to subvert itself.²⁸

There is a way out of this paradox, and Foucault takes it by distinguishing *power* from *domination*. Power is a kind of life force that opens perspectives on the real in Nietzschean fashion, while domination is institutional closure, premature totalization. On this account, there is a knowledge rooted in the suppressed potentialities and self-understanding of the dominated distinct from the forms of knowledge linked to domination. Thus in certain passages Foucault refers to an "insurrection of subjugated knowledges" to which his own critical work contributes.²⁹ His "genealogical method" attempts to recover the "local, discontinuous, disqualified, illegitimate knowledges" of the dominated in opposition to the "unitary body of theory which would filter, hierarchise and order them in the name of some true knowledge and some arbitrary idea of what constitutes a science and its objects."³⁰

Although Foucault's method is very different, the cognitive foundation of his critique is similar to that to which Marcuse appeals, not absolutist to be sure, but at least internally consistent in offering reasons for its claims. But because Foucault continually plays on the ambiguity of power and domination, we are never sure how far he intends to go toward a relativistic reduction of knowledge claims to political positions. Like Marcuse, Foucault's rhetorical strategy lends force to his condemnation of the established technocracy while blurring essential issues.

Marcuse and Foucault offer a persuasive account of the condensation of the social and the technical, and they propose a system theory of social action that appears more applicable to contemporary societies than the traditional Marxist class theory. But their very advances plunge them into insuperable difficulties. The theory of the bias of technical knowledge threatens rationality as a whole; the theory of social action seems to exclude resistance. Is there any way to preserve the essential insights of these thinkers while avoiding their shortcomings?

In the remainder of this chapter I will argue that Marcuse and Foucault encounter these difficulties because they lack a theory of *technological hegemony* capable of explaining the relationship of social organizations to ideology/science and power/knowledge. As a result, they fall into substantivism and immediately identify science and ideology, knowledge and power. These identifications give a particular dystopian pathos to their theories. Indeed, if the problem is knowledge as such, or the very existence of discipline, then criticism and resistance are equally hopeless. For all the rhetorical power of these images of a closed world from which escape is impossible, we can only understand independent critical knowledge of society and systematic counteraction if we abandon them. That

will require in turn a theory of those hegemonic mediations responsible for many of the problems Marcuse and Foucault appear to blame on knowledge and technology per se.

The Technical Code

Despite many ambiguities and problems, one thing is clear about the position of Marcuse and Foucault: they reject the accustomed terms of the rationalism/relativism debate and affirm *both* that rationality is integral to systems of domination *and* that it nevertheless possesses cognitive validity. Although this position appears contradictory, they finesse the difficulties with the notion that knowledge and power share a common foundation but have different destinies. For Marcuse that foundation is a method of abstraction rooted in the will to domination. His critique of that method will be discussed in the last chapter of this book. For Foucault, it is the common fund of "microtechniques" that establish both a disciplinary society and a social science and technology adapted to it.

As we have seen, neither Marcuse nor Foucault pursues this line of argument consistently. In this section, I will therefore leave behind the details of their positions to sketch a consistent application of an approach to the study of technology suggested by their work. I will call this approach a "double aspect" theory of power/knowledge or ideology/science because it treats hegemonic and cognitive functions as complementary aspects of a single underlying object rather than as externally related things.

The place to begin this discussion is with the function of rationality in modern hegemonies. An effective hegemony is one that need not be imposed in a continuing struggle between self-conscious agents but which is reproduced unreflectively by the standard beliefs and practices of the society it dominates. Tradition and religion played that role for millenia; today, forms of rationality supply the hegemonic beliefs and practices. This is the sense in which knowledge has become a kind of power, not merely a tool of those in power, *without losing its character as knowledge*. This change in the status of knowledge is rooted in distinctive structures of capitalist society.

In precapitalist societies workers had traditional tasks and established codes of self-expression; they owned their own tools and formed a natural community based on some traditional mode of appropriation. The labor process was so completely enveloped in regulations and restrictions

that precapitalist elites could only rule by escaping the economic domain entirely to exercise what Foucault calls "sovereign" power, the negative power of the state.

Capitalism frees itself from these limitations to an unprecedented degree by building workforces and markets out of atomized individuals, much like the prisons and asylums studied by Foucault but on a far wider scale. Released from all traditional rules and familial restraints, the capitalist has a great deal more freedom of action than had the leaders of traditional work groups. In Chapter 2, I called this special kind of freedom the capitalist's "operational autonomy." It is not primarily a property of actors but of organizations that exist through mobilizing an array of microtechniques.

The revolutionary significance of capitalism lies in the fact that its hegemony is based on simply reproducing its own operational autonomy through appropriate technical decisions. This is sufficient because power in modern societies can be wielded through technical control without titles of nobility or religious sanctions. The "will" that Marx identified with Jacobin "politics" is to be found here, in the expansive dynamic of modern organizations, driven ever further toward the accumulation of autonomous possibilities of action.

Operational autonomy is the power to make strategic choices among alternative rationalizations without regard for either customary practice, workers' preferences, or the impact of decisions on their households. Whatever other goals capitalists pursue, all viable strategies implemented from their peculiar position in the social system must reproduce their operational autonomy. The "metagoal" of preserving and enlarging autonomy is gradually incorporated into the standard procedures and ways of doing things, prejudging the solution to every practical problem in terms of certain typical responses. In industrial societies, strategies of domination consist primarily in embedding these constancies in technical procedures, standards, and artifacts in order to establish a framework in which day-to-day technical activity is also activity in the interests of capital.

Capitalist social and technical requirements are thus condensed in a "technological rationality" or a "regime of truth" which brings the construction and interpretation of technical systems into conformity with the requirements of a system of domination. I will call this phenomenon the social code of technology or, more briefly, the *technical code* of capitalism. Capitalist hegemony, on this account, is an effect of its code.³¹

In this sociological context, the term "code" has at least two different

meanings. First, it may signify a rule that simultaneously (1) classifies activities as permitted or forbidden; and (2) associates them with a certain meaning or purpose which explains (1). The traffic code defines permitted driving behavior by distinguishing the safe from the unsafe. Technical manuals are full of similar codes that determine the rule under which operations are to be performed in service to a variety of ends such as reliability, strength, human factors, cost efficiency, etc. It is characteristic of a bureaucratized society such as ours that we have written records of many codes regulating behavior.

The discussion of economic codes in Chapter 2 indicates a second sense of the term. That code is nowhere recorded in a manual but is implicit in behavior and attitudes, and signifies a broader range of values than the permitted and the forbidden. An act of interpretation is required to extract such a code from its various manifestations and to interpret their meaning. The prestige hierarchy of goods such as automobiles illustrates this type of implicit code: we "know" that Cadillacs are "better" than Fords, Mercedes "better" than Volkswagens. In displaying one or the other car we send a message about ourselves to others. As is clear from this example, such codes have a communicative function.

The technical code combines elements of both types. It is most essentially the rule under which technical choices are made in view of preserving operational autonomy, (i.e., the freedom to make similar choices in the future). This invariant requirement of the code is not generally explicit, although like the prestige hierarchy it can be brought to the surface without much difficulty. The goal of enhancing operational autonomy is internal to the lower level procedures of technical fields that serve the needs of business enterprises and other similarly structured organizations. Noble's account of numerical control, discussed in Chapter 2, is a clear example. As in that case, the preferred designs are usually signified as "efficient" with the class bias Marcuse identified in his critique of Weber. And since efficiency is such a widely shared value, that signification has a legitimating function which constitutes the communicative aspect of the code.

The technical code has (social) ontological significance in a society where domination is based on control of technology. It is not merely the rule under which means are chosen to achieve certain ends. Much more than that, it is the principle of organizational identity and survival. Marc Guillaume points out this connection. He defines social codes "as the ensemble of associations between signifiers (objects, services, acts . . .) and that which they signify in society, associations created or

controlled by organizations as a basis of their existence and if possible their development."³² However, in the case of the technical code, it is necessary to go beyond this formulation. To exist, organizations must "encode" their technical environment, not merely associating technology with certain signifiers, but installing these signifiers in its very structure.³³ How is this achieved? This question can only be answered by carrying the theory of the condensation of the social and the technical one step further. In the process, we will see how the double aspects of power/knowledge are reconciled in technical objects.

Everyone who works with developing technologies or studies their history discovers that they are built up from concatenations of more or less loosely connected parts. The parts themselves arise out of discoveries so basic that, although they may first have served one or another specific purpose, they can be used for very different purposes in a wide variety of contexts. Thus we distinguish between the principles embodied in technologies and the form of their concrete realization in this or that actual device.

I will reserve the term *technical element* for the specific principles, such as the spring, the lever, or the electric circuit. These are in themselves "relatively" neutral, if not with respect to all social purposes, at least with respect to the ends of ruling and subordinate social groups.³⁴ The work of discovering such elements is to some extent autonomized in the research process. Once discovered, they are like the vocabulary of a language; they can be strung together—coded—to form a variety of "sentences" with different meanings and intentions.

Individual technologies are constructed from just such decontextualized technical elements combined in a unique configuration to make a specific device. The process of invention is not purely technical: the abstract technical elements must be integrated into a context of constraints defined by their social environment. Technologies, as developed ensembles of technical elements, are thus greater than the sum of their parts. They meet social criteria of purpose in the very selection and arrangement of the neutral elements from which they are built up.³⁵

These social purposes are "embodied" in the technology and are not therefore mere extrinsic ends to which a neutral tool might be put. The embodiment of specific purposes is achieved through the "fit" of the technology and its social environment. The technical ideas combined in the technology are neutral, but the study of any specific technology can trace in it the impress of a mesh of social determinations which pre-construct a whole domain of social activity aimed at definite social goals.

Bruno Latour makes a similar point. He argues that each technology

draws together a "sociogram" of alliances of social interests around a specific configuration of technical elements, which he calls the "technogram." Latour argues that "every piece of information you obtain on one system is also information on other."³⁶ Sociogram and technogram are essentially two sides of the same coin, a particular technical configuration reflecting the needs of a particular network of users. A precise definition of a specific technology can therefore only be found at the intersection of the two systems.

The technical code of capitalism can now be defined as a general rule for correlating sociogram and technogram. The assumption that, as non-owners, workers are spontaneously indifferent to the welfare of the firm is the most important social factor that infiltrates itself into the definition of technical reason through this code. The assembly line is an excellent example of a technology influenced by this assumption. Its design fulfills the strategic objectives of an influential network of management scientists and business leaders because it is more than a tool: a strategy of technologically enforced labor discipline forms the glue that holds together the neutral elements from which it is composed. This asymmetrical effect on power is characteristic of a strategically encoded technology.

This example also illustrates the historical relativity of the process of rationalization. The assembly line only appears as technical progress because it extends the kind of administrative rationality on which capitalism already depends. It might not be perceived as an advance in the context of an economy based on workers' cooperatives in which labor discipline was self-imposed rather than imposed from above.³⁷

It is important to keep in mind that the parts of an invention like the assembly line have a technical coherence of their own which in no way depends on politics or class relations. Technology is not reduced in this example to production relations nor technical knowledge to ideology. The first term in each of these pairs has its own logic; it really *works*. But it is not merely because a technology works that it is chosen for development over many other equally coherent configurations of technical elements. Were that the case, then by analogy one could also explain the choice of individual sentences in speech by their grammatical coherence. The essentially social character of technology lies not in the logic of its inner workings, but in the relation of that logic to a social context.

This is even true of the social technologies Foucault studies. Techniques of discipline and normalization do not determine a single organization of society, but open possibilities that are disputed between dominated and dominating social groups. Foucault did not despair be-

cause, whatever the outcome of the struggle, modern societies will inevitably employ some variant of these techniques. On the contrary, his goal was to find a way "which would allow these games of power to be played with a minimum of domination."³⁸

Despite radically different purposes and institutional structures, modern sciences, technologies, and rationalized social organizations share a common foundation in the technical elements from which they are constructed. Because of this original commonality, science and technique are able to supply the hegemony they serve with the applications it requires. But the lower we descend toward the foundations of rational institutions, the more ambiguous are the elements from which they are constructed, and the more these are compatible with a variety of different hegemonic orders. This is the source of the ambivalence of technology.

The ambiguity of the elemental foundations explains why technical advance so often threatens the hegemony of the ruling groups until it has been strategically encoded. Each resolution of the original ambiguity introduces a bias, binding applications to particular hegemonic purposes. There are thus two connections between knowledge and power, technique and hegemony: first, a connection at the base, in the technical principles both employ; and second, a connection in the code which insures that they are coordinated in the application.

In Marcuse and Foucault, the relation between technical knowledge and society is unclear. Because their double aspect theory of technology is implicit, they lack an appropriate terminology in which to express it. At times they claim that technique is merely a projection of ruling class interests; at other times, they distinguish technique from such immediate reflexes of social interests as ideologies. These hesitations are an attempt to suggest the preestablished harmony of technique and hegemony without reducing one to the other.

Technological Figurations

What would it mean to make a counter-hegemonic use of knowledge or technology? How would such a use differ from the mere instrumentalization of neutral tools for new purposes? These questions concern the nature of resistance in technological societies. Modern ideas of resistance were not originally formed in reflection on the dialectic of technological subjects and their means, but in the political sphere. Political

struggle, like military struggle, lends itself to the sort of instrumentalist accounts I have criticized as inappropriate to the study of technology. In that sphere, there are no clear "sides" in struggles for identity that stretch all parties between their own contradictory potentialities.

Perhaps the old idea of class conflict is no longer viable, but neither is the ambiguity of modern social struggle adequately captured in the dystopian metaphor of society as a gigantic machine. Mechanical imagery describes a far more stable and harmonious social order than the one in which we live. A satisfactory model must reflect not only society's power to shape its members but also the tensions and resistances it evokes.

In the search for such a model, some theorists have chosen to compare society not with a machine but with a game.³⁹ Games define the players' range of action without determining any particular move. This metaphor can be usefully applied to technology, which sets up a framework of permitted and forbidden "moves" in much the same way games do. The technical code might be reconceptualized on these terms as the most general rule of the technical game, a rule which, furthermore, biases the play toward the dominant contestant.

The game metaphor is ambiguous, like the society which it describes. Thus Michael Buroway holds that "playing a game generates consent with respect to its rules," but he also notes that "participation in a game can undermine the conditions of its reproduction."⁴⁰ Buroway's study of the shop floor "game" called "making out" illustrates this ambiguity. He wonders whether what appears to be a struggle *against* the system may actually be functional *within* it. These two positions are personified by Cornelius Castoriadis and Marcuse.

But is making out as radical as Castoriadis claims? Or is it, as Herbert Marcuse would argue, a mode of adaptation that reproduces "the voluntary servitude" of workers to capital? Are these freedoms and needs, generated and partially satisfied in the context of work, and harnessed to the production of surplus value, a challenge to "capitalist principles"? Does making out present an anticipation of something new, the potential for human self-organization, or is it wholly contained with the reproduction of capitalist relations?⁴¹

In the remainder of this section I draw on the ideas of Michel de Certeau and Norbert Elias to develop a theory of resistance suited to explaining these ambiguities.⁴² I will apply their insights to a noninstrumentalist account of the structure of subversive practice.⁴³

De Certeau's contribution belongs to certain phase in the breakdown

of French structuralism. As coded objects, cultural artifacts resemble a syntax regulating behaviors which, like "speech," follow the rules of the code. For example, knives, forks, and spoons are not just strips of metal, but imply a whole system of eating behavior with respect to which each actual meal is a performance. Clothing, cars, technical devices, are all subject to a similar analysis.

This approach has a deterministic cast, but Roland Barthes, among others, offered a looser formulation, applicable to culture, in which speech practice can modify syntax.⁴⁴ De Certeau was influenced by speech act theory in attempting to develop a theory of cultural change on the basis of these formulations. The game metaphor serves in this context to soften the deterministic rigors of the then dominant linguistic model of society.

"Strategies," according to de Certeau, are the institutionalized means of control embodied in social and technological systems. These means of control presuppose a definite social base, for example, a corporation or government agency. The base supports a continuous action on the members of society in view of accumulating a "capital" of power. De Certeau writes,

I call *strategy* the calculation (or manipulation) of the balance of forces which becomes possible once a subject of will and power (a firm, an army, a city, a scientific institution) is isolatable. Strategy presupposes a *place* that can be circumscribed as one's *own* [*un propre*] and that can serve as the base from which to direct relations with an *exteriority* consisting of targets or threats (clients, competitors, enemies, the countryside around the town, research goals and objects, etc.). . . . One might call this a Cartesian gesture: circumscribing one's own in a world bewitched by the invisible powers of the Other. [It is] the gesture of scientific, political and military modernity.⁴⁵

In de Certeau's theory, the techniques of power are not tools wielded by elites; rather, they open a space, an "interiority," from out of which those elites act on society. The social distance implied in the metaphoric pair—interior/exterior—is vertical: it creates a position "above" society from which to see and control it. To that position corresponds the operational autonomy of a hegemonic subject. With certain modifications, this account could be generalized to any technically mediated activity in modern societies.

Social groups which lack a base from which to act on an exteriority respond "tactically" to the strategies to which they are subjected, that is to say with punctual, temporary, shifting actions that fall more or less under the control of the dominant strategy but subtly alter its significance

or direction. Tactics are the inevitable response of the dominated to their domination, unfolding on the terrain of the Other, and operating in the "usage" of the hegemonic system.

Tactics are not usually overtly oppositional, but rather subvert the dominant codes from within, through the way they distribute their effects over time, combine them with each other, pay lip service or exaggerate in the application. Tactics are as intrinsic to the implementation of strategies as the tricks of speech are to language. "A thousand ways of *playing/outplaying the other's game*, that is to say, the space others have instituted, characterize the subtle, tenacious, resistant activity of groups which, for lack of a base, must maneuver in a network of established forces and representations."⁴⁶

Just as operational autonomy serves as the structural basis of domination, so a different type of autonomy is won by the dominated, an autonomy that works with the "play" in the system to redefine and modify its forms, rhythms, and purposes. I will call this form of autonomy "margin of maneuver." In technically mediated organizations, it may be used for a variety of purposes, including controlling the pace, protecting colleagues, unauthorized productive improvisations, informal rationalizations and innovations, and so on. Action on the margin may be reincorporated into strategies, sometimes in ways that restructure domination at a higher level, sometimes in ways that weaken its control. Foucault's "subjugated knowledges" are elaborated in the "space" of tactical involvement, the margin of maneuver, opened by strategies. De Certeau offers examples such as practices in which workers use materials and tools from their workplace to make objects for their own use (*la perruque*), or the investment and distortion of Christianity by local rites in colonial situations.⁴⁷

De Certeau explains the tension between strategies and tactics by the multiplicity of competing codes that coexist in any society. Some of these establish themselves hegemonically in a "place" of power. They are officially codified and all are obliged to speak their language. Others remain marginal and exist only in the special usages they determine. These marginal practices interact with the dominant ones and distort their effects.

Society would be composed of certain exorbitantly developed practices that organize its normative institutions, and innumerable other practices in a 'minor' status . . . that conserve the premises or the remains of different (institutional, scientific) hypotheses for this society or for others.⁴⁸

The technical code of society might be conceived as an "exorbitant" practice, a syntax which, in the application, is subject to unintended

usages that may subvert its hegemonic rationale and the framework of choices it determines.

De Certeau sheds a new light on the metaphoric identification of societies with machines and games. These two metaphors are in fact angles of vision on social activity. The mechanical metaphor describes a smoothly working system from the point of view of those who manage it. The view of the dominated partner is exemplified in the game, and especially in the peculiar counter-hegemonic "move" that changes the rules. The two metaphors together thus embrace the complementary perspectives of actors located in different positions in the system. They exemplify the opposing self-understandings of operational autonomy and margin of maneuver.

De Certeau's distinction between strategies and tactics offers an alternative to both instrumental and substantive theories of technology. His theory of strategies exposes the substantive implications of the apparently neutral technical management of modern organizations. His analysis of the role of tactics brings out the inherent limits of dystopian rationalization. At the same time, it suggests a new way of understanding resistance as neither individual moral opposition nor as just another policy, indistinguishable except for the accidents of political fortune from the dominant one. Both morality and policy are functions of strategic will. Resistance, as a general modification to which strategies are subject, belongs to another order entirely, that order which Marx attempted to signify with his notion of the social.

This approach has a larger context in social theory: the attempt to transcend the dilemma of methodological individualism versus structuralism. A third position, sketched variously by the early Marxist Lukács, Pierre Bourdieu, Norbert Elias, and a number of other social theorists, argues that individual and society, considered as separate entities, are abstractions from a more concrete unity. That unity is a structured process of human relations.

Elias calls this process a "figuration," an ordered "pattern of bonding" among the "semiautonomous" individuals who make up society.⁴⁹ No individual exists outside such a framework, nor are the frameworks themselves conceivable other than as systems of human interdependencies. In our society, these relations are asymmetrical and position a few leaders to "manage" the others. I would add that the technological mediation of figurations intensifies the interdependencies of their members by laying out patterns of action that, like the rules of a game, establish power relations between them.

Elias uses imaginary games to illustrate these contests for power. In a game in which one player, A, is much more successful than his op-

ponent, B, A not only has power over B but "*in addition*, a high degree of control over the game as such. Though his control of the game is not absolute, he can determine its course (the game process) and therefore also the result of the game to a very great extent."⁵⁰ This second-order control over the game is very similar to what I have called "operational autonomy," the power continuously to select the procedures and devices (rules) that will govern the behavior of those within the system.

But Elias also allows for the case in which the dominated are able to use their discretionary margin to strengthen their position. Then the outcome of the play becomes increasingly unpredictable. It no longer looks like the result of a strategy but comes to resemble a social system. Elias imagines a multitiered game, very much like a modern society, in which a small number of players has the advantage over a larger number of weak players. He describes power shifts in such a game in the following terms:

As long as power differentials are great, it will appear to people on the upper level as if the whole game and the lower-level players in particular are there for their benefit. As power balances shift, this state of affairs changes. Increasingly it appears to all participants as though the upper-level players are there for the benefit of the lower-level players. The former gradually become more openly and unambiguously functionaries, spokesmen or representatives of one or other of the lower-level groups.⁵¹

Elias's model has interesting applications to the politics of technology. Where the rules of his multitiered game are technologically embedded, they establish a biased system within which the dominant players are able to functionalize the subordinate players' moves. Subordinates' initiatives tend to cancel out as they implement the dominant players' strategy, giving the impression that the "system" is effective in its own right rather than as a pattern of human relations. The stronger players can treat the game as the more or less exact realization of their own strategy, which itself coincides with a specific technical rationale, and the subordination of the weaker players then appears as an impersonal technical necessity.

Technical mediation, however, has unforeseeable consequences. Technological strategies create a framework of activity, a field of play, but they do not determine every move. Like all plans or rules, they are coarse grained compared with the actual detail of concrete activity. Furthermore, the technical system is not just a plan in the heads of a few administrators; it is a real thing with its own properties, its own logic. To the extent that this logic has not been perfectly anticipated

and mastered—and it never can be—there will be breakdowns, irrationalities or imperfections in the order of the plan. The “weaker players,” those whose lives or work are structured by the technical mediations selected by management, are constantly solicited to operate in this range of unpredictable effects. The coincidence of sociogram and technogram is therefore never absolute.⁵² As a result, tactical responsiveness is not something imported into the technically mediated game from the outside (“life,” instincts, etc.), but is a form of *socially necessary freedom* generated immanently within the game itself.⁵³

Struggles over control of technical activities can now be reconceptualized as tactical responses in the margin of maneuver of the dominated. Just because a measure of discretion is associated with the effective implementation of any plan, the use the dominated make of their position in the system is inherently difficult to foresee and control. It has no predetermined revolutionary or integrative implications as such, but like all tactical responses to strategies contains an essential ambiguity. These “usages” of the capitalist technical code are *both* necessary to its implementation *and* germs of a new society. Their contradictory potentialities are more or less contained by management depending on the extent of its operational autonomy. A strong management can cancel the potentially subversive long-term impacts of tactical maneuvers. If management is forced to compose with its subordinates over a long period, they can transform the technical process through iterative tactical responses that gradually weaken management control still further and bend its strategic line.

Workers’ control simply carries this process to the limit. It is not a new state power, but is rather a negative condition for a flowering of tactical initiative, the “organizing activity” specific to socialism. The ambivalent employment of the technical heritage depends entirely on maintaining and enlarging the margin of maneuver required to alter the strategies encoded in the division of labor and technology.

In sum, technology opens a space within which action can be functionalized in either one of two social orders, capitalism or socialism. It is an ambivalent or “multistable” system that can be organized around at least two hegemonies, two poles of power between which it can “tilt.”⁵⁴ From this standpoint the concepts of “capitalism” and “socialism” are no longer mutually exclusive “modes of production,” nor is their moral significance captured in the image of Manichaeian conflict between a prison-like society and the individual in revolt. They are rather ideal-types lying at the extremes of a continuum of changes in the technical codes of advanced societies. As such they are constantly

at issue in struggles over all sorts of technical problems: at work, in education, medicine, and ecology, and, as I will argue in the next chapter, in the development of a new technology such as the computer. This position offers a way of understanding the continuing struggle for radical change in a world that no longer believes a new civilization can be created by ordinary political action, or geographically localized in this or that country or block.

an interesting systems theoretic account of how knowledge can modify its objects, see Paul Dumouchel, "Systèmes sociaux et cognition," *Cahiers d'Epistemologie* no. 8901, Université de Québec à Montréal.

3. Cf. Roy Bhaskar, *The Possibility of Naturalism* (Atlantic Highlands: Humanities Press, 1979).

4. For a useful discussion of relevant issues in Weber, see Donald McIntosh, "Max Weber as a Critical Theorist," *Theory and Society*, January 1983. On the terms "substantive" and "formal" rationality, see Max Weber, *The Theory of Social and Economic Organization*, trans. T. Parsons, (New York: The Free Press, 1964), pp. 35-40.

5. Herbert Marcuse, "Industrialization and Capitalism in the Work of Marx Weber," in *Negations*, trans. J. Shapiro (Boston: Beacon, 1968), p. 212.

6. Jürgen Habermas, *Toward a Rational Society*, trans. J. Shapiro (Boston: Beacon, 1970), p. 84.

7. Herbert Marcuse, *One-Dimensional Man* (Boston: Beacon, 1964), p. 154.

8. "Today, domination perpetuates and extends itself not only through technology, but as technology, and the latter provides the great legitimation of the expanding political power, which absorbs all spheres of culture." *Ibid.*, p. 158.

9. For a comparison of Kuhn and Foucault, see Hubert Dreyfus and Paul Rabinow, *Michel Foucault: Beyond Structuralism and Hermeneutics* (Chicago: Univ. of Chicago Press, 1983), p. 197ff.

10. Michel Foucault, *Discipline and Punish*, trans. A. Sheridan (New York: Pantheon, 1977), pp. 206-7.

11. Foucault, *Politics, Philosophy, Culture*, trans. A. Sheridan, et al., (New York: Routledge, 1988), p. 27.

12. Ibid.

13. Karl Marx, *Capital*, (New York: Modern Library, 1906 Reprint), vol. I, p. 338.

14. See "A New Cartographer," in Gilles Deleuze, *Foucault*, trans. S. Hand (Minneapolis: Univ. of Minnesota Press, 1986). For Marcuse's critique of the notion that class agents control and challenge the system, see Marcuse, op. cit., pp. 31–33.

15. For a typical treatment, see John Rajchman, *Michel Foucault: The Freedom of Philosophy* (New York: Columbia Univ. Press, 1985), pp. 83–84. Marcuse would have been surprised to learn of the existence of the "Reich-Marcuse model." (p. 84) In conversation, he enjoyed pointing out the good health of capitalism in the age of sexual liberation, in diametrical opposition to Reich's predictions.

16. Foucault, *Power/Knowledge*, Colin Gordon, ed., (New York: Pantheon, 1980), p. 98.

17. Gilles Deleuze, op. cit., pp. 92–93. Cf. Peter Dews, *Logics of Disintegration* (London: Verso, 1987), pp. 161ff. Deleuze's question recalls Balzac's proud assertion, "Je fais partie de l'opposition qui s'appelle la vie." Gaetan Picon, *Balzac par Lui-même* (Paris: Seuil, 1956), p. 114. But see Paul Bove's cautions in the preface to Deleuze, op. cit., pp. xxxii–iv.

18. Foucault, *Power/Knowledge*, pp. 143–44.

19. Ibid., p. 99. Cf. Ibid., p. 160. According to Foucault, capitalism arises in precisely this way from the "colonization" of the preexisting microtechniques of power by capitalist "strategies" of domination. In support of this view, he refers us to Marx's discussion of cooperation in *Capital*. See Foucault, *Discipline and Punish*, op. cit., p. 221. This reference suggests a reinterpretation of Marx's theory of the origins of the capitalist labor process which complements recent labor process theory.

20. Marcuse's Preface to *One-Dimensional Man* is a masterpiece of wavering on these issues. See op. cit., p. xv especially.

21. Marcuse occasionally called for a sort of educational dictatorship to undo the work of one-dimensionality, but these remarks seem like aberrations. For an interesting clarification of Marcuse's position, see his debate with Norman O. Brown, "Love Mystified: A Critique of Norman O. Brown," in Marcuse, *Negations*, op. cit.

22. Foucault, *Power/Knowledge*, pp. 122–23.

23. Michel Foucault, "The Ethic of Care for the Self as a Practice of Freedom," in *The Final Foucault* (Cambridge, Mass.: MIT Press, 1988).

24. Marcuse, *One-Dimensional Man*, pp. xvi.

25. Ibid., pp. 231–32. The implications of this position are explored in more detail in Chapter 8.

26. Ibid., pp. 154, 251. For further discussion of these ambiguities, see Otto Ullrich, *Technik und Herrschaft* (Frankfurt: Suhrkamp, 1977), pp. 427ff.

27. Ibid., p. 168. See also, Herbert Marcuse, *An Essay on Liberation* (Boston: Beacon, 1969), p. 12.

28. Foucault, *Power/Knowledge*, p. 131. This problem is discussed at length in the later chapters of Dews, op. cit.

29. Foucault, *Power/Knowledge*, p. 81.

30. Ibid., p. 83.

31. On the social relativity of efficiency, see Dietrich Rueschemeyer, *Power and the Division of Labor* (Stanford: Stanford Univ. Press, 1986), p. 171. On codes, see Roland Barthes, *Le Degré Zéro de l'Écriture* (Paris: Gonthier, 1969), pp. 94ff.

32. Marc Guillaume, *Le Capital et son Double* (Paris: PUF, 1975), p. 64.

33. Barthes makes a similar point, writing that "Langue/Parole" must be supplemented in the technical domain by a "troisième élément, pré-signifiant, matière ou substance, et qui serait le support (nécessaire) de la signification." (op. cit., p. 105) For persuasive technological examples, see the accounts in Langdon Winner, "Do Artifacts Have Politics," in *The Whale and the Reactor* (Chicago: Univ. of Chicago, 1986), pp. 22-23; and Stephen Marglin, "What Do Bosses Do?" in André Gorz, ed., *The Division of Labor* (Sussex: Harvester, 1978), pp. 41-44.

34. For more on the concept of "relative neutrality" see the discussion of formal bias in Chapter 8.

35. For a theory of technology based on a similar distinction, see Gilbert Simondon, *La Mode d'Existence des Objets Techniques* (Paris: Aubier, 1958), chap. 1. Cf. William Leiss, *Under Technology's Thumb* (Montreal: McGill-Queen's Univ. Press, 1990), pp. 29-32.

36. Bruno Latour, *Science in Action* (Cambridge: Harvard Univ. Press, 1987), p. 138. My account of the bias of formalism in terms of the "fit" of neutral constructions in concrete historical situations is similar to Latour's approach. Cf., for example, Latour's account of mapmaking, pp. 215ff.

37. Bernard Gendron and Nancy Holstrom, "Marx, Machinery and Alienation," *Research in Philosophy and Technology*, vol. 2, 1979.

38. Foucault, *The Final Foucault*, p. 18.

39. This approach calls to mind Jon Elster's Marxist version of game theory. His theory of "rational expectations" resembles the theories discussed in this section in recognizing the relative freedom acting subjects enjoy within the framework of any game-like system. That even dominated groups have choices is a necessary consequence of organizing human activities around rules. However, Elster conceives the social game as a contest for power and income. He treats the technical framework as a mere backdrop, but I argue that it is far more than that, that it is in fact the main stakes in the struggle over civilizational models. For a presentation of Elster's views and responses by critics, see "Marxism, Functionalism, Game Theory: A Debate," in *Theory and Society*, vol. 11, no. 4, July 1982.

40. Michael Buroway, *Manufacturing Consent* (Chicago: Univ. of Chicago Press, 1979), pp. 81 and 94.

41. Ibid., p. 73. Buroway concludes that everyday resistance is ultimately integrative and does not challenge the system. But one might plausibly object that the larger social and ideological context determines the range and significance of resistance. Thus the system generates subversive tensions that appear in everyday activities it "metabolizes" in the course of its normal functioning but which can explode it under revolutionary conditions. Cf. Paul Thompson, *The Nature of Work* (London: MacMillan, 1983), pp. 167ff.

42. Michel de Certeau, *L'Invention du Quotidien* (Paris: UGE, 1980); Norbert Elias, *What Is Sociology?* (New York: Columbia Univ. Press, 1978).

43. De Certeau and Elias do not address the question of the motives and specific objectives of change, nor will I in this concluding section of this chapter. These motives include fulfilling work and wider social participation. They have been sketched in the first two chapters of this book, and will be taken up in more detail in the last two chapters in the context of the theory of socialist culture. Here the issue is not why society should be changed, but whether and how it can be changed where the will to change is present.

44. See Barthes, op. cit., pp. 103-4.

45. De Certeau, op. cit., vol. 1, p. 85. (All passages from this book are my translation.)

46. De Certeau, op. cit., vol. 1., pp. 59-60.

47. Ibid., pp. 68ff.

48. Ibid., pp. 106-7.

49. Elias, op. cit., p. 176. Cf. Norbert Elias, *The Court Society* (New York: Pantheon, 1983), p. 144.

50. Elias, *What Is Sociology*, p. 81.

51. Ibid., p. 90.

52. This view of technical activity is supported by a number of recent contributions to the understanding of the relation of rules and plans to performance. For example, Lucy Suchman's theory of computer interface design emphasizes the complex ways in which the implicit plans of action embodied in devices are instrumentalized and modified by actors in the course of action. Users are not so much controlled by machines as mobilized by them in relatively unpredictable ways. But neither Suchman nor her sources consider the paradigmatic case for modern industrial society in which plans are established by an elite in order to reproduce its power through the actions of its subordinates. See Lucy Suchman, *Plans and Situated Actions: The Problem of Human-Machine Communication* (Cambridge: Cambridge Univ. Press, 1987), pp. 185ff. Cf. Jon Barwise and John Perry, *Situations and Attitudes* (Cambridge, Mass.: MIT Press, 1985); Harold Garfinkel and Harvy Sacks, "On Formal Structures of Practical Actions," J. McKinney and E. Tiryakian, eds., *Theoretical Sociology* (New York: Appleton-Century-Crofts, 1970). For more on the application of these ideas in computer design, see Chapter 5 of this book.

53. For more on the concept of socially necessary freedom, see Andrew Feenberg, "Technocracy and Rebellion," *Telos*, no. 8, Summer 1971.

