

The "Autonomy" of the Technological Phenomenon

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An autonomous technology This means that technology ultimately depends only on itself, it maps its own route, it is a prime and not a secondary factor, it must be regarded as an "organism" tending toward closure and self-determination: it is an end in itself. Autonomy is the very condition of technological development. This autonomy corresponds precisely to what J. Baudrillard (*Le Système des objets*) sees under the name of *functional* when he says that "functional qualifies not what is adapted to an end but rather what is adapted to an order or a system." Each technological element is first adapted to the technological system, and it is in respect to this system that the element has its true functionality, far more so than in respect to a human need or a social order. And Baudrillard presents numerous examples of this autonomy, which transforms everything covered by technology into technological objects *before* being anything else: "The entire kitchen loses its culinary function and becomes a functional laboratory. . . an elision of prime functions for the sake of secondary functions of calculation and relation, an elision of impulses for the sake of culturality . . . a passage from a gestural universe of work to a gestural universe of control. . . The

simplest mechanism elliptically replaces a sum of gestures, it becomes independent of the operator as of the material to be operated on."

Performing this function, technology endures no judgment from the outside nor any restraint. It presents itself as an intrinsic necessity. Let us recall a rather typical statement among a thousand. Professor L. Sedov, president of the Permanent Commission for the Coordination of Interplanetary Research in the USSR, has declared that no matter what difficulties or objections crop up, nothing could halt space research. "I feel that there are no forces capable today of stopping the historical processes" (October 1963). This remarkable declaration can apply to all technology. The technological system, embodied, of course, in the technicians, admits no other law, no other rule, than the technological law and rule visualized in itself and in regard to itself.¹

However, we must know more about this autonomy. First of all, it is the notions or hopes that are modified by technology. An important aspect of this autonomy is that technology radically modifies the objects to which it is applied while being scarcely modified in its own features (if not its forms and modalities). Let us take a simple example. We distinguish between open data and closed data. Open data relates to still unsettled questions, it has an indeterminate content, it implies the participation of the interested parties. Closed data concerns a well-defined object, it can be coded and diffused instantaneously, and, of course, it is closed to participation. Only closed data takes advantage of all the technological means, only it can be rapidly transmitted, etc.

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Hence, the instant that technology is applied more rigorously in coding and transmitting data, the faster it accelerates and the more the data tends to become closed, i.e., to exclude participation by everyone, despite the ideology and the moral desire one may have.

We will not take up here the problem of the relationship between technology and science and technology's relative autonomy from science, since we treated these matters in *The Technological Society*. We will merely add four things emerging from recent studies. The man who ... has investigated this most closely is Simondon. And after showing the interconnections, he concludes not so much – obviously – that there is an autonomy pure and simple of technology, but that there is a possibility for technology to keep developing for a long, long while, even without basic research:

Even if the sciences did not advance for a certain time, the progress of the technological object toward specificity could continue. The principle of this progress is actually the way in which the object causes itself and conditions itself in its own functioning and in the responses of its functioning to utilization – the technological object, issuing from an abstract work of an organization of subensembles, is the arena for a certain number of relationships of reciprocal causality.

This text gives the precise point of the autonomy of the technological object and thereby specifies technology itself. In the same way, but going to extremes, Koyré (*Études d'histoire de la pensée scientifique*) opines that technology is independent of science and has no influence on it – which strikes me as impossible to support. J. C. Beaune, following Hall (*The Scientific Revolution*), likewise feels that science and technology have separate existences and autonomous developments, whose convergence was historically contingent; he also feels that the passage to scientific technology consisted in unifying the empirical and dispersed technologies, which I have called the passage from the technological operation to the technological phenomenon. These ideas merely take up what I wrote in 1950. Lastly, we can find numerous examples of both the correlation and the independence of technology in Closets. But they are not very significant!

The second remark: John Boli-Bennet (*Technization*), in another connection, offers a stunning analysis of the relationship between science and

technology. His is the most recent analysis that I know of, after Ernest Nagel (*The Structure of Science*, 1961), Karl Popper (*The Logic of Scientific Discovery*, 1959), and Carl Hempel (*Aspects of Scientific Explanation*, 1965). There are, says Boli-Bennet, two essential characteristics of scientific knowledge. The first is the "empirical proof of error": a statement cannot be accepted as scientific knowledge if it is theoretically impossible to find empirical data in respect to which the statement is invalid. The second is intersubjectivity, a concept that has replaced scientific objectivity: a statement is scientific only if it is liable to verification or "falsification" which is not subjective and individual, but intersubjective, each scientist never being more than one subject; but each subject having a certain knowledge and a certain background can repeat the same experiment, hence arrive at the same result. In sum, a scientific statement is one that is potentially "falsifiable" on an intersubjective level.

On this basis, we can very clearly see the close relationship between science and technology, quite a different relationship from the one that observers have been hunting for years by setting up "causalities." We will come across this science/technology problem again when studying the finalities of technology. But the mutual relationship between science and technology cannot be divorced from the relationship between technology and politics. It is through, and because of, technology that science is put in the service of government and that politics is so enamored of science.

The third remark: The science/technology interpenetration has *inter alia* a radical effect that is admirably set forth by K. Pomian ("Le Malaise de la science" in *Les Terrains de l'an 2000*, 1976): namely, the end of scientific innocence. There is no more neutral science, no more pure science. All science is implicated in the technological consequences. And the strength of Pomian's long and profound *factual* study lies in showing that there is no political implication here. As he demonstrates beyond dispute, the essential element is not the decision by politicians to use a scientific discovery in a certain way. But rather, the necessary implication of all scientific research in technology is the determining factor. It is the domination of the technological aspect over the epistemic aspect. And the factors operate in terms of one another: Militarization, nationalization, technicization are intercorrelated. In the same way, Pomian also points out that there is no good or bad use of science or technology.

The two are indissoluble, so that science, he claims, is not neutral, but ambivalent. "To believe that a methodology is neither good nor bad is to tacitly assume that human happiness and suffering are quantities with opposite signs, canceling one another. Far from it. In moral arithmetic, if there is an arithmetic, the sum of two opposite quantities does not equal zero." And we are gradually led to reverse the customary proposition: any *scientific* decision entails *political* consequences. "The decision to build a giant accelerator has political implications that the physicists cannot allow themselves to ignore." Pomian cites numerous present-day cases of scientists realizing the consequences of what they are doing and demanding a halt to research (and not a better political application!) Take for examples, the group working around Berg (1974) and the Conference of Asilomar (1975). In contrast, Pomian reveals the politically oriented character of the manifesto of researchers at the Pasteur Institute (the group for biological information). The object of the manifesto is not really the science/technology problem but rather a political debate in the most banal sense of the word! It is politics which is more and more induced by technology and incapable now of steering technological growth in any direction.

Lastly, we have to bring up a new analysis (1975),² which fairly transforms the present study of the relationship between science and technology. First of all, we have to distinguish between mathematics (which develops deductively, starting with axioms, and operates upon abstract symbols) and the physical or natural sciences (which develop on an instrumental and material basis). These latter sciences can progress only from a technological ensemble, which is itself nothing but the materialization of theoretical schemata.

Technology is both ahead of and behind science, and it is also at the very heart of science; the latter projects itself into technology and is absorbed into it, and technology is formulated in scientific theory. All science, having become experimental, depends on technology, which alone permits reproducing phenomena technologically. Now, technology abstractly reproduces nature to permit scientific experimenting. Hence, the temptation to make nature conform to theoretical models, to reduce nature to techno-scientific artificiality. "Nature is what I produce in my laboratory," says a modern physicist.

In these conditions, science becomes violence (in regard to everything it bears upon), and the technology expressing the scientific violence becomes

power exclusively. Thus, we have a new correlation, which I consider fundamental, between science and technology. The scientific method itself determines technology's calling to be a technology of power. And technology, by the means it makes available to science, induces science into the process of violence (against the ecology, for instance). "The power of technology (theoretically unlimited, but impossible to utilize effectively) materializes in a technology of power." That is the ultimate point of this relationship. Which the text summed up here calls the "Technological Baroque."

Quite obviously, an autonomy from the state and from politics does not imply that there is no interference with, or political decision-making about, technology. I will certainly not deny the existence of the famous "military-industrial complex." The state cannot help interfering. We have seen that it is tightly bound up with technology, that it is called upon by the technologies to widen its range of intervention. Hence, all the theorists, politicians, partisans, and philosophers agree on a simple view: The state decides, technology obeys. And even more, that is how it must be, it is the true recourse against technology.

In contrast, however, we have to ask who in the state intervenes, and how the state intervenes, i.e., how a decision is reached and by whom in reality, not in the idealist vision. We then learn that technicians are at the origin of political decisions. Next, we have to ask in what direction the state's decision goes. And we perceive very quickly that a remarkable conjunction occurs. The state is furnished with greater power devices by technology, and, being itself an organism of power, the state can only move in the direction of growth, it is strictly conditioned by the technologies not to make any decisions but those to increase power, its own and that of the body social.³

Finally, since the system is far from being fully realized, politicians sometimes intervene, taking measures about technological problems, for purely political and in no way technological reasons. The result is generally disastrous.

Those are the four points that we are going to examine rapidly.

Habermas, starting with the presupposition and the democratic ideology, vaguely poses the question: How can we reconcile technology and democracy? But since his view of the technological reality is inexact, since his discourse is purely ideological, the idea of correcting, of mending technol-

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ogy in the actual world of practice is purely illusory. Certainly, the first question to trouble us is: What is becoming of democracy?

Among the hundreds of articles on this topic, we can point out one by R. Lattès ("Énergie et démocratie," *Le Monde*, April 1975) as significant because, written by a scientist, it ingenuously expresses all the ideas assumed by the most unreal idealism. I will not repeat my criticism of identical positions, as set forth in my article "Propagande et démocratie" (*Revue de Science politique*, 1963). Instead, I will limit myself to underlining two particular features.

Monsieur Lattès rightly feels that for the exercise of democracy, all citizens must be well informed and judge with full knowledge of the facts. If parliamentary debate is to have any sense, all the deputies must be well educated and well informed. Then, regarding the problem of energy, Lattès asks seven "obvious" questions, whose answers one must know for any valid opinion in the energy debate. But he does not seem to realize for even an instant that this issue, paramount as its importance may be, is simply one of dozens: the risks of military policies, the multinational corporations, inflation, its causes and remedies, the ways and means of aid to the third world, etc. For each issue, the citizen would have to have a complete, serious, elaborate, and honest file. Who could fail to see the absurdity of the situation! People do not even have time to "keep up to date."

Furthermore, Lattès apparently believes that the correctly informed citizen could decide on the problem of nuclear energy beyond gut responses and panicky reactions. But (and I will develop this further on) what marks the situation is the inextricable conflict of opinions among the greatest scientists and technicians. The more informed the citizen, the less he can participate. Because the evaluations are perfectly contradictory, Lattès is deluding himself. But this is certainly more comforting! There is absolutely no way the citizen can decide for himself. Yet the politician is equally deprived (cf. "L'Illusion politique" in Finzi: *Il potere tecnocratico*).⁴

Thus, despite the advances made in understanding the state/technology problem, we must emphasize an opinion frequent among intellectuals: "To resolve the problems and difficulties caused by technology, we have to nationalize. We have to let the state run the whole thing." That is Closets's implicit thesis, straight through; he tries to prove that all the dangers and abuses of technology are

due to its lack of direction. We have to work out a general policy of progress, set up planning agencies, reorganize, etc. But all this can be done only by the political authorities, although he does not come right out and say so. We know that this is also Galbraith's thesis.

Habermas does a superficial analysis of the relationship between technology and politics. He is content with arguments like: "the orientation of technological progress depends on public investments," hence on politics. He seems to be totally unaware of dozens of studies (including Galbraith's or mine) showing the subordination of political decisions to technological imperatives. He winds up with the elementary wish to "get hold of technology again" and "place it under the control of public opinion" — reintegrate it within the consensus of the citizens. The matter is, alas, a wee bit more complicated; likewise, when he contrasts the technocratic schema with the decision-making schema. To grasp the interaction, he ought to study L. Sfez (*Critique de la décision*, 1974). And Habermas's discussion of the "pragmatic model" is along the lines of a pious hope, a wish: the process of scientification of politics, such as appears desirable to him, is a "must." But the reality of this technicization of politics actually occurs on a different model!

Habermas poses the philosophical problem honestly: The true problem is to know if, having reached a certain level of knowledge capable of bringing certain consequences, one is content to put that knowledge at the disposal of men involved in technological manipulations, or whether one wants men communicating among themselves to retake possession of that knowledge in their very language. But Habermas poses the problem outside of any reality. When reading this text, we need only ask: Who is that "one" who puts technology at the disposal of either group? Who exercises this (if you like) supreme "will"?

And Richta goes along with Galbraith! The state, they feel, returns to its true function of representing the general interest when it encourages science. "It is significant," writes Richta, "that the state intervenes most drastically in sectors in which science makes the most of itself as a productive force that, by nature, is hostile to private property and that endlessly exceeds its boundaries." The American federal government finances 65% of all basic research, the French government 64%, for the profit motive can no longer make technology advance. But we are forgetting that the state thereby becomes a

technological agent itself, both integrated into the technological system, determined by its demands, and modified in its structures by its relationship to the imperative of technological growth
[...]

Besides, given that, in any event, technology produces a specialization (which is inevitable and the very condition of its success), but also given that the technological system functions as an overall system, no technician can thus grasp the technological phenomenon. Such a grasp would require the experience of the body social, a non-technologically specialized collective organism – in other words, clearly the state. We find the same thing in the Mintz and Cohen book *America, Inc.* (1972). With enormous documentation, these authors show that the whole of American society is subject to two hundred ruling industrial firms – and for Mintz and Cohen, the sole issue is once again the supremacy of the government, which alone will permit the fight against technological abuses, against harmful effects (inequality, exploitation, etc.). It is, incidentally, once more the state that can assure technology its true place and its progress, because – they maintain – the giantism of economic ventures is one cause of blockage to technological advances (but Mintz and Cohen never raise the problem of government giantism).

Lastly (but, of course, the list is not closed), we have to recall Saint Mark's enthusiasm for having the state alone protect nature. Nationalizing and socializing nature is the way to save it – and such mastery would also make technology itself controlled, well oriented, useful, etc.

Before such a roster of authorities, one is surprised and amazed. But also confused. Just what are they talking about? That marvelous ideal organism, the incarnation of Truth and Justice, letting a sweet equality reign without suppression or repression, favoring the weak in order to equalize opportunities, representing the general interest without damaging private interests, promoting liberty for all by a happy harmony, insensitive to the pressures and struggles of interest, patient but not paternalistic, liberating while socialistic, administering without creating a bureaucracy, able to encourage new activities of regulation and concertedness without claiming to impose its law, in such a way as to allow the social actors to freely control the effects of technological progress. A state, finally, having Omnipotence, Omni-Science, without abusing them for anything in the world.

One can only pinch oneself before such a pastoral! Has anyone ever laid eyes on such a state? And if not, what guarantee, what chance do we have that it will come true? Who are the people who will staff it? Saints and martyrs? The huge, the enormous mistake of all those excellent authors is simply that they never breathe a word about this mythical state, which they entrust with so many functions.

Hitherto, the state, whatever its form, socialist or not, has been an organism of oppression, of repression, eliminating its opponents, and constituted by a political class that governs for its own benefit. Will someone explain to me in the name of whom and of what the state will be any different tomorrow – for the dictatorship of the proletariat is exactly the same thing. The marvelous state that will run technology and solve the problems is composed of men (Why should they no longer be dominated by the spirit of power?) and structures (which are more and more technological).⁵ What those authors are proposing is that we hand over all power to the administrations, increase administrative power (an ineluctable growth, to be sure, but in no wise a remedy) – i.e., to transform an aleatory control into a technological organization.

In reality, not only is there no guarantee that the state will carry out its envisioned role. But, as can be demonstrated, this state, ruled by the technological imperative and no other, must unavoidably create a society that will be a hundred times more oppressive. It may be able to put order into the technological chaos, but not to control and direct it. It can only accentuate the features we are familiar with. Relying on the state (without considering the autonomy of technology and what the state will turn into under the pressure of technology) means obeying that so technological reflex of a specialist: Things are going badly in my sector, but my neighbor surely has the solution. Finally, it is interesting to note that the advocates of this position, while abominating technocracy, are summoning it with all their might. For a state qualified to dominate technology can only be made up of technicians! But we will come back to technocracy further on.

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To wind up, we will cite a fact that stunningly reveals the dependence of politics and the autonomy of technology. The technological demand is dependent on technological means and not on political ideologies. For instance, Peru has immense copper resources in Cuajone. Experts are unani-

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mous in affirming the incredible wealth of these deposits. But they are very hard to get at and extract. In 1968, Peru turned to the USSR. Soviet experts carefully examined the problem, and their highly detailed report concluded that only the United States had the technology to properly mine the deposits. These experts advised Peru to confide the work to the Americans. In early 1970, the Peruvian government was in a quandary about handing over the "Cuajone contract" after expropriating the International Petroleum Company. But what strikes me as important here is that most of the nontechnicized countries must either leave their riches unexploited or else appeal to highly technicized countries – whatever their ideological outlook may be.

Ideological imperialism is nonsense. Only the technological weight gives true superiority.

It might now be useful to focus on the idea of autonomy from economics, for misunderstandings abound. Quite clearly, one cannot *separate* technology and economy, as Simondon strikingly points out: "Thus there exists a convergence of economic constraints (decrease in raw materials, in work, in energy consumption, etc.) and of properly technological demands. But it seems that the latter would predominate in the technological evolution." Simondon shows that the areas in which the technological conditions override the economic conditions are those in which technological progress has been most rapid. The reason, he says, is that the economic causes "are not pure," they interfere with a diffuse network of motivations and preferences, which rotate or overthrow them. And it is to some extent the "pure" character of the technological phenomenon that assures its autonomy.

Hence, sociologists imperceptibly slide from the primacy (and autonomy) of economics to the primacy (and autonomy) of technology. This is not generally formalized, clearly worded, or enunciated as an overall reality; but more often, it is a subliminal thought, latently taken for granted, as it were. "It goes without saying" for most observers that technology is what determines and causes events, progress, general evolution, like an engine that runs on its own energy. Technology in the intellectual panorama plays the same part as spirituality in the Middle Ages or the idea of the individual in the nineteenth century. Observers do not proceed to any clear and total analysis, but one cannot conceive of society or history in any

other way. This trend is so powerful that it crops up even in those who deny it.⁶

I must, however, add some clarification. When I first analyzed technology's autonomy from economics, certain readers saw this as a declaration of *absolute* autonomy – and their criticism was aimed at this *absolute*. Yet I had emphasized that my term did not imply an equivalence between technology and divinity. It is no use saying, "Either there is autonomy, and hence it is absolute – or it is not absolute, and hence there is no autonomy."

This kind of theoretical argument does not go very far. Everyone knows that a sovereign state today cannot do anything it pleases with its sovereignty; belonging to the "concert of nations" is a practical limit on sovereignty. Yet being sovereign, being colonized, having a government imposed by an invader, are not one and the same. Thus, I never said that technology was not dependent on anything or anyone, that it was beyond reach, etc. Obviously, it is subject to the counterthrust of political decisions, economic crises. I indicated, for example, that a government decision at odds with the law of development in technology, with the logic of the system, could halt technological progress, wipe out positive consequences, etc., but that in the conflict between politics and technology, the former would inevitably lose out, and that such a political decision, going against a technological imperative, would ultimately be ruinous for politics itself.

It is quite obvious that technology develops on the basis of a certain number of possibilities offered by the economy. And when the economic resources are lacking, technology cannot operate at its full capacity, achieving what its possibilities allow it to achieve. The relationship between technology and economy is complex. Technology is a determining factor in economic growth, but the converse is equally true. Closets shows clearly that the impact of technology on economy is ambiguous and that economic advances are not proportionately highest where there is the most technological research. Still, technology develops most rapidly in the peak sectors, and it is there too that economy follows. The relationship between the two is striking. In the United States, exports rose an average of 4% in 1967, but 58% for computers, 35% for aeronautics, 30% for telecommunications hardware. Here, the direct relationship is reestablished, but with technology being decisive for economy.

The relationship varies with the periods. It does not appear certain, first of all, that a relationship exists between the great movements of technological *invention* and the economic or social structure. The technological inventions seem like unforeseeable givens of civilization and are by no means tied to the economic level. Nor is technological invention today tied to any one country. It breaks away from those who have encouraged it and benefits countries that did not take part in the effort of scientific or technological invention. But when we leave the domain of invention and proceed to application, technology presumes the involvement of greater and greater capitals.

Can one say that industrial development is what conditions the possibility of technological growth? (Considering that industry is itself a product of technology!) Most technological research in the twentieth century, so it seems, is conditioned and stimulated when the market causes an industrial boom. However, M. Daumas (*Revue d'histoire des sciences et de leur application*, 1969), on the contrary, forcefully asserts the autonomy of technology from industry. And he maintains (which has always been my position): "There is no denying that the evolution of technologies can be understood only if placed in its original historical context; but it is all right to think that the original task of the historian of technologies consists precisely in revealing the intrinsic logic of the evolution of technologies. This evolution actually takes place with an internal logic, which is a very distinct phenomenon from the logic in the evolution of socio-economic history. Investigating this internal logic in the technological evolution is the only way for 'the technological history of the technologies' to slough off its character of data history."

With the spread and growing complexity of technological development, invention in its turn depends on already acquired technological bases (the outcome of earlier applications) and involves *more and more expensive* elements. Hence, technological invention comes to depend *also* on possibilities of economic investment. We thus perceive a mutual influence. On the one side, all modern economic growth depends on technological application, in all areas.⁷ But, vice versa, the possibilities of advanced technological research and of the application of technologies depend both on the economic infrastructure and on possibilities of mobilizing economic resources. Negatively, the economy can thus either block technological

development for lack of power or prevent technological application. The technological program is conditioned by two series of economic imperatives: in a capitalist country by the profitability of investment; and everywhere by the possibility of obtaining the funds necessary for investment.

Nevertheless, at the moment, this is less and less so, for people are coming to realize how impossible it is to calculate the profitability of investments in basic research, and they are growing more and more "convinced" that this research is essential, cannot be neglected, etc. The relationship between technological research and profitability is no longer direct. Hence, the technological applications will be highly unequal according to the economic forms and levels. The latter cause an inequality both in the intensity of technological progress and in the rapidity of access to the profits of technologies.

All this is obvious. But the importance of the economic factor notwithstanding, I will maintain the concept of technology's self-sufficiency in the sense that economy can be a means of development, a condition for technological progress, or, inversely, it can be an obstacle, but never does it determine, provoke, or dominate that progress. Like political authority, an economic system that challenges the technological imperative is doomed.

It is not economic law that imposes itself on the technological phenomenon; it is the law of technology which orders and ordains, orients and modifies the economy.⁸ Economics is a necessary agent. It is neither the determining factor nor the principle of orientation. Technology obeys its own determination, it realizes itself. And by so doing, it naturally employs many other, nontechnological factors. It may be blocked by their absence, but its reason for functioning and growing comes from nowhere else. Modifying a political or an economic system is perfectly ineffective today and does not alter the true condition of man, because this condition is now defined by its milieu and its technological possibilities, and because the impact of political or economic revolutions on the technological system is practically nil. At most, these troubles can hold up technological progress for a certain time; but revolutionary power changes nothing in the intrinsic law of the system.

This autonomy will get its institutional face in self-organization. That is to say, normally, the technological world will itself organize technological research, the direction of application, the distribution of funds, etc. The autonomy of

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the technological system must be matched by the autonomy of the institutions that are part of it, that embody it. And this, incidentally, will be the only acceptable autonomy in our society, because it will be the only one providing an ultimate justification. The basic research oriented toward technology cannot develop unless it is sufficiently autonomous! There is an excellent study on this topic by Monsieur Zuckerkandl, research director of France's National Center of Scientific Research (*Le Monde*, November 1964).

One of the effects of autonomy is that technology is becoming the principal factor in reclassifying the domains of activity, of ideological directions. Thus, in 1950, I studied the way technology is making political regimes more similar and reducing the role of ideologies: e.g., the Soviet and the American systems. Likewise, technology is causing a reclassification of public and private activities: the distinction is fading between the economic activities of these two areas. All this was taken up and demonstrated at length by Galbraith in *The New Industrial State* and by M. L. Weidenbaum in "Effets à long terme de la grande Technologie," *Analyse et prévision*, 1969. But the essential point is to see that these effects derive from the autonomy of technology.

Evidently, it is hard for the Marxists to admit that technology has become an autonomous factor, dominating the economic structure and having the same nature and effects in both a capitalist and a communist regime. The most frequently developed argument is that, without any possible doubt, technology is simply in the service of capital, that the familiar effects are due to its integration in capitalism. The technician is merely a salaried employee like the others, the ideology of efficiency is not technological but rather the reflection of the profit need. The division of labor and specialization are not products of technology, but additional ways of exploiting the working class, etc. The most complete effort at systematically demonstrating this interpretation was made by Benjamin Coriat (*Science, technique et capital*, 1976).⁹ That is why I will stick to his book rather than lesser works along the same lines.

The two themes to be demonstrated bear, first of all, on the fact that the power of decision belongs to capital. It is capital that decides whether or not to use technologies; the capitalist technologies are as much technologies of production as they are technologies of controlling the exploited class; and capital uses the technologies *only* when they

can procure greater profits. If the author admits that technology is not neutral, then only in the sense that it serves capitalism exclusively. The capitalist mode of production has one single goal: the valorization of capital; and by examining the contributions made by the different types of inventions to capital in its process of self-valorization, one can expose the (social) causes determining the incorporation or rejection of the various technologies. Capital utilizes only those that increase the extraction of surplus value. Likewise, the law of value defines the very space in which the technological rationality can operate.

Naturally, the author accuses Richta of dodging the law of value and the production relations *in* and *under* which technology is put to work. But the entire basis of his demonstration rests on Marx's demonstration that capital resorts to mechanization only under two conditions: (1) when the use of dead labor (accumulated in the machine) permits obtaining more surplus labor (diminishing the part of the day that the worker devotes to his own production and increasing that part which goes back to capital); (2) when the technologies allow capital to better dominate the labor process.

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But the most characteristic thing about Coriat's unrealism is his living in the past. Coriat takes Taylorism and mechanization as examples, models, and the *ne plus ultra* of technology. We must be dreaming! Nothing fundamental has occurred; there has been no change in the technological structure since Taylor. Technology is summed up in and boils down to: the machine. We can obviously understand in these circumstances that Marx's analyses are accurate *for those facts* that are contemporary with, or very slightly subsequent to, Karl Marx. But the mistake is to claim that we are still back there. In Coriat, technology is nothing but the *industrial* application of science in terms of the production of *goods* (in the narrow sense). He blissfully declares that the technologies whose goal is not to produce goods are unemployed! And his critique of Taylorism (as if that were the present situation) corresponds to a labor situation of 1930. In other words, Coriat's "demonstration" is acceptable only for the reader who first grants total approval to the literal expression of Karl Marx's thought and who totally "pooh-poohs" the present facts about technology. Coriat remains enclosed in a problematic established on totally obliterated facts.

We would like to dwell on a further aspect of that autonomy from values and ethics.¹⁰ Man in his hubris – above all intellectual – still believes that his mind controls technology, that he can impose any value, any meaning upon it. And the philosophers are in the forefront of this vanity. It is quite remarkable to note that the finest philosophies on the importance of technology, even the materialist philosophies, fall back upon a preeminence of man.¹¹ But this grand pretension is purely ideological. What is the autonomy of technology all about in regard to values and morals? One can, I feel, analyze five aspects.

First of all, technology does not progress in terms of a moral ideal, it does not seek to realize values, it does not aim at a virtue or a Good.

Secondly, technology does not endure any moral judgment. The technician does not tolerate any insertion of morality in his work. His work has to be free. It seems obvious that the researcher must absolutely not pose the problem of good and bad for himself, of what is permitted or prohibited in his research. His research, quite simply, *is*. And the same is true for its application. Whatever has been found is applied, quite simply. The technician applies his technology with the same independence as the researcher. Now this is the great illogic of many intellectuals. They agree on the first term, which strikes them as obvious, but they want to reintroduce judgments on good and evil, human and inhuman, etc., when they come to the second term, that the technician ought to use his technology to do good. Yet this makes no sense at all after the first term, for application coincides exactly with research. Technological invention is already the outcome of a certain behavior. The problem of behavior (on which people claim to have a value judgment) does not arise only with application. (We will study the conflict between power and values in the last part.) It is the same behavior that dictates the attitude of research (claiming it to be free) and the attitude of application. The technician who puts something to work claims to be as free as the scientist who does the research. Thus it is childish of an intellectual to bring morality into the consequences if he has rejected it in the principle. The autonomy of technology is established here chiefly by a radical division of two areas: "each for itself." Morality judges moral problems. It has nothing to do with technological problems: only the technological means and criteria are acceptable.

An absolutely engrossing study was done by an American technologist on the following theme:¹² So long as the problems are purely technological, they can always find a clear and certain solution. But once the human factor has to enter, or once these problems become too large for any direct technological handling, they seem insoluble. Confronted with these difficulties, people have been developing "social engineering." This innovation appeals to the better feelings; a whole improvement of man rests on the finer instincts and it claims that the route will be the improvement of man, albeit obtained by technologies (psychological or psychosociological technologies). Now after a certain number of examples, the author feels that this route is unsuccessful and uncertain because there are too many nontechnological factors. The only way out is to transform all the problems into a series of specifically technological questions, each receiving its solution from the adequate technology. Here, we can be sure of getting results by avoiding a mixture of types. There is no finer example affirming technological autonomy! Morality, psychology, humanism – they all get in the way. Such is the obvious verdict.

And this is reinforced by the philosophical certainty that only man can be subjected to a moral appraisal. "We are no longer in that primitive epoch when things were good or bad per se: things are only as man makes them. Everything boils down to him. Technology is nothing in itself." But in formulating this oversimplification, the intellectual fails to realize that man is dependent on technology and that, since the latter has become free of all moral judgment, the above statement would imply precisely that technology could do anything. Man does what technology allows him to do. He has thus undertaken to do anything. Maintaining that morality should not judge invention or technological operation leads to saying, unwittingly, that any human action is now beyond ethics. The autonomy of technology thus renders us amoral. Henceforth, morality will no longer be part of our domain, it will be shunted off into the void. In the eyes of scientists and technicians, morality – along with all values and what can be called humanism – is a purely private matter, having nothing to do with concrete activity (which can only be technological) and with no great interest in the seriousness of life.

Here is a small example. In March 1961, the French Minister of National Education launched

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a survey among students at the scientific *Grandes Écoles* (the faculties specializing in professional training) and in the preparatory classes for these schools. The questionnaire dealt with the teaching of philosophy and literature. The outcome was significant. The students were almost unanimous in denying any sense or value in philosophy. As for the teaching of French, they made a distinction: Literature was totally uninteresting; but knowledge of the language, in contrast, was useful for writing reports and describing experiments.

That is a fine illustration. The technician does not see any bearing that the study of ethics or philosophy can have on his work. Naturally, he admits that the specialists on moral problems, the philosophers, et al., can pass opinions on this work, pronounce judgments. But that is no concern of his. It is pure speculation. There are more and more works of philosophy, sociology of technology (and the theology of technology is beginning to blossom); but their only audience is within the circle of philosophers and humanists. They have no outlet whatsoever into the world of technicians, who utterly ignore all this research. And this is not simply due to specialization. These technicians live in a technological world that has become autonomous.¹³

Since technology does not support any ethical judgment, we come to the third aspect of its autonomy. It does not tolerate being halted for a moral reason. Needless to say, it is simply absurd to voice judgments of good or evil against an operation that is deemed technologically necessary. The technician quite frankly shrugs off something that strikes him as utterly fantastic; besides, we know how relative morality is. The discovery of "situational morality" is quite convenient for putting up with anything. How can we cite a variable, fleeting, constantly redefinable good in order to forbid the technician anything or stop a technological advance? The latter is at least stable, certain, evident. Technology, judging itself, is now liberated from what was once the main check on human action: beliefs (sacred, spiritual, religious) and ethics. Technology, with a theory and a system, thereby assures the freedom that it has acquired in fact. It no longer has to fear any limitation whatsoever because technology exists beyond good and evil.

For a long time, observers claimed that technology was neutral, and consequently not subject to morality. That is the situation we have just described, and the theoretician who thus described

technology was merely rubber-stamping the de facto independence of technology and the technician. But this stage is already passed. The power and autonomy of technology are so well assured that now technology itself is turning into a judge of morality. A moral proposition will not be deemed valid for our time if it cannot enter the technological system and be consistent with it.¹⁴

The fourth aspect of this autonomy concerns legitimacy. Modern man takes for granted that anything scientific is legitimate, and, in consequence, anything technological. Today, we can no longer merely say: "Technology is a fact, we have to accept it as such, we cannot go against it." This is a serious position which reserves the possibility of judgment. But such an attitude is looked upon as pessimistic, antitechnological, and retrograde. Indeed, we must enter the technological system by acknowledging that everything occurring within it is legitimate per se. There is no exterior reference. There is no asking the question about truth (for now, truth is included in science, and the truth of praxis is technology pure and simple), or the question about good, or the question about finalities. None of these things can be discussed. The instant something is technological, it is legitimate, and any challenge is suspect. Technology has even become a power of legitimation. It is technology that now validates scientific research, as we shall demonstrate further on.

This is very remarkable, for hitherto, man has always tried to refer his actions to a superior value, which both judged and underpinned his actions, his enterprises. But this situation is vanishing for the sake of technology. Man in our society both discerns this autonomy demanded by the system (which can progress only if autonomous) and grants this system autonomy by accepting it as legitimate in itself. This autonomy is obviously not the outcome of a struggle between two personified divinities, Morality and Technology! It is man who, becoming a true believer in, and loyal supporter of, technology, views it as a supreme object. For it must be supreme if it bears its legitimacy in itself and needs nothing to justify it!

This conviction is spawned by both experience and persuasion; for the technological system contains its own technological power of legitimation, advertising. It is shallow to believe that advertising is an external addition to the system, due to the domination of technology by profit seeking. Advertising is a technology, indispensable to technological growth and meant to supply the system

with its legitimacy. This legitimacy actually comes not just from the excellence that man is ready to acknowledge in technology, but by the persuasion that in fact every element of the system is good. That is why advertising had to add public relations and human relations. By no means does "the mass consumer society vote for itself," but rather, it is the technological society that integrates the individual in the technological process by means of that justification.

There is, however, a further stride to be made, and quite a normal one at that. Independent of morals and judgments, legitimate in itself, technology is becoming the creative force of new values, of a new ethics. Man cannot do without morality! Technology has destroyed all previous scales of value; it impugns the judgments coming from outside. After all, it wrecks their foundations. But being thus self-justified, it quite normally becomes justifying. What was done in the name of science was just; and now the same holds true for what is done in the name of technology. It attributes justice to human action, and man is thus spontaneously led to construct an ethics on the basis of, and in terms of, technology.¹⁵

This does not occur in a theoretical or systematic manner. The elaboration only comes afterwards. The technological ethics is constructed bit by bit, concretely. Technology demands a certain number of virtues from man (precision, exactness, seriousness, a realistic attitude, and, over everything else, the virtue of work) and a certain outlook on life (modesty, devotion, cooperation). Technology permits very clear value judgments (what is serious and what is not, what is effective, efficient, useful, etc.). This ethics is built up on these concrete givens; for it is primarily an experienced ethics of the behavior required for the technological system to function well. It thereby has the vast superiority over the other moralities of being truly experienced. Furthermore, it involves obvious and ineluctable sanctions (for it is the functioning of the technological system that reveals them). And this morality therefore imposes them almost self-evidently before crystallizing as a clear doctrine located far beyond the simplistic utilitarianisms of the nineteenth century.¹⁶

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Notes

- 1 It is obvious – and this comment holds for all the rest of this discussion – that when I say technology "does not admit," "wants," etc., I am not personifying in any way. I am simply using an accepted rhetorical shortcut. In reality, it is the technicians on all levels who make these judgments and have this attitude; but they are so imbued, so impregnated with the technological ideology, so integrated into the system, that their vital judgments and attitudes are its direct expression. One can refer them to the system itself.
- 2 "Neuf thèses sur la Science et la Technique" in *Vivre et survivre* (1975). This anonymous text is probably by Groetenduijk. I have summed up the first five theses.
- 3 Furia, *Techniques et sociétés* (1970), leans toward the same opinion. In contrast, see U. Matz; "Die Freiheit der Wissenschaft in der technischen Welt" in *Politik und Wissenschaft* (1971). But he is actually investigating the freedom necessary for the scientist in a technicized state.
- 4 See Jacques Ellul, *The Political Illusion* (1967), and Finzi, *Il potere tecnocratico* (1977).
- 5 On the capacity of the state to play the role that is presumed, see Jacques Ellul, *The Technological Society*, chap. 4, and *The Political Illusion*. I will not bother repeating these demonstrations here.

- 6 It appears, quite oddly, in one of the most profound and rigorous thinkers of our time, Bertrand de Jouvenel; he keeps insisting that it is man who decides, and that the overall decisions are made on a political level – technology being merely secondary and subsequent. And yet his admirable book *L'Arcadie* is the best demonstration of the autonomy, the self-sufficiency, of technology. This notion runs all through his book, recurring constantly, so that we wonder if the author wrote "on several levels," which are complementary but different and at times seemingly opposed to one another.
- 7 Of course, everyone agrees that research is the key to (economic) development and that it is therefore worth accumulating economic resources in order to achieve a greater economic advance by means of technological research. But the relation between the two is growing less and less clear. "Research and development" is a source of very great uncertainties. In France, the O.E.C.D. (Organization for Economic Cooperation and Development) has concluded: "The relations of research and development to economic growth suffer from a paradox. They are both obvious and unmeasurable. Even excluding the money spent on military research, we are unable to bring out the correlation between the expenses of research and

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- development and the growth of the GNP" And Closets has a good formula for defining the relationship between economy and technology: One can only speak of an "economy of uncertainty." As for research and development, see the series *Analyse et prévision*, 1967 to 1970 – and the writings of Jouvencel
- 8 Richta underlines an important turnabout in the Weberian school. At first, with Weber, they asserted that "one can rationalize technologically only in terms of commercial reason. The law of technological reason must always yield to the law of economic reason." But since 1960, the Weber disciples (e.g., Papalukas) have been claiming that this economic rationality is relative and that the relationship between capital and technology is reversing: "It is economic reason that must adapt to the harsh technological reality, it is technological rationality that becomes the primary dimension and that thereby dominates the principal focus of tension in society" (R. Richta, *Civilization at the Crossroads*, p. 80)
- 9 Also see S. Rose, *L'Idéologie de et dans la Science* (1977), a work of strict Marxist orthodoxy, which tries to prove that science is ideological. Very scholarly and very disappointing
- 10 Two very good examples of this autonomy are offered, though on different premises, by G. Vahanian and by H. Orlans. G. Vahanian, *The Death of God*, shows that the "how to do" has become independent of all Christian thought and has, in fact, invaded Christianity, which is subordinated to efficiency. H. Orlans, in *Toward the Year 2000*, Daedalus, 1967, shows that "not all technological development is desirable, of course, but we cannot really see how we can prevent anything technologically possible from being realized"
- 11 The reader can refer to the excellent analysis of such illusions in Seligman (*A Most Notorious Victory*, 1966), who shows that the tragedy of these illusions comes from technology's having its own strength, capable of destroying the designs of man, of determining his ideologies. And, as he shows at length, this autonomy of technology makes man's autonomy "at best questionable"
- 12 A. M. Weinberg, "Technologie ou 'engineering' social," *Analyse et prévision* (1966)
- 13 Nevertheless, since 1968 we have to modify this statement slightly. Certain scientists (but no technicians as yet) are starting to ask moral questions about the legitimacy of their scientific work and its goals, however, with no results
- 14 On the autonomy of technology from values, one should read the admirable pages by B. Charbonneau, *Le Chaos et le système*, particularly concerning the atomic bomb. "It is not the most monstrous tyrant that produces the bomb, but the most advanced society. And in 1944, it was not the U.S.S.R. or Nazi Germany, but an evangelical and liberal nation ruled by a president whose goal was to free the earth of fear. Who will have wanted the irreparable if ever it comes? Certainly not the scientists, who are only after knowledge, nor the technicians, who are only after power. As for the politicians, they are only after peace and justice. Unhappily, action commands. It was not Roosevelt who made the bomb: Hitler forced him, and then Stalin. But the Communists will demonstrate that the bomb is a product of capitalism. The proof is that the U.S.S.R. is exploding even more powerful bombs. Who or what is behind the bomb? Progress (science, technology, the state) left to its own devices. The U.S.S.R. was the second nation to explode the bomb because it was the second power on the globe. Marx has no more to do with this than Jesus."
- 15 For lengthy treatments on the contents of this ethics, see Jacques Ellul, *Le Vouloir et le faire*, vol. 1, chap. 2 (1963)
- 16 In regard to man, Mumford shows decisively and at length how and why the series of the most advanced technological inventions has absolutely nothing to do with man's "central historical task, the task of becoming human." If we take the most recent technological exploits – the moon landing, climate control, artificial survival, creation of life – nothing has the least relationship to the project of "becoming human." Everything obeys the internal logic of the system