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# The Mediation is the Message: Rationality and Agency in the Critical Theory of Technology

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*Critical theory of technology brings technology studies to bear on the social theory of rationality. This paper discusses this connection through a reconsideration of the contribution of the Frankfurt School to our understanding of what I call the paradox of rationality, the fact that the promise of the Enlightenment has been disappointed as advances in scientific and technical knowledge have led to more and more catastrophic consequences. The challenge for critical theory is to understand this paradox without romantic and anti-modern afterthoughts as a contribution to a progressive worldview.*

## 1. Rationality in the Critical Theory of Technology

In 1888 Edward Bellamy published *Looking Backward*, the most famous utopian novel of the 19th century. Bellamy's hero wakes up after sleeping for more than 100 years in a 20th century socialist society. All the institutions are explained to him as rational, that is, both just and efficient. Far from being regimented, Bellamy's socialist society is inhabited by highly developed and morally responsible individuals.

In 1932 Aldous Huxley published *Brave New World*, the most famous dystopian novel of the 20th century. Huxley's heroes are persecuted non-conformists in another perfectly rational society, but this is a society of total administration. Huxley's dystopia has sacrificed justice and individuality to achieve stability and control.

What happened to transform 19th century optimism into 20th century pessimism? Why did the 19th century foresee utopia and the 20th century dystopia? What transformed the meaning of rationality between these two centuries?

Bellamy's utopia is organized around an industrial army in which workers enjoy equal pay. They are relieved of the most difficult and dangerous work by machines. The hardest jobs are performed in a shorter work week so as to recruit workers who value leisure without the need for financial incentives or coercion. The industrial army is commanded by experts of high moral character.

Everyday life and politics are not organized by the army nor is art, literature, science, invention, journalism, and religion. All these activities are pursued freely, without expert control, because they have no scientific basis and hence no use for expert management. Bellamy's utopia is thus a bipolar society combining collectivism and individualism in ideal proportions. But this is precisely what did *not* happen in the 20th century when the technical means were actually available to achieve utopian ends.

Huxley's dystopia is also a rational society, extrapolated from mass manipulation by the emerging broadcast media and Ford's assembly line. His dystopia reconciles individual and

society by eliminating individuality. Its rulers argue that all ills stem from the lack of fit between human capacities and the division of labor. Human beings must therefore be reconstructed in mind and body to suit the tasks they are condemned to perform. People become technical objects in this scheme, their genetic heritage mere raw material for the production of better adapted models. The alternative the novel proposes, or rather the dilemma it constructs, distinguishes total technology from individualistic chaos, the one offering slavery and stability, the other freedom and catastrophe.

Both of these novels concern the radical consequences of social rationalization through technology. The comparison between them raises the question of the significance of rationality. Our common sense identifies the rational with science and efficiency. It is universal, necessary and morally neutral. But in Bellamy technical and moral progress are conjoined while in Huxley technology is bound up indissolubly with domination. In neither case is rationality the neutral medium in which independent desires and cultural impulses are transparently fulfilled and expressed. On the contrary rationality *is* desire and culture in living social form. As my title indicates with McLuhan-esque exaggeration, the rational mediation of social action biases the message or meaning of that action.

The question the novels do not address is precisely how rationality is combined with values. Each novel posits an essential connection between technical advance and a specific value, freedom in the one case, domination in the other. This leaves little room for human agency in the technical sphere. But a new politics is emerging that is neither utopian nor dystopian. This politics responds to breakdowns of rationality through democratic interventions by ordinary people with consequences for the design of technologies and technical systems. A new understanding of rationality is needed to respond to the questions raised by this new technical politics. My starting point in approaching these daunting issues is the critique of rationality in the Frankfurt School.

The Frankfurt School of Theodor Adorno, Max Horkheimer, and Herbert Marcuse elaborated an unorthodox version of Marxism that shared with Huxley a skeptical view of progress. Marx had relied on the spread of critical rationality to eventually render the working class immune to the ideologies that kept it in thrall. Like Bellamy, he believed in the emancipatory effect of a further process of technological rationalization under the control of workers. Later Marxists simplified the argument and concluded that capitalism distorted a pure technical rationality waiting to emerge under socialism. They expected social progress to unleash technology for the good of all. Although they were Marxists, the philosophers of the Frankfurt School believed that class consciousness had failed to emerge as Marx expected, that the opportunity for proletarian revolution had been missed, and that technology—rationality in its most concrete form—was the problem, not the solution.

The Frankfurt School argued that both capitalism and communism were based on the generalization of technical mediation in the oppressive form which capitalism first gave it. The factory was the opening scene of rationalization as domination. Today it is everywhere, reaching into medicine, entertainment, sports, education, and framing everyday life and belief. Power follows technology. The enrolment of everyone and everything on the planet in the system has made it possible to spread centralized administration from the factory to society at large.

There are several possible responses to this situation. Traditional Marxists, liberals and neoliberals still hold that modernization must continue until it finally fulfils its promise. The

negative consequences so far endured are dismissed as contingent accidents along the path of progress. Marxists had high hopes in the tumultuous period after World War I. But their hopes had dimmed by the time the Frankfurt School first flourished in the 1930s. These philosophers witnessed the rise of virulent racist and nationalist ideologies purveyed by the new mass media. They did not despair completely but in fact they saw no path forward.

The Frankfurt School criticized the progressive notion that domination is overcome through progress in rationality. On this view domination should recede as rationalization advances. This is what Habermas calls the "Enlightenment project," but it seems to be failing. What we witness instead is a catastrophic reversal of the expectations of the Enlightenment which Marx still hoped to fulfill through socialist revolution. The Frankfurt School proposed a "rational critique of rationality" in response to this situation in the hope of salvaging a coherent basis for a critical theory of modernity out of the flawed inheritance of the Enlightenment and Marxism. This approach must be distinguished from the more familiar romantic critique that calls for a retreat from rationality and all its works. These two critiques imply different politics and it is therefore important to distinguish them clearly.

Romantic critique of reason as such begins in the late 18th century, accompanied by idealization of the past. I cannot review this trend here but must mention its essential thrust. That thrust is evident in much romantic literature which opposes passion to bourgeois calculation and social conformism. The theme is summed up by Balzac's antihero Vautrin who declaims "J'appartiens à l'opposition qui s'appele la vie." The image of life versus mechanism captures the essence of the romantic critique. On these terms, rationality is not a reliable means for understanding life but is instead a specific form of life dedicated to questionable goals. In most formulations this critique implies a rejection of modernity as an instance of that form of life.

This critique appears to be verified by the 20th century catastrophes of reason. Wars, concentration camps, nuclear weapons, and now environmental disaster threaten the Enlightenment project. But it is difficult to believe that the full content and significance of rationality is exhausted by these disasters. Surely reason has underexploited potentials that can be mobilized in a self-critical approach. A distinction must be drawn between technical and critical rationality. This is the approach of the Frankfurt School's non-romantic critique of rationality.

Romanticism despairs in enlightenment and gives up on reason altogether. The philosophers of the Frankfurt School offered a more complex response, a "dialectic of enlightenment" that recognized the catastrophe of modernity but also the continuing promise of a different kind of rational society. The underlying problem, they believed, lay in the transformation of reason in modern times which left it vulnerable to exploitation by the dominant elites.

Horkheimer argued that reason is rooted in a value, the preservation of life, but in modern times it is reduced to a pure means, an instrument of power indifferent to life. Horkheimer distinguished accordingly between traditional "objective" and modern "subjective" reason. Objective reason contains a value within itself. Medicine is an example. It combines rational techniques based on science and experience with a commitment to healing. Until modern times this was the normal form in which reason was deployed socially. But with the emergence of a total civilization of technique reason becomes "subjective" in the sense that it responds to the will rather than to intrinsic purposes of some sort.

Marcuse argued that subjective reason is concretely realized in modern technology. It makes possible not only a generous material standard of living but also access to the cultural heritage of the human race, formerly available only to the wealthy. Advancing technology spreads the capacity for self-rule thus proving the obsolescence of class just as Marx supposed. But at the same time it provides the means for perpetuating the capitalist system indefinitely through "delivering the goods" and integrating the working class to consumer society. "Technological rationality" thus shatters the dream of Enlightenment. This is a radicalization of Weber's rationalization thesis culminating not in the iron cage of bureaucracy but in an iron cage of technology.

Marcuse's critique appears similar to the romantic critique of rationality, but in fact his argument is subtly different. The dire consequences of rationalization are not due to the nature of rationality as such, but rather to its restriction and narrowing under the influence of capitalism. Premodern technical practice cultivated the *potentialities* of its materials. Traces of such notions sometimes persist among practitioners of technical arts such as architecture. They may aim not at arbitrary goals but at realizing a value such as beauty latent in their objects, a natural site, for example.

Frank Lloyd Wright attempted to situate his buildings harmoniously in the landscape, but the same engineering techniques he employed, freed from aesthetic concern, are also available to create steel and glass monstrosities cut off from any relation to nature. The formal neutrality of modern reason, which derives from its mathematical construction of its objects, cancels its intrinsic connection to potentialities and places it at the disposal of the powerful, ready to serve their subjective values. With such considerations in mind, Marcuse argued for a social revolution in reason itself, incorporating values into its technological applications. He hoped this could be achieved through the fusion of aesthetic and technical rationality in a renewed objective reason.

These theories of rational domination elaborated by the Frankfurt School are suggestive but so abstract they fail to engage with later struggles over technology in domains such as the environment and the Internet. They are, furthermore, ambiguous. Horkheimer and Adorno argued that instrumental reason is essentially constituted by the repression of inner and outer nature. Yet Adorno also condemned capitalism for distorting technological development and lamented the suppression of beneficial technical alternatives. It is not easy to reconcile these two positions. The contradiction is even clearer in Marcuse. On the one hand he follows phenomenology in arguing that modern scientific-technical rationality is intrinsically linked to domination. On this basis he advocates a new science and technology that will treat nature as a subject, by which he means respect its potentialities. But on the other hand he rejects any regression to a premodern qualitative science of nature. What his reform of science and technology would entail remains obscure. This ambiguity has opened the Frankfurt School's critique of rationality to the charge that it is romantic and irrationalist.

Yet despite these problems, I believe the essential point of the Frankfurt School's critique is valid. That point is the social bias exhibited by apparently neutral technology and the attendant paradox of rationality, the fact that the progress of technology has gone hand-in-hand with the progress of domination.

There are no ready concepts for talking about this paradox. That the existing technology favors domination is clear, but we must clear up the ambiguity in the Frankfurt School's critique, show its relevance to the contemporary politics of technology, and clarify the distinction between

critical theory and the essentialist condemnation of technology as such. To understand the paradox without romantic subtexts we need a concept of *social* bias appropriate for the analysis of *rational* systems. The Frankfurt School intended just such an analysis but failed to develop the categories and methods for performing it. The clue to an alternative approach lies in the notion that the very neutrality of technology links its fate to a project of domination.

I have formulated this approach as a theory of the bias of technology. This requires a departure from the usual concept of bias which is closely associated with prejudice and discrimination. But bias in a less familiar sense appears in other spheres as well. For example, because right handedness is prevalent, many everyday objects are adapted to right-handed use. This too could be called a bias but it does not involve prejudice. Rather it is built into the design of the objects themselves. In this it resembles the kind of bias exhibited by technology and other rational systems.

In accordance with this distinction, critical theory of technology identifies two types of bias which I call "substantive" and "formal" bias. Enlightenment critique addresses the more familiar substantive bias. Eighteenth century philosophers were confronted with institutions that claimed legitimacy on the basis of stories about the past and religion. Aristocratic privilege was justified by mythic origins such as participation in the crusades. Kings ruled in the name of God. Rational critique undermined these narrative myths behind religion, monarchy and feudalism. The Enlightenment judged institutions on the basis of facts and arguments and this judgment was fatal to the *ancien regime.* Much later a similar critique attacked racism and gender bias again in the name of rational ethical principles and scientific knowledge.

I call the bias criticized in such cases "substantive" because it is based on pseudo-facts and emotions, specific contents that motivate discrimination. For example, when women are thought to be less intelligent than men—a widely held view that appeals to feelings rather than evidence—even the smartest among them will have difficulty finding the jobs they deserve and less qualified men will perform less efficiently in those jobs. Substantive bias intrudes values and prejudices into domains that ought to be governed by rationality and justice. Critique of substantive bias therefore implies the purity of reason as such.

But technology too discriminates between rulers and ruled in technologically mediated institutions. This bias does not involve prejudice. A biased technology is still rational in the sense that it links cause and effect efficiently. No narrative myths or pseudo-facts obstruct its functioning, and it is certainly free of emotion. Nevertheless, when the division of labor is technologically structured in such a manner as to cause subordinates to perform mechanical and repetitive tasks with no role in managing the larger framework of their work, their subordination is technologically embedded. I call this a "formal" bias because it does not violate the formal norms such as control and efficiency under which technology is developed and employed. These norms do not specify a particular substantive goal although the technologies they govern may in fact achieve such goals through the side effects of their role in social life.

In this respect the formal bias of technology is similar to the bias of the market which was the starting point for Marx's critique of capitalism. The market appears rational but, strangely, equal exchange leads to inequality. This inequality escapes Enlightenment critique because it is not justified by narrative myths but by the exchange of equivalents. In the mid-19$^{th}$ century two styles of critique emerged in response. The French anarchist philosopher Proudhon famously claimed that "property is theft." He argued that property income is not the result of an

equal exchange. Various theories of this sort have appeared over the years, some arguing that capitalists charge more than goods are worth, others arguing that they pay workers less than their fair share. In either case, the market is treated as a fraud rather than as a coherent system.

Marx was a more rigorous thinker. He realized that the critique of the market would have to begin with the fact of equal exchange rather than denying it. The origin of inequality would have to be found in the very rationality of the market. He proved this with an elaborate economic theory that I will not review here. His argument turns on the difference between the worker's wages, which is more or less equivalent to the value of his labor power, and what he is capable of producing in the course of the working day, the length of which is set by the capitalist. Since the worker owns and sells his labor power, not the product of his labor, no violation of strict market exchange is involved in setting a workday long enough for the capitalist to make a profit. The problem is not primarily the unfairness of this system, but the larger consequences of capitalist management of the economy, such as the deskilling of work and economic crises. With this argument Marx showed that rational systems can be biased and he extended this type of critique to technology as well.

The methodological significance of Marx's analysis lies not just in the condemnation of exploitation but in combining the apparently contrary notions of rationality and bias. This was precisely what the Frankfurt School was to do much later in its critique of technology. The point of that critique was not to blame technology for social ills nor to appeal to technological rationality as an antidote to the inefficiency of capitalism, but to show how technology had been adapted *in its very structure* to an oppressive system. This notion of structural bias can be elaborated further.

There are two familiar ways in which rational systems and artifacts are biased. In the first place they may require a context for their implementation and that context may have different implications for different individuals or social groups. Consider the case of maps. A map may be a perfect representation of the territory and in that sense highly rational, but it is useless until direction on the map is correlated with direction on the ground. Thus the map does not stand alone but must enter practical reality with a bias in the most neutral sense, a simple orientation. But a map may also embody a social bias, for example, in the case of early navigation when map-making was a necessary preliminary to the conquest of territory occupied by natives who themselves had no need of maps to get around.

The second way in which rational artifacts are biased is through their design, as in the case of right handed tools or the market in Marx's theory. As we will see in a later discussion of constructivism, design is shaped by many actors deploying rational solutions to the problems that interest them, not by pure reason alone. Artifacts and systems thus reflect particular interests through the role of powerful actors in shaping design. This does not make them irrational or inefficient but on the contrary is the way in which they are rational. I employ the concepts of "translation" and "design code" to understand this apparent paradox.

Technologies are built according to a "design code" that translates social demands into technical specifications. The sidewalk ramp is a good example. Until it was introduced, disability was a private problem. The interests of the disabled were not represented in the design of sidewalks which obstructed their movements at every crossing. But once society accepted responsibility for the free movement of the disabled, the design of sidewalks translated the new right. This recognition takes the form of a standard for the width and slope of the ramp.

Progress is defined relative to design codes and not in absolute terms. Take commercial aircraft as an example. The criterion of progress in this domain has shifted from speed—the Concorde—to size—the 747—as a function of OPEC's power to raise the price of fuel. Neither size nor speed is the "right" criterion; there is no question of rightness because the choice of a criterion is contingent on shifting historical events. On these terms modern societies have experienced a specifically capitalist form of progress biased by class power.

Along the way, unsuccessful alternatives have been rejected and forgotten, covered over by a kind of unconsciousness which makes it seem as though the chosen path of progress was inevitable and necessary all along. This is what gives rise to the illusions of pure rationality and universal progress. These illusions obscure the imagination of future alternatives by granting existing technology and rationalized social arrangements an appearance of necessity they cannot legitimately claim. Critical theory demystifies this appearance to open up the future. It is neither utopian nor dystopian but situates rationality within the political where its consequences are a challenge to human responsibility.

**2. System and Lifeworld in Instrumentalization Theory**

In this section I present my own approach, which I call instrumentalization theory, in a critical confrontation with Jürgen Habermas, the most prominent contemporary representative of the Frankfurt School. Habermas introduced communication theory and system theory into Critical Theory and turned it away from the radical critique of modernity toward the reform of the welfare state. He rejected what he considered the anti-modernism of Adorno, Horkheimer and Marcuse. Their critique of social domination was based on a more fundamental critique of the domination of nature but, he argued, the category of domination applies only to human relations. The very concept of domination of nature is incoherent and implies a critique of technology as such not so very different from what one finds in Heidegger. Furthermore, these philosophers never explain the critical standard underlying their argument, nor do they propose a concrete program of reform of modern society. According to Habermas there is a gaping normative deficit in the philosophy of the early Frankfurt School.

In his 1968 essay on "Technology and Science as Ideology," Habermas takes up a strand of Marcuse's argument, the notion that the problem with technology is its universalization as a worldview or ideology influencing every aspect of life in modern society. Habermas quotes Marcuse who writes, "When technics becomes the universal form of material production, it circumscribes an entire culture; it projects a historical totality-- a 'world.'" This is Marcuse's critical version of the technocracy thesis according to which experts have taken over and depoliticized public life. Self-expanding technology replaces moral considerations and debate. Habermas finds in this approach a way of separating the critique of technology as such, which he rejects, from the critique of the legitimating function of technology in technocratic ideology.

Habermas develops his own version of this argument in the course of a critical confrontation with Marxism. Marx argued that the tensions between productive forces and relations of production motivate class struggle, but Habermas claims that class struggle has weakened in intensity to the point where this theory must be completely revised. The tensions Marx addressed through social categories must now be explained through an analysis of the generic action types involved in work and communication underlying those categories.

Habermas thus substitutes the concepts of “purposive rational action” and “communicative interaction,” for Marx’s forces and relations of production. Purposive-rational action is success and control oriented. The technical relation to nature is rational in this sense, i.e. more or less effective and efficient. It differs from communicative interaction which aims at mutual understanding rather than technical success. The tension between the types of action involved in work and social relations now replaces the original Marxian problematic.

Habermas identifies two major features of all societies on the basis of these distinctions. On the one hand every society has an institutional framework based on a system of meanings, practices and expectations established by communicative interaction. On the other hand there are technical subsystems which contain the knowledge, practices, and artifacts that enable the society to produce the goods required for survival. The balance between the technical and communicative dimensions varies, but the institutional framework was always predominant until modern times.

Habermas distinguishes two stages in the development of modernity in each of which a different technical subsystem intrudes on the institutional framework. In the first phase of bourgeois society the market penetrates everywhere and displaces the institutional framework as the determining instance of social life. So long as the market is interpreted as a quasi-natural phenomenon, it supports bourgeois hegemony. Exchange appears fair since equivalents are traded without coercion. The legitimacy of the ruling interests is established through their identification with the “laws” of the market.

This legitimation fades as governments begin to regulate markets in the 20th century. In the postwar period technology takes over where the market leaves off in organizing more and more of social life; market legitimation gives way to technological legitimation. The institutional framework is increasingly subordinated to the conditions of economic and technical development. Legitimation is now achieved by identifying the ruling interests with the efficient functioning of the system. Normative concerns are increasingly evacuated as a dystopian logic takes over. Depoliticization masks continuing domination and justifies a technocratic order.

Habermas's early essay is an attempt to establish a critical but positive relationship to modernity. He postulates a double rationalization, both technical and communicative. The technical rationalization is of course familiar but Habermas treats progress in freedom, individuality, and democracy as belonging to a parallel communicative rationalization. He does not criticize modernity as such but rather the over-emphasis on technical rationalization under capitalism at the expense of communication. Critique should aim at furthering communicative rationalization rather than denouncing technology.

In his later work Habermas develops an improved version of his theory. He realizes that individual action orientations do not a society make. The real problem is coordination among many acting subjects. Habermas distinguishes two different types of action coordination characterizing the domains of “lifeworld” and “system.” These now replace the “institutional framework” and “technical subsystem” of his earlier work. In the new theory coordination is achieved differently in each domain, through mutual understanding in the lifeworld and through systems such as the market without much in the way of communicative interaction.

The concept of lifeworld is derived from phenomenology. Husserl used the term to refer to the domain of everyday meanings underling scientific conceptualization. In Heidegger it was identified with the “world” as a system of meanings implicit in the active relation to things.

These meanings are “preconceptual” in the sense that they are prior to and make possible the articulation of meanings in language. Both thinkers draw our attention to meaning as the irreducible medium of experience. Habermas reformulates the concept to emphasize the intersubjective context in which meanings are generated and shared.

The lifeworld is essential to the reproduction of the individuals but it is incapable of managing the institutions of a large-scale modern society. For that purpose more impersonal and quasi-mechanical forms of interaction are required and these are made possible by systems of economic exchange and administration. The system concept employed here is derived from the Talcott Parsons’ generalization of certain features of markets to other social domains. These systems are self-regulating and require no collective agreement but only stripped-down and conventional responses such as the typical dialogue involved in making a purchase or obeying a command. Modern society depends on the effectiveness of systems at unburdening the lifeworld of excessively complicated tasks.

Technocracy is now redefined as “colonization of the lifeworld” by the system. The outcome depicted in *Brave New World* threatens, but unlike Huxley, Habermas does not despair. He advocates increased social control of the system in terms of a consensus reached freely in the public sphere through communicative acts. He thus revives the bipolar vision of *Looking Backward*.

Unfortunately, he abstracts completely from technology in this version of his theory. He focuses instead on the welfare state, multiculturalism, and deliberative democracy. He is concerned for example about legal intrusions into the family and ignores such technological intrusions as the medicalization of child birth. But technology is just as important as markets and administrations. It too functions as a system in coordinating action and it too causes many of the most important problems of modern societies. How can a critical theory of modern society omit from its agenda questions concerning the environmental, the Internet, economic development in poor countries, and the democratization of technology?

Despite these limitations Habermas's dualism has interesting implications. As he argues, modern societies operate in two main worlds, a world of quasi-mechanical or causal institutional interactions and a world structured around meanings and communicative understanding. Each world requires its own method of analysis. But unfortunately there is an ambiguity in Habermas’s application of this dualistic conception.

In methodological discussions the distinction is analytic. This means that system and lifeworld co-exist in all social institutions. The weight of the two types of action coordination differs in different institutions, but there is invariably considerable overlap. Sociologists who study organizations find this overlap in the dependence of formal hierarchies on informal relationships, both of which are necessary to effective functioning. Similarly, economists who study the effects of taxation on incentives for spouses to work illustrate the penetration of system rationality into the family, an institution that is primarily the scene of communicative interaction.

But it is not easy to apply the colonization thesis on this interpretation since system and lifeworld are always already interpenetrating each other. How then can the one “colonize” the other? Habermas evades this question by tacitly identifying system and lifeworld with separate institutions such as the economy and the family. But this risks neutralizing the system as a sphere of pure rationality. Market rationality, for example, appears to be based on the essence of economic relations rather than on social choices. The market’s boundaries can be set from the

outside, but within its range it operates according to its own laws. Similarly, on this account technology can be employed for one or another socially determined purpose but its workings and developmental path are science based rather than socially based.

Habermas's formulation eliminates the problematic of rational domination so central to the thinking of the first generation of the Frankfurt school. He returns to a traditional liberal-Marxist notion of progress. Social critique is reduced to boundary policing. Apparently, systems are alright in themselves and the only problem is their extent. Such a view of systems has conservative consequences. The communicative sphere has only an instrumental relation to the separate systems and cannot redesign them from the ground up without violating their internal logic. This leads Habermas to reject radical proposals for changing the structure of the economic system such as self-management. The system is surrendered to capital and the experts.

If Habermas accepts the neutrality of systems, this is because he has no concept of formal bias and hence no conceptual basis for criticizing systems in themselves that does not tip over into romantic rejection. Caught between the neutrality thesis and romantic critique, he is helpless to devise an adequate critical theory of modernity.

To escape these problems, it is necessary to stick rigorously to the idea that system and lifeworld are a crosscutting analytic distinction throughout all the institutions of modern society, not social spheres but overlapping perspectives. I therefore propose what I call a double aspect theory of technology and other rational institutions according to which their intrinsic logic is conditioned by the social forces presiding over their design and configuration.

The details of this double aspect theory require careful elaboration. Since system and lifeworld are not separate things, but different aspects of one and the same thing, they cannot interact causally. And yet they are not identical either. Analytically distinguished entities such as these entertain logical relationships of some sort. For example, the Pythagorean theorem explains the relations of the three sides of a right triangle. Similarly, the notion of form explains the relations of the parts of a work of art. The related entities—sides, colors, shapes—cannot exist separately and yet they are distinguishable. We grasp them through special concepts adapted to each case. The concept of formal bias serves this function in relation to rational systems, explaining the relation of the analytically distinguished system functions and lifeworld meanings.

Hegel wrote a short essay called "Who Thinks Abstractly" that helps to clarify this. He argues for reversing the usual understanding of abstract and concrete. It is not the philosopher who thinks abstractly, but the ordinary person who summarizes a complex of relationships in a single trait. Abstraction is thus a synecdoche in which a part stands for the concrete whole. Hegel gives the example of the servant who is treated as merely a servant by a vulgar master, in contrast with the "French noble" who understands that his servant has ideas and purposes just like himself and who relates to him accordingly as a person.

The Habermasian conception of system suggests something similar. Consider market relations. Their communicative simplicity is made possible by abstracting economic exchange from the complex relations that surround it. We enter a store and relate to the clerk exclusively as a clerk, ignoring all other aspects of the clerk's being. This is abstraction in Hegel's sense. (In a curious confirmation of Hegel's Francophilia, it is considered proper even today to first recognize a French clerk as a person with an appropriate greeting. Only then is it polite to relate to the clerk as a clerk.)

Systems generally can be considered abstractions from the wider whole of the lifeworld in which they are embedded. What is abstracted is the functional dimension of the lifeworld. Thus a clerk performs an economic function, just as a device performs a technical function. The functional dimension of persons and things is distinguishable but it is not self-subsistent. The clerk cannot be separated from the person who is a clerk, nor the device from the social world in which it serves its function.

An automobile, for example, has a transportation function, but it is also part of the lifeworld of its owner with a significance in terms of beauty, status, social behavior, its role in urban design, and so on. Of course the abstract idea of the transportation function is useful and the causal mechanisms that serve it can be studied and perfected, but this does not nullify the social meaning of the automobile. In sum, the functional logic that operates at the systemic level is abstracted from the meanings that circulate in the lifeworld.

I call this approach "instrumentalization theory." The term was perhaps poorly chosen. Phenomenologically considered, worlds are made as human beings engage *practically* with their environment. This is the sense in which I intend "instrumentalization," and not a specific reference to tools. I could have called my approach "world-making theory" and avoided this particular confusion while inviting others.

In the instrumentalization theory the causal aspect of the system level is called the "primary instrumentalization" and its social dimension, the "secondary instrumentalization." As applied to technology the point of the distinction is to show the relation between two fundamental aspects of every functional artifact, causal structure and lifeworldly significance.

The primary instrumentalization is an imaginative relationship to the technical affordances of natural objects. It "functionalizes" the object. Functionalization involves *decontextualizing* elements of nature in order to isolate their useful properties. The decontextualization is accompanied by a *reduction* of the object to just those aspects through which it can be incorporated into a device. Every technical insight involves these operations by which a natural object enters the social world through its practical affordances. A simple example is grasping a stick in order to extend one's reach to a fruit hanging from a high branch. The action depends on causal perceptions and reasoning. All human beings and even some animals are capable of this to some degree. Modern technology assembles huge numbers of such affordances in coherent patterns to accomplish goals that go beyond any individual's needs.

The logic of such assemblages is not exclusively technical. It is constrained by causal principles: only an assemblage that "works" is built. But usually many working combinations are available. The secondary instrumentalization determines which ones are realized. At this level the selected affordances are given meaning in their social context. They cannot remain simply in the form of a bright idea but must be brought within the scope of the *system of the meanings* that makes up the way of life of the society. The reduction of the object, which strips it bare of connections, is compensated too as its design is mediated by ethical and aesthetic values. This is the lifeworldly significance of the technical; it situates artifacts in the way of life to which they belong.

Technological design combines both levels seamlessly and both are necessary. Apart from the simplest technical actions, the construction of a device is always a social act involving the secondary instrumentalization. The pattern thereby established is not purely rational because powerful actors preside over the process of accommodation. Some possible designs are favored

and others foreclosed with different consequences, beneficial or detrimental, for different social groups. Here is where the formal bias of technology reveals its political significance.

The instrumentalization theory offers a framework within which to analyze the imbrication of the technological system and lifeworld. The two instrumentalizations refer to different aspects of artifacts and their users, but these are aspects only, not separate spheres able to exist independently of each other. This is crucial. Unlike Habermas's system and lifeworld, here the aspects are only analytically distinguished, each level reflecting the other on its own terms. The fact that modern societies are able to abstract the functional level of artifacts and to construct technical disciplines on that basis masks this essential social dimension. The abstraction certainly has consequences—it makes modern technology possible—but it does not actually eliminate the social. Recall the example of the sidewalk ramp discussed earlier. The ramp's causal properties are describable on purely technical terms in a specification, but that specification is not purely technical; it represents the rights of the disabled technically. That is its significance in the lifeworld.

Social criticism must address the design and configuration of technical systems. The instrumentalization theory offers a critical approach to technology without technophobia. It identifies systemic domination with a secondary instrumentalization that narrows the values technologies serve to exclude important contexts and consequences. This is what happened in the development of industrial technology under capitalism. But it also identifies the breaking-points at which technologies can be reconfigured to serve democratic purposes. The secondary instrumentalization may cancel or mitigate the potential for domination by orienting technology toward a broader range of social values. This is the outcome of democratic interventions into technology. Distinguishing these two levels saves the theory from the dilemma of essentialist technophobia vs. the neutrality thesis which threaten it in the various formulations of the Frankfurt School. The key concept missing in all these formulations is the notion of formal bias, which makes possible a true critical theory of technology.

**3. Constructivism, Critical Theory, and Communication**

The Frankfurt School's responses to the failure of the modern faith in reason was a "dialectic of enlightenment" that recognized the catastrophe of modernity but also the promise of a rational society based on freedom from myth and domination. The most significant application of this dialectic was to the development of mass society. The Frankfurt School's argument presupposed Kant's ideal of enlightenment formulated in the phrase *sapere audi*, "dare to know." This is the ideal of autonomous individuality Marx projected onto the working class as class consciousness. But instead of a self-conscious class atomized and homogenized masses betrayed Marx's hope. This is due to the surprising effectiveness of propaganda and advertising which he could not have foreseen.

The mobilization of whole populations through nationalism, racism and consumerism is the new basis of class rule in the 20$^{th}$ century, made possible by the technical mediation of the public sphere. The Frankfurt School argued that at the basis of the new system lay the "culture industry," which extended the commodity form to culture. Today's commodified cultural products are fundamentally different from earlier cultural artifacts, even those sold on markets. Art used to have its own canons and logic based on religious or artistic traditions. The sale of the work did not affect its inner form as profoundly as it does in the case of contemporary

commodified cultural products. These products communicate a conformist ideology through stereotyped characters, plots and images. A new authoritarianism emerges in which accepting the facts established by power and reflected by the media appears as the only rational response to "reality." This is the rationalization of consciousness itself. But the counter ideal remains: democratic discussion between free individuals is still an imperative of critical reason.

This ideal was concretized sociologically by Habermas. In an early book he argued that the interventions of private persons into public discussion in bourgeois society constituted a new social form, which he called the public sphere. The contexts of these discussions, such as coffee houses, and their literary background in texts valorizing individual feeling and private life, demarcated this form of publicity from the institutions of the pre-bourgeois state. The ideal of citizenship as the right to engage in rational discourse concerning the common good emerges from this innovative communicative structure. Habermas's book concludes on an analysis of the destruction of the bourgeois public sphere by the mass media. Just as participation in the public sphere broadens to include the whole underlying population, it is transformed and instrumentalized by governments and corporations. Rational discussion is replaced by propaganda and citizenship in the full sense of the term gives way to passively manipulated masses.

Oscar Negt and Alexander Kluge replied to Habermas, defending the notion of a proletarian or oppositional public sphere as an alternative instance of democratic self-expression and debate. But their conception was tied to forms of action and organization characteristic of the high points of political struggle, such as workers' councils and student revolt, and these have played a relatively small and intermittent role in the life of advanced societies. Habermas's pessimistic conclusion was relayed by Marcuse's critique of "one-dimensional man" which itself reached a mass audience in the 1960s and '70s. So strong is the commitment of most critical theorists to this decline-and-fall schema that they have barely noticed the contrary effect of the Internet. Habermas himself dismissed it—incredibly—in a footnote to a presentation to the International Communication Association in 2006.

This blind spot is rooted in the history of the Frankfurt School. Its thought was elaborated during a long period of defeats for the left. Broadcasting and technical macro-systems offered a dystopian paradigm of technology in this period. There is a large dose of truth in these philosophers' pessimistic conclusions despite the evident exaggeration. But their critique of technology is limited by this historical context. Today it appears abstract and technophobic and as a result it is frequently dismissed by a younger generation of scholars for whom the Internet is a natural milieu and who are attuned to new forms of struggle and contestation.

In particular, struggles around technology cast a different light on the theory of the public sphere. Environmental struggles, user agency on the Internet and in medicine, and economic and technical struggles in developing countries all testify to the fact that the "masses" have not been incorporated completely into the system. These struggles are not always political in a traditional sense but they refute the dystopian tendency of critical theory. Unfortunately, critical theory in both its early formulations and in the recent work of Habermas and his followers ignores agency in the technical sphere. As a result it remains caught in the dystopianism appropriate to the age of broadcasting even as the Internet creates a new social and technical context. If the Frankfurt School's radical political conception is to survive it must take into account this changed context.

The Frankfurt School requires some new intellectual resources to make the turn toward technical issues. These can be found in social constructivist technology studies. Social constructivism offers methods for studying technology and emphasizes the role of agency in technical development. Although social constructivism is not a political theory, it undermines technocratic ideology and modernization theory. Placing it in the context of critical theory brings out these political implications.

The term social constructivism refers to several related approaches in science and technology studies that have in common a rejection of positivist and determinist theories according to which science and technology are products of pure rational understanding of nature. If only logic and evidence count in scientific and technical controversies, social explanation of the most dynamic forces in modern societies is excluded apriori. In opposition to this view constructivists emphasize the social shaping of science and technology, not to the exclusion of rationality but as its context and medium. In their research constructivists strive to conform to the "principle of symmetry" which recognizes both cognitive and social aspects in all scientific and technical activity.

In the 1980s social constructivism inspired new approaches to technology studies. Some of the major figures in this trend are Trevor Pinch, Wiebe Bijker, and Bruno Latour. In their writings efficiency appears as an analog to positivist truth. Just as positivism exempts scientific truth from social explanation, so traditional sociology dismissed social explanation of technology. Progress in efficiency was viewed as an exogenous source of social change. For social constructivist technology studies, on the contrary, technical choices, like scientific choices, are underdetermined by purely internal criteria such as efficiency.

No doubt constructivists were not alone, nor were they the first, in rejecting determinism for more empirically grounded studies of specific technologies. However, their work brought two fundamental methodological principles to the fore: the role of *interpretation* in design, and the *co-construction* of artifacts and social groups. The application of these principles to the study of technologies opens up a lifeworld perspective on the material underpinnings of modernity. Let me begin the demonstration of this approach by briefly defining these principles which are applied in the analysis of the Internet that follows.

Social constructivist technology studies attempts to identify the "relevant actors" engaged with the design process. These actors define a given state of affairs as a technical problem for which they seek a technical solution. But problem definitions are not absolute; they are relative to actors' interests and concerns. A slightly different perspective on the "same" problem may yield a very different technical solution. This is called the "interpretative flexibility" of artifacts. As Pinch and Bijker explain, the interpretation of an artifact influences not just its use but also its very design. In this sense technology is socially relative. Interpretative flexibility is especially important in the early stages of development.

Technology is not simply a matter of artifacts but, as Latour has argued, it involves networks of individuals and things co-constructed through various types of associations. The presence of the network is often obvious, for example, a factory or a hospital, organized around the technologies that mediate the individuals' activities. In other cases a latent group may be constituted in response to a network's unintended side-effects or unexplored potentials. This describes, for example, the experience of victims of pollution or unsafe foodstuffs, mobilized once they discover the source of the problems they share. But it also describes the experience of

users of a technology who introduce innovative features as they discover new ways of exploiting it.

Although it would seem possible in principle to include them, missing in most constructivist accounts are these latent groups, the "irrelevant actors" who lack the power to influence design decisions. This describes the entire underlying population in Marxist accounts of the development of the industrial system and the Frankfurt School's account of the mass media. The absence of these non-actors from constructivist accounts is problematic. Constructivists have also shied away from invoking diffuse influences such as ideology and culture that play an essential role in politics.

The methodological limitations of social constructivist technology studies appear to stem from the heritage of science studies. Scientific controversies involve actors who are roughly equal in power, committed to their profession, and more or less sincere in their pursuit of truth. The world of technology is quite different. Much technology is developed by organizations rather than individuals and the disproportion in their power is often enormous. Furthermore, organizations are far less trustworthy than individual scientists and engage in blatant manipulation far more frequently than scientists commit fraud. Without idealizing the scientific community, we can confidently assert that a vision of society modeled on it is quite unreal. Thus constructivist insights must be supplemented by other methods to gain a full picture of the significance of technology.

Despite its limitations, constructivism is useful for overcoming the complementary limitations of the Frankfurt School. The theory of the culture industry was formulated at a specific stage in the development of the media, essentially, the early days of radio and film. The theories of the decline of the public sphere and one-dimensional society reflected the era of television in which broadcasting gained new powers. But the media system has changed radically with the emergence of the Internet and it is therefore necessary to modify the earlier analysis. Constructivist methods make this possible through a much more detailed account of the relations of technical design to social design than the Frankfurt School achieved.

If these apparently unrelated approaches can be combined, this is because there is a significant methodological similarity between them. Just as the commodity form enters the content and inner details of the products of the culture industry, so constructivism argues that social demands enter the content and inner details of technical designs. This parallel reflects a similar attempt to get beyond the notion of autonomous fields, neutral in themselves, and merely "used" for extrinsic purposes by social actors. Instead, both critical theorists and constructivists insist on the underdetermination of cultural and technical products and the role of social actors in shaping their inner workings.

This is the case with the Internet, a technology that is still at an early stage of development. The Internet illustrates the basic constructivist notion that technologies are not things but processes, contingent on shifting interpretations as well as knowledge of nature. Since the Internet is not a finished product, but is still incomplete and evolving it is impossible to fix its nature once and for all and to praise or damn it for qualities it may very well modify or lose in the near future. Hence the pointlessness of much of the hype and demystification circulating among scholars and journalists who write about the Internet.

The history of the Internet reveals the complexity of the relations between technology and politics. Originally called "Arpanet," it was developed by the Pentagon for timesharing on

mainframe computers. It was intended to ameliorate scientific communication for defense with an information exchange and calculating service. The key to its later evolution was the selection of an unusual method for handling data.

Computer networks communicate on telephone lines by sending small “packets” of data which are assembled at their destination. Telephone companies manage regular telephone calls on central computers and they extended this system to data. In principle the central computer was no longer required in computer networks based on “packet switching” yet it survived because of the limitations of early personal computers and the institutional momentum of the telecoms. This was reflected in the main early packet switching protocol, known as X.25. The distributed packet switched Internet was based on a competing protocol, TCP/IP, which required local computers to run a small program to construct and send the packets. X.25 networks were accessible from dumb terminals with practically no computing power, but the Internet protocol required every computer attached to the system to manage its own data. Hence the long delay in the expansion of the Internet which had to await cheap computing power.

These arcane technical differences have huge social implications. No centralized control over the Internet was necessary or possible and this had two unanticipated consequences: internationalization and frequent user innovation. These consequences should not be conceived on deterministic causal terms but rather as openings seized and given meaning by social actors who then intervened to exploit and modify the system in accordance with agendas unimagined by the original inventors. As personal computers spread and the Internet grew, these agendas gradually modified the very definition of the technology. The Internet went public in the 1980s and the Web made it popular in the 1990s. Millions of new users layered it with new functions and social meanings, additional secondary instrumentalizations to which corresponded various technical reconfigurations, primarily in the software running on the network.

For example, the ability to hook up any computer running TC/IP turned out to favor the internationalization of the system in competition with national telecoms, each of which resisted joining an X.25 network controlled by the other. The French Teletel system, which was many orders of magnitude more successful than any other national network, was unable to recruit other nations to its protocols and was slowly overtaken by the Internet. Internationalization of the Internet had immense repercussions for localized political struggles that were able for the first time to appeal to a worldwide audience inexpensively and through means under their own control. This is the technical base of world public opinion on resistance to tyranny around the globe.

The same design that enabled the Internet to expand geographically also enabled it to expand socially. To its distributed technical structure there corresponded a distributed social structure. Of course this was not the original intention of the Pentagon, but their system was quickly colonized by communicative usages. In fact one of the engineers who developed the system introduced an e-mail application simply for fun. A circuitous path leads from that first initiative through many intermediary steps down to the “blogosphere,” Facebook and the huge online lobbying organizations of today. The reliance on TCP/IP meant that no gate keepers could block these secondary instrumentalizations which have changed the over-riding meaning of the network from an information exchange to a space for community.

This multiplicity of actors and their interpretations yields alternative models of the Internet none of which has yet achieved closure. The scientific model of free information

exchange came into conflict with corporate interests, while all sorts of communicative applications developed rapidly once the Internet went public. The various interpretations of the Internet reflect ideologies, conceptions of society. The struggle between them implies different social visions, ultimately, different ways of life embodied in design, not simply different uses of the same technology.

Three coexisting models of the Internet compete and complement each other today. An information model stems from the original actors in the scientific community. A consumption model responds to the needs of business. A community model introduced by lay users has transformed the Internet into an innovative social phenomenon. If closure around one of these three models is so difficult to achieve, this is largely due to the policy of network neutrality. Under this policy no one type of data can be privileged and given extra bandwidth at the expense of other types. This has prevented powerful actors in business from turning the Internet into another broadcast medium at the expense of its communicative functions.

The significance of the community model appears clearly in the light of the Frankfurt school's critique of the mass media. The essential point of that critique was the effectiveness of broadcasting in promoting a consensus favorable to the ruling interests. The Internet weakens consensus by introducing unconventional viewpoints and making them visible to a large audience at no cost.

It is true that the quality of discussion on the Internet varies widely. Everyone has access to the unmoderated comments that follow news stories and many of these discussions are spoiled by intemperate contributors. But it is unfair to judge the Internet by this example. No doubt political discussions on street corners would similarly degenerate. This is not so much a technological issue as a problem of civic culture. More significant phenomena have developed around moderated online communities, independent media sites, blogs, and social networks. These spaces of interaction break broadcasting's one-way monopoly on opinion formation. The network revives a public sphere of discussion and debate.

Technology is not only instrumental to this development, but it plays a central role as an object of discussion in this new public sphere. The Internet connects scattered users and victims of the vast technical systems that underlie modern societies. Environmental campaigns employ the Internet to build constituencies affected by pollution and other problems. Communities of patients have organized to demand increased research funding and access to experimental treatments. The Internet thus has a unique and still largely untapped democratic potential to enable latent communities to recognize and articulate their needs.

Perhaps the most important manifestation of that potential to date is the defense of the Internet by its own users. The emergence of large online communities has empowered their members to protest and enact their own vision of their rights. For example, when Facebook attempted to assert its perpetual ownership of all materials placed on its pages, users organized to block the change and forced a retreat. Threats to network neutrality have been met by effective mobilization of huge numbers of Internet users. These are democratic interventions for the sake of democratic communication.

The democratic applications of the Internet have implications for the theme of rationality and domination. The Frankfurt school demanded that we situate rationality in its social context. It so situated the dominant rationality as exemplified in the bureaucratic and technical systems of advanced capitalism. The politics of the Internet and the agency of users and victims in domains

such as environmentalism and medicine signify the existence of another situated rationality, a rationality from below. Foucault's concept of “subjugated knowledge” reflects the experience of those who are poorly represented by the dominant rationality. The perspective from below reveals the blind spots of those in charge and inspires resistance where participant interests are slighted by the dominant design. Rationality and values come together in the incorporation of those interests in revised technical codes. Insofar as technical codes are more or less representative in this sense, they are political and interventions by actors into their formulation are political interventions.

Just as the Frankfurt School related the dominant rationality to a social subject and its project, so must this rationality from below be related to a subject and project. That subject is multiple; it consists in the technical networks that become self-aware and emerge as a resistant communities. Where their struggles yield new meanings that feed back into technological development, they affect designs and technical disciplines. In such cases of public action around technological issues, rationality and values come together. This is not quite Marcuse’s synthesis of aesthetics and technology in a new objective reason but it is as close as we are likely to get for the foreseeable future.

The Internet is an example of the co-construction of technology and society in action. Since it widens the range of communicative features represented by the technical codes I call it “democratic rationalization.” The term is an apparent oxymoron. In Weber rationalization means calculation and control and is implicitly linked to top-down management and administration. Weber assumed uncritically that organization in a modern society requires strict regulation from above. This is what led him to pessimistic conclusions. By excluding democratic or cooperative control apriori he condemned developed societies to an iron cage. But democratic rationalizations bend the bars of the cage.

We must generalize beyond Weber’s concept to a view of rationalization that does not prejudge the future. This generalized notion of rationalization would still refer to optimizing means through calculation and innovation but it would not imply a tyrannical system of control. A different type of “rational” society is possible based on mutual discipline and democratic leadership. It would require different technology. This possibility sheds light on the increasingly common interventions from below.

These interventions do not usually take the form of electoral politics. Rather, they emerge from controversies, hearings, lawsuits, participation in design, and creative appropriations. They often yield better working systems, for example, in the case of much environmental regulation, or the introduction of communication on computer networks. It is legitimate to call these “rationalizations” since they do improve efficiency albeit relative to goals established through more democratic procedures than those of corporations and many government agencies.

The new politics of technology is gradually introducing technology into the public sphere where it is subject to normative considerations. We need a theory of democracy adapted to this evolving situation. The available conceptual framework is the so-called lay-expert dilemma: experience with the defects and flaws of technological systems motivates public involvement. Lay people speak out and the experts respond. Out of these interactions between lay and expert improved systems may emerge.

That goal does not imply the replacement of experts by lay actors. Rather, where their relationship is healthy and constructive, they learn from each other, reflecting the

complementarity of everyday experience and technical rationality. Populist anti-intellectualism is of course a danger, but expert arrogance is its still more worrisome counterpart. It motivates the commonplace dismissal of public protest as irrelevant, regressive, and ideological. Yet such interventions often lie in the background of technical codes first formulated long ago and now taken for granted by experts. There is thus no reason of principle to exclude it from current technical debates. But expertise tends to obliterate its own history, forgetting the often complicated origins of its current standards. Now in a period of rapid change in technology, the background is coming to the fore. It is clear that public influence on technology is not an extraordinary external intrusion into a fully autonomous technical sphere but an intrinsic aspect of the dynamics of technical development. The technical sphere must be redefined to include the experience of users and victims as well as the knowledge of experts. Exchanges between them offer two different articulations of the same basic technical phenomena from the standpoints of system and lifeworld.

These considerations on technology have implications for our understanding of the public sphere. What is considered a public issue, suitable for free discussion, has changed over time. Law and war were the most important issues for early democracies and little else qualified as a suitable subject of discussion. But the public sphere expanded throughout the 19th century to encompass excluded zones formerly attributed to nature or God. Slavery was abolished and marriage and education were removed from religious control and transferred to the secular authorities. Somewhat later governments begin to intervene in the economy, removing it from the sphere of “natural law” and repositioning as a political issue. This process of dereification continues as technology, another pseudo-natural domain, is incorporated into the public sphere.

In one sense this could be seen as a generalization from Marx's approach to class struggle. Marx too anticipated technological change under a socialist system in which the workers who use technology would also determine its future. The early Frankfurt School’s approach to technology corresponded to the Marxist critique of political economy in demystifying the biases of the prevailing technological rationality. Today we can extend and concretize that approach in a critical theory of technology. Like the Marxist critique it explains struggles over design as rational in a democratic social context.

I began by comparing utopian and dystopian images of technology, but in reality we neither seek the one nor flee the other. The threat of technology has diminished with the rise of new social movements that establish the possibility of human agency in the technical sphere. Environmentalism and the Internet have renewed the aspiration to control technology. Although my emphasis here has been on struggles in the technical public sphere, they alone cannot decide the issue. The dominant ideology is still dominant but at least its hegemony is no longer technologically secured without fear of contestation. The contest engaged around freedom of communication promises further democratic advances. Insofar as success in this struggle is a theoretical task, critical theory still has a contribution to make.