THE MATERIAL AND CULTURAL ASPECTS OF TECHNOLOGY

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In what follows, I rely on the presupposition that it is the task of philosophy to deal with the most general and the most fundamental traits of reality. If this is taken for granted, it has consequences for the philosophy of technology. When dealing with the field of technology in philosophical terms one cannot confine the discussion to a mere analogue of the epistemology, methodology, or the philosophy of science. Dealing with technology only in these terms would amount to cutting off an inherent, essential part of the phenomenon. I want here to defend five theses.

1. Both areas, the physical world and the sphere of culture, are involved.

As I want to show, the cultural aspect of technology is the most important one. Since modern technology has created a Second Nature, as it were, it is inevitably also shaping our view of the world, our style of living; in short, it is shaping our culture. In fact it is impossible to reasonably speak about technology without at least tacitly taking into account the natural as well as the cultural aspect. Consider the famous saying that technology is the art of guiding the forces of nature according to human purposes. This is to say that technology means to deliberately reshape the physical world in order to attain certain desired results or to fulfill specific functions. In this saying, the "physical world" refers to the natural aspect and the "functions to be fulfilled" refer to the cultural aspect. Here it becomes evident that technology by its very nature involves the material as well as the cultural aspect, and these two aspects are woven together inseparably.

2. Technology fulfills basic needs and is an inherent element of culture.

Let us start with a few basic questions. What is the purpose of technology? Why is it brought about? What is the reason for putting it to use? Which function does it fulfill?

The answer usually given to these questions is that technology fulfills

basic human needs. This understanding is along the lines of Benjamin Franklin's saying that man is the tool-making animal; it corresponds to Marx's insistence on work, production, and the economy as the decisive factors in history; and it is in accord with Henri Bergson's (1907) formula of man as *Homo faber*—an expression deliberately conceived in opposition to the traditional understanding of man as *Homo sapiens*. The common feature of all of these approaches is that technology is considered as belonging to the very nature of what is human; it provides the indispensable means for subsistence. The underlying idea is, that as part of nature, as living beings, humans must—just like the other animals—find a way to cope with a hostile environment and to provide for basic needs such as food and shelter.

Let us consider this materialistic or rather naturalistic understanding of technology in more detail. Speaking of basic needs implies that there are specific, clear-cut needs shared by all humans, and that it is the task of technology to fulfill these needs. As we all know there are indeed such basic needs as nutrition, fresh air, and sleep. They are a biological necessity, that is to say, we cannot survive if they are not fulfilled. Here the casual remark of Bertolt Brecht applies: *Erst kommt das Fressen, und dann kommt die Moral*. In other words, the normative, cultural impulses come into play only after the basic biological needs have been fulfilled.

Yet, this is not the whole story. After all a person has a body *and* a mind. We are, along with other living beings, part of the natural world. But we are not just there, like molecules or stones. We have an understanding of ourselves, we strive for meaning, we are always members of a society and share the values of the culture we live in. Ortega y Gasset (1936) has put this into the provocative sentence: "Man, in a word, has no nature; what he has is history." Expressed differently: what nature is to things, history, *res gestae*, is to man. This amounts to the claim that humans have no needs that are fixed once and forever. What Ortega has in mind is the panorama of the historical development that leads to specific ways of living, to certain cultural styles, which then, in their turn, determine what one may call, along the lines of Hegel, the objectivized spirit, i.e., language, religion, art, science, the legal system, etc. It goes without saying that Ortega y Gasset (1939) does not ignore the basic, biological needs. He takes it for granted that such needs do exist, but he does not deem it worthwhile to refer to them, because he considers them inferior to the higher cultural values. (It may

be worth mentioning that current discussions about the problems of euthanasia pertain to the very same issue of the higher cultural values as opposed to basic biological needs, the question being, whether life is still worth living when only biological survival, but no longer a really human existence, is possible.)

In this context one has to remember that technological artifacts are designed to extend in one way or another the natural capacities of humans: the car and the airplane multiply the efficiency and the range of locomotion; television extends the capacities of sight; and the telephone extends the reach of hearing. Taken in this sense technology does indeed relate to basic needs, since a certain minimum of locomotion, sight, and hearing is indispensable for survival. This is even more obvious with respect to the use of simple tools which are in an almost literal sense extensions of the human body. It is not by chance that the author of the first German monograph on the philosophy of technology chose the following sentence of Edmund Reitlinger as the motto of his book (Kapp, 1877): "Die ganze Menschheitsgeschichte, genau geprüft, löst sich zuletzt in die Geschichte der Erfindung besserer Werkzeuge auf." [All of human history, adequately examined, in the end is the history of better tools.] In a pointed formula one could say that we depend on technology and that we use technology just because we have a body, because we are part of the physical world.

Here belongs Arnold Gehlen's (1957) thesis, that by developing ever more sophisticated tools humans have transcended the sphere of innate behavioral patterns. By means of our intellect and by producing technology and putting it to use we have in the process of cultural evolution attained—albeit in too effective a manner—the domination over nature. Furthermore it must be kept in mind that whatever the output of a certain technological system may be, in order to be useful for us, its outcome or function must finally be reduced to bodily experience and to the level of the senses; a plane is only useful for me if I actually use it, and a television transmission that is never brought to the senses by means of a screen is only potentially useful. In a similar vein even the most sophisticated technology-mediated experimental data gained in scientific research must ultimately be brought to the mind by means of concrete sense-experience; otherwise we would not have any knowledge whatsoever about the data (see Rapp, 1974). This once again underlines the inherent relationship between technology and the human body.

3. Technology has turned from a servant of culture to its master.

On closer inspection it turns out that technology is by no means culturally neutral. Only when abstracting from the concrete phenomenon can the basic biological features and the higher, more elaborate cultural features of technology be separated from each other. As is well known from the findings of cultural anthropology even the allegedly purely natural functions of eating, mating, and communication are actually styled differently in each culture. Metaphorically speaking, it is culture that gives these features, which in their general function are indeed common to all mankind, a certain form, a specific shape, and a concrete Gestalt. In this context technology provides a certain content, i.e., the means for fulfilling certain functions, whereas it is culture that gives this content a specific form; at this point technology interlaces with culture. It cannot be otherwise. Because the way in which people live their lives is determined by the prevailing cultural patterns, everything people do is an expression of the priorities taken for granted and of the values observed in a given society. After all, to put it in philosophical terms, each culture is a realized value-system. Without such a normative frame of reference, i.e., without being a member of a cultural system, a human is less than an animal (see Bidney, 1953, p. 429).

The upshot of what has been said so far is that there is no way of separating technology and culture. Still, for the purpose of a specific investigation within the framework of a scholarly discipline it makes sense and it is even necessary to separate both areas in analytical terms. But it must always be kept in mind that when dealing with the one of these two dimensions, at least implicitly one is necessarily also dealing with the other. With respect to the interrelation and balance between culture and technology, clearly a shift has occurred with respect to modern technology. Modern technology has brought about a complete change of the environment in which we live as well as of the internal frame of mind, i.e., of our style of life. This being the case, a paradoxical—perhaps even a dialectical—shift in relevance has taken place. Whereas in former times, before the Industrial Revolution, technology was integrated into culture as a matter of course, it has in our times taken command. Today technology is dominating culture and not the other way round. As Cassirer (1930) puts it, not only does technology create its own norm, there is a tendency for this norm to be taken as the only legitimate yardstick and that it be imposed on all other fields of life. The all-pervading character of modern technology is also stressed by R. M. Adams

(1996, p. 7), who points out that the loosely linked systems into which the various elements of technology are grouped "can neither function nor be understood except as parts of an embracing social organism."

Technology is thus no longer the servant of culture. It is rather, in an ever-increasing way, becoming its master. Of course there is no denying the fact that during the history of mankind technology has always been an important factor. Not by chance are pre-historic periods named in terms of the materials used (Stone Age, Bronze Age, Iron Age). And at least as far as warfare is concerned, other things being equal, the side which uses the more effective type of technology will win. Furthermore specific areas like transport, communication, the economy, etc., are clearly dependent on the technology used. This notwithstanding, until modern times technology was not the decisive element that determined the style of a given culture.

In this context the literature on the subject is revealing. Neither in the writings of the French structuralists about universal patterns of culture nor in the established panoramas of universal history—to mention just two examples—is technology given a decisive part. Before the beginnings of the Industrial Revolution there is virtually no work of historical or philosophical writing in which technology appears as a crucial factor. This holds good even for most of the authors of the 19th century (Hegel, Ranke, Droysen, Nietzsche, Jacob Burckhardt, Dilthey) who give various explanations of historical change, but never put the stress on technology. It is by no means surprising that the Marxist, materialistic interpretation of history is due to the experience of the Industrial Revolution. The explanation of historical change as caused by technical innovations is actually a retrospective scheme applied to history in view of mankind's experience with modern technology. But this picture does not correspond to the self-image of the eras considered, nor does it correspond to the general understanding of history that prevailed before the arrival of modern technology. (For a different "mechanism of progress" point, see Rapp, 1992, pp. 181-198.)

To point out the dominance of technology in our culture would be like carrying coals to Newcastle. Especially in the industrial nations this feature cannot be overlooked. High Tech determines politics (after all, the breakdown of the Eastern bloc is to a high degree due to the failure to cope with the arms race);

characteristic of the global market place is the competition of technological innovations, and wherever one goes on the globe, one will encounter Coca Cola, supermarkets, highways, airports, videoclips, and the Internet. More and more the notion of the global village is turning into reality. Marshall McLuhan's phrase, "the medium is the message," and the slogan of the *Technokratiediskussion*, "the means determine the ends" (Lenk, 1973) are just different versions of one and the same phenomenon—namely, that today it is technology that determines culture and not culture that determines technology.

This becomes even clearer when we turn to an overall analysis of the basic ideas that dominated the epochs of Western history. Greek antiquity was dominated by the idea of *polis*, the Roman empire by the idea of *ordo*, the Middle Ages by theology (i.e., by reference to God), the Enlightenment by the notions of reason and of the increase of scientific knowledge. Our time is dominated by the idea of technological progress. It is technological progress, or in a more neutral and more realistic wording, technological change that pervades and dominates every sphere of life.

4. Three factors account for the dominance of technology.

What are the causes that bring about the virtually unlimited technological change we are witnessing, a change in quality as well as in quantity? Since this change does exist it must in one way or another be possible to explain it. There are several different ways for handling this task, but for sake of brevity, let us turn to an explanation that relies on three basic elements: (a) the invention of invention, (b) unlimited needs, and (c) adjustment to the world of artifacts. These three elements combine to make up the historical process of technological change. As far as we can see, there are no obstacles that could prevent this process from continuing in the future.

(a) From the point of view of knowledge, of science, of method, and of theory, the *invention of invention* (Whitehead, 1930, p. 120) is the decisive factor. This principle, i.e., the deliberate search for new inventions, is the methodological systematization of the modern idea of domination over nature. Such an attitude towards the physical world is by no means obvious.It is rather the outcome of the development of the Western history of ideas that led, roughly speaking, from Aristotle to Newton. The relevant metaphysical presuppositions

include the change from the ancient distinction between terrestrial and celestial movements to a unified understanding that englobes the whole universe without making a distinction between the life-world of humans and the celestial vault. Most revealing in this respect is Descartes's understanding of matter as the geometrically conceived *res extensa* that is governed by the laws of mechanics, an understanding in which living beings are considered as mere automata. This worldview stands in stark contrast to the Greek understanding of a living cosmos, of a greater whole into which man is integrated, and in which the movement or activity of every being is guided by inherent goals. Bacon's and Descartes's idea of mastering nature by investigating her laws and putting them to use is at the same time more modest and more presumptuous than the dream of omnipotence by magic practices. Eliade (1980, p. 101) stresses that in virtually all archaic cultures we find an ambivalent, inherently conflicting attitude towards metals and towards the knowledge and the activity of the smith; i.e., the very beginning of technology was regarded as a favorable and at the same time as a dangerous step. According to this modern, mechanistic understanding, one has to precisely investigate Nature's laws and to obey them in order to obtain the desired results. But once this principle is observed, no obstacles stand in the way of putting to use the physical world for human purposes. (The metaphysical presuppositions and the dynamics of modern science and technology are discussed in Rapp, 1994.) Yet, as becomes evident from the current discussion about medical technology and genetic engineering, this attitude does not only offer opportunities, it also raises serious questions about normative, juridical limitations mankind has to impose on itself in order to respect the dignity of the human individual.

As a matter of fact, the organizational, epistemological, and methodological structure of modern science and engineering is of such a type that, to use a paradox, modern science and technology are doomed to progress. There is no way of preventing them from being successful. The epistemological presuppositions, the methodological ways of procedure, as well as the organizational structure (division of labor, international exchange of information, scholarly criticism, mutual control of the experiments made), all combine to foster further progress in science and technology. The mathematical formula used for describing processes of nature and the empirical data gained by means of technology-based experiments are designed in such a way as to ensure intersubjectivity, reproducibility, empirical content, and technical applicability. Whatever the new findings may be, in any case the metaparadigm of modern

science and technology (mechanistic view of nature, mathematical description, experimental analysis) is maintained. The result is that at any given historical stage one can rely on the highest level obtained by accumulation of the previous development as a basis for further investigation. Accordingly, the theoretical framework will be adjusted to the new findings, whatever they may be. The result is a sort of guarantee and promise for future scientific findings and for new technological applications. The internal structure of science and technology guarantees their further success. All this is contained in what Whitehead has called the *invention of invention*.

It is worthwhile to keep in mind that the indispensable intermediate element between science and technology is the economy. Scientific knowledge and technological know-how are only put to use to the degree in which they are profitable—or at least in which they are expected to bring profit in the near future. The economist Schumpeter (1942) has coined the phrase that capitalism is based on the "principle of creative destruction." It is the combination of the principle of invention of invention with the likewise innovative principle of the ever-expansive, market-based, and profit-oriented capitalist economy that feeds the virtually unlimited process of technological change.

(b) Yet, in the final analysis all this would not happen if it were not brought about by certain individual actors. Since they are in principle free human beings, these actors are not forced by some external power to participate in this game. As can be observed all over the world, the majority of people actually want or at least accept the game of technological change. Why? The answer is that, ultimately, people like technology and they want ever more of it. Now as was pointed out above, human nature has not been defined once and forever, unlike that of our fellow creatures. The needs we aim to fulfill are, as far as they go beyond the indispensable means for biological subsistence, shaped by the culture we live in. The problem is that *these needs are potentially unlimited*.

(c) This brings me back to the problem of the distinction between basic biological needs and more sophisticated higher, cultural needs (see Maslow, 1968). As we have seen, in its simple, elementary form, technology does indeed fulfill basic needs. In more general terms, technology ensures survival, it provides efficient solutions, it makes life easier, it creates wealth and civilizational comfort. For this reason, it is accepted virtually by everybody. On a world-wide

level we can observe a desire for the sophisticated systems and gadgets modern technology provides. The point is that once they are available, people develop the need for television sets, airplanes, and Internet transmissions. But it must be kept in mind that, say, a hundred years ago, when these innovations were not known at all or only dealt with in the virtual form of science fiction, people were able to live without these facilities.

Now it is time to reconsider Ortega y Gasset's saying that man has no nature, only history. In other words, the things we strive for, the values we aim to realize by our actions are not given once and for ever. The result is that in the life of an individual as well as in history there is always some margin for the modification of the hitherto prevailing trend. After all, history is a creative process in which new ways of living, new styles of culture, new values are brought to bear. In our times there is no inherent evolution of cultural patterns inspired by some internal idea; rather the culturally external element of technology takes over, and has acquired the leading role that sets the pace. Let me repeat, all this is possible because the needs to be fulfilled by the present and future types of technology are by no means clearly and once and forever defined. Because man has no fixed nature, his needs are defined by the culture in which he lives. Since we live today in a culture shaped by technology, it is technology that determines our needs. To use a pointed formulation, modern technology fulfills precisely the needs which it has created by providing the means for their potential fulfillment. In other words, not only factually but also in the normative sphere *humans adjust to the world of the artifact*.

5. Cultural alienation or creative impulse?

The question now arises about how to deal with this situation in philosophical terms. How are we to judge the technological progress that dominates cultural change? Do we appreciate this process or do we reject it? And if so, for what reasons?

Christianity and all other religions tell us that God created man. Now by means of modern technology man as it were, creates himself. He aims at creating his body by cloning and by organ transplantation; and he creates his way of life by producing technological artifacts. This is to say that in a certain way a human is like God. But the problem is that we are still undefined, vulnerable, and mortal

beings; we are still far from being self-sufficient. In short, today by means of technology humanity has not only released itself from the material burdens of life, it has by the very same activity also overcharged itself with the problems modern technology is bringing about. This is the sometimes admitted, sometimes only tacit self-understanding of our time. As with all other problems of cultural criticism there is no simple, straightforward solution to this predicament. But one can at least mention three points of reference that offer themselves for an attempt at an answer. Let us consider them in sequence.

(a) One can deal with the issue in terms of the *philosophy of history*. This approach by no means results in an unambiguous answer. But it places the problem in the right setting. As Ferguson ([1767] 1966, p. 122) has aptly put it, history is the result of human actions, but not of human design. This applies also to the realm of technology. Technology is brought about by humans, but it has consequences that were not foreseen and that go far beyond what was originally intended. In a secular society, history is no longer considered the result of Gods will. It is rather taken as the contingent outcome of events that might well have been different; and it is not clear what the future course of events will be. Yet, as far as we can see, technization is taking command. In this context the statement of the French historian Braudel (1989, p. 93) is pertinent when he says that "Marx is very much mistaken, when he claims that men make history; it is rather history that makes men. They suffer it. . . . A *voluntaristic* history is an illusion, a drop of water in the ocean."

If this view is taken seriously and it is combined with the modern, secularized understanding of history, a strange situation arises. Mankind has brought about modern technology without really knowing what this means. Yet, even in a secularized society there is still a longing for ideals and for meaning that transcends the mere individual concern. Since the highest power governing the fate of mankind by inscrutable decree is adored as Deity, it is only too natural that in our times technology is worshiped as the new God. This is precisely what Barthes (1964, p. 76) argues. (See also Rapp, 1979.) Barthes compares the unveiling of the new Citroen model DS (sounding like déesse = deity) with a religious act, with a celebration in which, by means of television, the whole nation participates. His claim is that today the car is the equivalent of the cathedral of the Middle Ages: a great creation of the epoch, a magical object, adored by the whole community. But the modern technology thus adored is human-made, so that in the

final analysis man adores himself, his own power and creativity; the cathedral celebrates the power of God, the flight to the moon celebrates the power of humans. Yet, man is still frail and mortal. Modern man strives to be Nietzsche's *Übermensch*—not in the aesthetic and normative sense of control over one's own mind, as Nietzsche had it, but rather in terms of power over nature, wealth, and comfort, i.e., external facilities. This stands in clear contrast to Hegel's idea that everything the human mind creates will pass through a stage of alienation, but finally return to and enrich the realm of the collective mind, the sphere of the objective spirit. The hedonism fostered by modern technology is the exact opposite of what Hegel put forward in his philosophy of idealism.

(b) Another way of explaining the dominance of technology in modern culture would consist in a straightforward discussion of the *relative merit of a certain culture*, i.e., of a specific style of life or a certain *Lebensform*. In the 18th and 19th centuries the explanation seemed simple. During the era of colonialism and in the time of the Enlightenment, the Europe-centered and progress-oriented view of historical change and of different types of civilizations was taken for granted. By now, this attitude is a matter of the past. The Western intellectual tradition and its notion of progress are no longer accepted as the relevant points of reference. Today the all-tolerant, postmodern, multicultural approach is inclined to accept and to approve everything whatsoever, for the simple reason that it exists. Adhering to this understanding would amount to accepting the technology-shaped culture in whatever form it may appear. Indeed, refraining from a normative attitude, failing to make value judgments results in taking for granted the existing state of affairs. There is even some sense in doing this, insofar as every style of culture, every *Lebensform* is comparable to an individual that stands on its own, that has its own intrinsic value and hence resists an evaluation from the outside; this is the meaning of the Scholastic dictum, *individuum est ineffabile*.

(c) But accepting whatever a culture may produce and what tends to happen in it does not solve the problem. After all, each culture and mankind as a whole must find a way to deal with the innovations offered by quasi-institutionalized technological change, and this way is by no means prescribed in a definite manner by human nature, by some hidden teleology of history, or by technological change itself (which, after all, is human made). Since we have freedom, we cannot avoid making a choice either explicitly by deliberate reasoning or implicitly just by doing, by following one way of action rather than

another. There is no way of escaping our freedom. In the traditional societies the problem was solved by accepting the way of life and the value patterns inherited from the past. And, contrary to the modern ideology of free rational choice, this is to a large degree still true today. What appears to be a free choice, starting allegedly from a *tabula rasa* is, in actuality, only a modification of the past.

In this situation the more modest and hence more feasible approach of *reference to the tradition* and of *immanent critique* seems appropriate. Nobody will expect that in an open, pluralistic society it will be possible to arrive at unanimous solutions that can easily be put into practice. Existing trends, diverging interests, conflicting value patterns, and the unforeseeable future outcome of a certain way of action preclude such a straightforward approach. What can be done and what must be entertained is public discussion, putting forward conflicting scenarios, and exchange of arguments. In doing this the basic issue is whether the inherent cultural tradition or the external technology-shaped style of life is to be given priority.

By somewhat modifying Ortega y Gasset's dictum we can say that man's nature is what history has made of it. From this one can conclude that technological innovations must be integrated into the existing cultural tradition and not forced upon it. Only in this way will they have a productive and not a destructive outcome. This is all the more appropriate in developing countries, since their historical and cultural tradition is even less in accord with modern technology than that of the Western nations. On a more general level, the Western style of arguing and of free discussion is indispensable for the approach suggested here because open discourse is the best means for arriving at positive, fruitful results. It is the task of philosophy to foster this discussion by revealing the basic implications and the ultimate foundations of different approaches, putting forward creative ideas to foster the discussion, arguing about conflicting notions, and pointing out their relative merits. The underlying idea is that listening to the voice of reason will lead to the right answer. As Paton (1948, p. 36) has aptly put it in commenting on Kant's *Grundlegung zur Metaphysik der Sitten*, the "disinterested pursuit of the moral ideal is at once the source of man's dignity and the standard by which he must be judged."

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