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Escaping the Iron Cage, or, Subversive Rationalization and Democratic Theory

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Introduction: Two Kinds of Rationalization

A great deal of 20th century social thought has been based on a pessimistic view of modernity that achieved its classic expression in Max Weber's theory of rationalization. According to Weber, modernity is characterized by the increasing role of calculation and control in social life, a trend leading to what he called the iron cage of bureaucracy. Human beings enslaved by a rational order have become mere cogs in the social machinery, objects of technical control in much the same way as raw materials and the natural environment. While this view is overdrawn, it is true that as more and more of social life is structured by technically mediated organizations such as corporations, state agencies, and medical institutions, the technical hierarchy is increasingly identified with the social and political hierarchy.

My title implies a provocative reversal of Weber's conclusions. Subversive rationalization is a contradiction in Weberian terms. On those terms, once modernity has defeated tradition, radical struggle for freedom and individuality degenerates into an affirmation of irrational life forces against the routine and drab predictability of a bureaucratic order. This is not a democratic program but a romantic anti-dystopian one, the sort of thing that is already foreshadowed in Dostoievsky's *Notes from Underground* and various back to nature ideologies.

I will attempt here to create a third alternative. I start from the assumption that there is no unique correlation between technological advance and the distribution of social power. If authoritarian social hierarchy is not technically necessary, then there must be other ways of rationalizing society that democratize rather than centralize control. We need not go underground or native to escape the iron cage. I will argue that this is in fact the meaning of the emerging social movements to change technology in a variety of areas such as computers, medicine, and the environment.

I call the availability of technology for alternative developments with different social consequences, its ambivalence. The ambivalence of technology can be summarized in the following principles.

1. Conservation of hierarchy: social hierarchy can generally be preserved and reproduced as new technology is introduced. This principle explains the extraordinary continuity of power in advanced capitalist societies over the last several generations. This continuity was made possible by technocratic strategies of modernization, despite enormous technical changes.

2. Subversive rationalization: new technology can also be used to undermine the existing social hierarchy or to force it to meet needs it has ignored. This principle explains the technical initiatives that sometimes accompany the strategies of structural reform pursued by union, environmental, and other social movements.

In this essay I will develop a theory of the democratization of technology based on this second principle. But does it make sense to call it a principle of *rationalization*? Is it not irrational precisely to the extent that it implies citizen involvement in the affairs of experts? Furthermore, skeptics argue, while protest groups may occasionally be right, even against the opinion of experts misled by professional biases, there is no easy way to know if their views are representative and thus no reason to call their interventions democratic. The general public would likely disapprove of such interference if it knew the true cost. The counter-argument in favor of democratization must therefore establish the *rationality* and the *legitimacy* of informal public involvement in technical change. I will address these issues briefly in the first part of this essay. In a second part, I will identify a type of collective action specific to the technical sphere, one which can account for actual democratic struggles over technology occurring today. Finally, in the concluding part, I will show how recent technology studies can be reconfigured to recognize the role of public actors in democratic technical change.

Technology and Democracy

Rationality and Autonomy

The strongest objections to democratizing technology come from experts who fear the loss of their hardwon freedom from lay interference. Can we reconcile public involvement with the *rationality* and *autonomy* of professional technical work or will the politicization of technology destroy the autonomy of the technical professions?

The fear of democratization is based on an illusion specific to technical change. Successful public interventions into technology result in changes reflecting interests excluded at earlier stages in the design process. The eventual internalization of these new interests in design masks their source in public protest. The waves close over forgotten struggles and the technologists return to the comforting belief in their own autonomy which seems to be verified by the conditions of everyday technical work.

Thus the notion that technology is apolitical is an illusion that arises from the very success of public involvement in technical change; it reappears with each new phase of protest and intervention as a defensive reaction on the part of professions and organizations that want no interference with their technical initiative. But in reality the autonomy they claim was violated long ago in the course of earlier controversies the outcomes of which they now unwittingly endorse in defending their traditions. Informal democratic procedures are always already an implicit part of the design process despite the impression of technologists and managers.

The rhythm of public and professional dominance in technical fields parallels Kuhn's famous distinction between revolutionary and normal science, with, however, a significant difference. As it professionalizes, natural science wins ever more independence from public opinion and democratic interventions become rarer. Of course this does not mean that mature science is independent of politics and culture,

just that their influence reaches it indirectly through established administrative channels and changes in scientists education and personal vision. However, the constant involvement of the population in technical activity, if only as an object, generates ever renewed forms of what might be called (following Foucault and Harraway) subjugated or situated knowledges that can become the basis for public interventions at any stage in the development of a technical field.

These situated knowledges are usually and often rightly viewed with skepticism by established experts who are guided by the pursuit of efficiency within the framework of the established technical codes. But in Kuhnian terms, efficiency only applies within a paradigm; it cannot judge between paradigms. To the extent that professional cultures are based on efficiency, they constitute the technical equivalent of Kuhn's normal science and as such they lack the categories with which to comprehend the paradigmatic changes that will transform them in the course of events. And since democratic interventions are often responsible for such changes, they too remain opaque to the dominant technical culture.

In sum social initiatives influence technical rationality without destroying it. In fact, public intervention may actually improve technology by bringing significant issues to the surface in opposition to vested interests entrenched in the design process. The autonomy of the technical professions has less to do with their separation from politics than with their capacity to translate politics into technical terms.

Democratic Interventions

Let me now turn to the problem of the *legitimacy* of democratic interventions. Typically, they are the work of lay activists caught up in a local problem or crisis. This is not surprising as technical issues are usually of interest only to those directly affected by them and therefore willing to devote the time needed to form a situated knowledge. In some cases, active minorities select themselves on the basis of common social attributes such as neighborhood, race or gender, hobby or illness and then try to influence public opinion by provoking *technical controversies*. In their struggle for access to experimental drugs, AIDS patients, for example, attacked regulatory procedures, demanded hearings and negotiated changes. In other cases public involvement in the design process takes the form of what I will call *creative appropriations*, i.e. modifying existing technologies through innovative applications. The development of the French Minitel system and the Internet show the effectiveness of such aposteriori interventions by users. Technical controversies and creative appropriations have become inescapable features of contemporary political life, laying out the parameters for official technology assessment.

While it is indeed difficult to tell whether the outcome of a technical controversy corresponds to a public will, there is another sense in which public involvement in technical change is intrinsically democratic. I follow C. B. Macpherson here in claiming that a democratic society should offer opportunities to develop human capacities and powers. All forms of public activity and participation should be sanctioned as democratic so long as they respect the rights of others. Democracy therefore includes citizens attempts to enhance participation and agency by reforming the procedures of government, business, education, and other social spheres. *As more and more of social life is framed by technical systems, cases increasingly appear in which public*

interventions into technology determine the conditions of agency. If agency is a value in itself, its enhancement may provide a basis for calling certain technological controversies and creative appropriations democratic despite the fact that they do not appear representative nor even political at first sight.

Unfortunately, the obstacles to participation are considerable and growing. They include the technocracy, which offers persuasive arguments and alibis for passivity. This vitiates all aspects of democratic life, but it is particularly worrisome in the emerging technical public sphere which contends directly with technocratic power without the benefit of democratic traditions and forms to maintain at least a facade of participation.

The resulting weakness of democratic interventions into technology is symptomatic. The fundamental problem of democracy today is quite simply the survival of agency in a technocratic universe. This problem has been brought into focus by the Frankfurt School. Adorno's concept of total administration, Marcuse's one-dimensionality, Habermas's technicization of the lifeworld all call attention to this catastrophe lurking in the shadow of technological advance. On the right, where agency is identified with the market and the fetus, it is easy to come up with a program for addressing this problem. The left has greater difficulties. The politics of sexual and racial identity returns agency to the individual but at a level that leaves technocratic structures untouched. Without denying the importance of these issues, I would like to stimulate reflection on the renewal of agency in the technical sphere.

Political action in this sphere foreshadows a world in which technology, as a kind of social legislation affecting every aspect of our lives, will emerge from new types of public consultation. For example, in environmental struggles not only do citizens exercise an unaccustomed technical agency, but they have enlarged the realm of public discourse by creating new fora of public discussion, such as Environmental Protection Agency hearings, thereby indirectly enhancing democratic agency in general. This and many other cases show that technical politics does not stand in unmediated opposition to democratic community as skeptics contend, but actually realizes important democratic values.

Technology and Agency

The Paradox of Reform

This approach to the democratization of technology conflicts with certain basic assumptions of democratic political theory as it is conventionally understood. I would now like to address this problem in terms of a variety of theories of culture and technology. Let me begin by offering my reasons for thinking it essential to introduce a "technical turn" in political theory.

Modern ideas of democracy were originally formed in the political sphere, and politics, like military combat, lends itself to an instrumentalist account of action. Common sense tells us that in politics, the subject of action for example, the state can be defined independently of the means it employs. This is the origin of the notion that the democratic state is neutral, available for use by all parties, regardless of ideology. The understanding of technical resistances is naturally influenced by these deeply ingrained assumptions about politics.

But the social study of technology shows that it is not neutral in this sense. In reality subjects and means are dialectically intertwined: the army does not merely take up arms, but is structured around the activities they support. Similarly, the enterprise does not use its workers as means to its production 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. But how then can change occur? How can the actors modify the system that defines their identity?

Counter-hegemony

I have found a suggestive starting point for answering this question in Michel de Certeau and Norbert Elias. Both use games as a model of society that reflects not only its power to shape its members but also the resistances it evokes. Games define the players range of action without determining their moves. This metaphor can be usefully applied to technology, which sets up a framework of permitted and forbidden moves in much the way games do. What I call the "technical code" is the most general rule of the game, biasing the play toward the dominant contestant.

Strategies, according to de Certeau, are institutionalized means of control embodied in social and technological systems. These means of control presuppose a definite social base, such as a corporation or agency. The base supports a continuous action on the members of society and makes it possible to accumulate a capital of power. I call this process of accumulation the growth of the "operational autonomy" of technical leadership. In de Certeau's theory, the techniques of power are not tools wielded by elites; rather, they open a space, an interiority, within which those elites constitute themselves as such and from out of which they act on society. The social distance implied in the metaphoric pair interior/exterioris vertical: it creates a position above society from which to see and control it. 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 ones *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 ones own in a world bewitched by the invisible powers of the Other. [It is] the gesture of scientific, political and military modernity. Social groups which lack a base from which to act on an exteriority respond tactically to the strategies to which they are submitted, that is to say with punctual, shifting actions that fall more or less under the control of the dominant strategy but subtly alter its significance. Tactics are the 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 overtly oppositional, but rather subvert the dominant codes from within, through the way they distribute their effects over time, combine 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 others 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.

De Certeau explains the tension between strategies and tactics by the multiplicity of codes coexisting in any society. Some of these establish themselves hegemonically while others remain marginal and exist only in the special usages they determine. The exorbitant practices are officially codified and all are obliged to speak their language. Marginal practices interact with the dominant ones and distort their effects. The technical code of society is an exorbitant practice, a syntax which is subject to unintended usages that may subvert the framework of choices it determines.

De Certeau's theory of strategies exposes the substantive implications of the apparently neutral technical management of modern organizations, while his analysis of tactics brings out the inherent limits of dystopian rationalization. De Certeau 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.

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 free play margin of maneuver. In technically mediated organizations it is used for a variety of purposes, including controlling the pace of work, unauthorized productive improvisations, technical reappropriations, and so on. Action on the margin is usually 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.

Technological Figurations

De Certeau's approach has a certain similarity to Norbert Elias's theory of figurations, which he describes as ordered pattern[s] of bonding among the semi-autonomous individuals who make up society. Elias illustrates his theory with imaginary games. In a game in which one player is much more successful than another, the winner not only has power over his adversary 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. This second order control is an instance of operational autonomy; it includes the power continuously to select the procedures and rules (devices) that govern participants behavior.

But Elias also allows for the case in which the dominated succeed in using their margin of maneuver to strengthen their position. Then the play becomes increasingly unpredictable. It no longer looks like the result of a strategy but resembles a social system in which the strong players gradually become more openly and unambiguously functionaries, spokesmen or representatives of one or other of the lower-level groups.

Elias model is applicable to the politics of technology. Where the rules of his multi-tiered game are technologically embedded, they establish a biased system within which the dominant players functionalize the subordinate players moves, i.e. they *manage*. Subordinates initiatives tend to cancel out as they implement the dominant players strategy, giving the impression of a mechanistic system rather than a pattern of human

relations. The stronger players can treat this system as an expression of their will, which itself coincides with a specific technical rationale, and the subordination of the weaker players then appears as an impersonal technical necessity.

However, technical mediation 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. To the extent that the requirements of that activity have not been perfectly anticipated and mastered and they never can be the plan will occasionally break down. The weaker players, those whose lives or labor are structured by the technical mediations selected by management, have to work in this zone of unpredictable effects. Indeed, where labor is not completely deskilled, the idea of vocation formalizes recognition of this feature of technique by integrating it to the life process of technical subjects in the form of professional virtues such as discretion, responsibility, respect for quality, and so on.

Struggles over control of technical activities can now be reconceptualized as tactical responses in the margin of maneuver of the dominated. 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. Just because a measure of discretion is associated with the effective implementation of any plan, the actions of the dominated are inherently difficult to foresee and control. They have no predetermined revolutionary or integrative implications as such, but like all tactical responses to strategies are essentially ambiguous. 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 compromise with its subordinates over a long period, they can reappropriate the technical process through iterative tactical responses that gradually weaken management control. The ambivalent employment of the technical heritage depends on maintaining and enlarging the margin of maneuver required to alter the strategies encoded in the division of labor and technology. I have called this deep democratization to distinguish it from populist theories of decentralization and local control.

In sum, technology opens a space within which action can be functionalized in either one of two types of social systems, a technocratic system based on control from above and a democratic one in which control is increasingly exercised from below. 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. Democratization can be conceptualized on these terms as an immanent potentiality of technologically advanced societies.

The Third Symmetry

Actor Network Theory

De Certeau's theory of practice was developed under the influence of Foucault, as was the actor network theory of Bruno Latour. Not surprisingly, there are important similarities between these approaches. Together, they provide the basis for a theory of deep democratization of the technical sphere.

Latour invites us to study technology as the embodiment of "programs," i.e. intentional structures with a close resemblance to de Certeau's strategies. Technical objects are not things in the usual sense, but nodes in a network that contains both people and devices in interlocking roles. Actor network theory argues that the social alliances in which technology is constructed are bound together by the very artifacts they create. Thus social groups do not precede and constitute technology, but emerge with it. This is the "symmetry of humans and nonhumans" which, Latour believes, distinguishes his theory from the usual formulations of constructivism.

Latour argues that just as authors and readers meet on the printed page, so the builders and users of machines are joined in the application. Machines are comparable to texts because they too inscribe a story, i.e. a prescribed sequence of events which the user initiates and undergoes. This analogy then authorizes a semiotics of technology drawing on concepts developed in linguistics, several of which play an important role in the theory.

In the first place, Latour adapts the concept of shifting out, or change of scene, to describe the process of delegating functions to humans or nonhumans through technological design. Just as characters in stories move from one space or time to another at the whim of the author, so elements of technological programs are shifted from one matter to another. Latour offers the example of an automatic door opener: the imperative close the door is shifted out from a message posted on the wall to a spring, from the ethical to the mechanical domain, depending on how the door is equipped.

Secondly, he adapts the distinction between the syntagmatic and paradigmatic dimensions of the phrase to sociotechnical networks. No elaborate account of this distinction is needed here. As Latour explains it, the syntagmatic dimension refers to the additive process of enrolling elements in the technical network, and the paradigmatic dimension describes the various shifts or delegations through which these elements are effectively bound together.

Images of Resistance

Michel Callon notes that networks are constructed by simplifying their members, that is, by enrolling them under a definite aspect that serves the program while ignoring other aspects that do not. In line with this notion, John Law calls network builders heterogenous engineers because they manage the simplification and linking of many different types of human and nonhuman elements. But, Callon adds, the actor network should not...be confused with a network linking in some predictable fashion elements that are perfectly well defined and stable, for the entities it is composed of, whether natural or social, could at any moment redefine their identity and mutual relationships in some new way and bring new elements into the network. In short, the simplification might fail and the suppressed qualities reemerge. Latour calls the dissagregating forces the network must resist or turn aside, its anti-program.

At one point in his account, Latour illustrates the idea of the anti-program with Frankenstein's monster. Like the objects enrolled in technnical networks, the monster

has an independent life that threatens its builder. But Latour quickly turns from the worn-out commonplace made up by bleeding-heart moralists frightened by autonomous technology. Yet there is more to the commonplace than he admits. As we have seen, the notion of a technical system implies control from a center, a place of power. This pretension is belied by the analytic practice of actor network theory, much as Frankenstein's monster belied the pretensions of his creator. But then the image of poor Frankenstein, unable to control his monster, is not merely grist for the mill of soft hearted culture critics. It stands for the inherent limits of technical power.

It is true that Shelley romanticizes the problem in a way which perhaps excuses Latours harsh judgement. Let us try another literary example, the myth of the sorcerers apprentice who sets in motion a process that gets out of control. H.G. Wells composed an astonishingly prescient version of the myth in *The Food of the Gods*, a tale of two early bioengineers who invent a miracle food that causes animals and plants to grow to eight times their normal size. The trait is inheritable, and so sloppy experiments conducted on a farm near London result in the birth of giant wasps, rats, and even people. The world is irreversibly changed by bigness insurgent.

In Latour's terms, the delegation of the original program to sacks, walls, and guardians broke down as rats got at the food, and the network was unexpectedly prolonged (in its syntagmatic dimension) through its nonhuman rather than its human members. Of course from the standpoint of the preexisting experimental program the network was supposed to serve, this prolongation amounts to chaos, but if one views the matter objectively, i.e. *not* from the standpoint of the two scientists and their failed strategy, it remains a prolongation of the network nevertheless. As such, it transforms that network and makes it possible for new actors to pursue new programs.

And in fact Wells shows us how a new system emerges out of the elements of the old one as a result of unforeseen breakdowns, partial disaggregation, and tactical reappropriations. Wells likes the results and so makes the products of the disaster his Children of the food new heterogeneous engineers with their own program for reestablishing order, their order, an order of giants. *The Food of the Gods* is a metaphor for the replacement of the narrow old-European world by a dynamic industrialism.

Ecology as an Example

In this story we have an illustration of the fragility of technical systems. Where the simplification of human subordinates breaks down, a specific type of network instability results. This has political implications actor network theorists have not yet explored, but which make perfect sense in de Certeau's terms. As he argues, systems are vulnerable to tactical transformation. The anti-program is thus not merely a source of disorder but contains the potentiality for reordering the network around new programs. These concepts are particularly applicable to the environmental movement.

Ecological networks emerge into public view, and indeed are often constituted as objects of science, on the borders of technological systems. There, where unintended consequences meet citizen outrage, a new kind of politics has been born, and this in turn has provided a stimulus to the study of the subtle interconnections of people and things.

From the human standpoint, ecological issues are primarily medical, but from the standpoint of industry it is a question of the autonomy of enterprise. Since the earliest forms of regulation, autonomy has had a price. Organizers of potentially dangerous

technical systems have been forced to conform with technical codes that prescribe a certain minimum level of protection of nature and human health. At first regulation is generally experienced as an external intrusion. But organizers eventually learn that they can best retain their independence by defining system boundaries narrowly to limit violations of these codes.

Unfortunately, there are other more devious ways of preserving autonomy. Control of the risky elements in the network and control of information about the network can be traded off paradigmatically for a time in public debate. Hiding a health hazard, or better yet defining it out of existence, and removing it physically, are functionally equivalent strategies from a systems perspective at least for a definite period. And, centralized technical decisionmaking, working to fulfill simple mandates such as profits or growth, generates strong pressure to narrow the range of concerns incorporated into design, if necessary by controlling information to protect system boundaries.

This observation begins to indicate the ambiguous role of technocratic management of environmental and related issues such as on the job health and safety and product safety. On the one hand, technocracy brings expertise to bear on the problems, but on the other hand, its tendency to monopolize and channel information offers a cheap alternative to actually solving them. Technocracy is thus not the boon to technical advance it claims to be, but on the contrary is often guilty of obstructing much needed recognition of problems that require innovative technical solutions.

However, information control strategies come up against the widespread access to expertise and publicity in democratic societies. As information control becomes more difficult, boundary-drawing must be shifted out to the level of devices and procedures and the problems solved at the technical level. This has two principal effects. On the one hand, crude simplifications that threaten conformity with the code may eventually have to be abandoned, the complex and uncontrollable character of certain elements admitted, and substitutes found. In favorable cases concretizing advances may resolve the problems without loss of efficiency. On the other hand, the resort to technical delegations tends to discredit earlier alibis for indifference to the problems, not just by refuting them but by revealing them as ideological. Who today believes that the accident at Three Mile Island proved the *safety* of nuclear power as industry advocates claimed at the time? Who does not see in this claim a self-serving excuse for a deplorable indifference to safety?

Specific Intellectuals

The agents of such transformations of networks are an interesting lot, insufficiently studied by sociology of technology. Foucault called them "specific intellectuals" to distinguish them from the type of literary intellectual who traditionally spoke in the main of universal values. Specific intellectuals constitute a new class of heterogenous engineers whose tactical labors in their technical fields extend the recognized boundaries of networks, often against the will of their managers.

In some cases the very same people who create the technology later denounce its effects and in the process subvert the boundary-drawing strategies of corporations or agencies employing their inventions. The most famous such instance was the atom bomb. It was built by scientists with the idea that it could be used like an ordinary, but very powerful, weapon in World War II, and indeed it was so used during the brief

period when the U.S. was the only nuclear power. The military wished to retain this reassuringly ordinary conception of the bomb during the Cold War era because it minimized the risk to Americans from a new type of weapon they did not really understand. But, anticipating the arms race and its apocalyptic implications, the bombs inventors redefined it as a threat to the survival of Americans. The scientists established themselves as representatives of a larger network encompassing not only bombs and Russians, but bombs, Russians and Americans as well, that is, the planet as a whole.

Environmental disputes benefit from similar defections and splits among experts in biology, and similarly point out the illusory nature of the reassuring boundaries system managers attempt to impose on their networks. Environmentalists bring out contradictions between different technical codesmedical, engineering, agricultural, etc.while redefining networks to include hitherto excluded members. Where excluded members mobilize, political movements of a new type emerge that promise to create a lively technical public sphere.

The Third Symmetry

Technical networks are not identical with technical systems. The system concept reflects the spontaneous representations of owners, managers or organizers in charge of an apparatus that implements their program. They have a natural tendency to bound the apparatus conceptually in function of their strategies, and to consider everything which is not in accord with their goals as environment. But this teleological understanding of systems violates Latour's principle of symmetry. The intentions of managers are no more fundamental than the vagaries of people and things enrolled unintentionally in the network of which the system is a subset. A network theory of the technical politics in which these unofficial members engage needs new categories that do not reflect the limited viewpoint of managers.

Chief among these new categories is a third principle of symmetry I will add to the symmetry of successful and unsuccessful theories and devices, introduced by constructivism, and the symmetry of humans and nonhumans, added by actor network theory. This third principle concerns the symmetry of program and anti-program, at least in those cases where the anti-program is taken up by actors able to build a new network around it. This symmetry is the basis of a subversive politics of technological rationalization. If sociology of technology can recognize such subversion as more than a deviation from system norms, it will be able to elaborate a much needed democratic politics of technology.

Conclusion

Rationalization in our society responds to a particular definition of technology as a means to the goal of profit and power. Democratic interventions into technology such as the environmental movement challenge the horizon of rationality under which technology is currently designed. They prefigure the creation of a new public sphere embracing the technical background of social life, and a new style of rationalization that internalizes unaccounted costs born by nature, i.e., some-thing or -body exploitable in the pursuit of profit. Ultimately this implies a willingness to take responsibility for the human and natural contexts of technical action. I call this subversive rationalization

because it requires technological advances that can only be made in opposition to the dominant hegemony. It represents a democratic alternative to both the ongoing celebration of technocracy triumphant and the gloomy Heideggerian prediction of techno-cultural disaster.

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