THE TECHNOLOGICAL SOCIETY

BY

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TRANSLATED FROM THE FRENCH BY JOHN WILKINSON

&

WITH AN INTRODUCTION BY ROBERT K. MERTON

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Note to the Reader

I think the task of the reader will be lightened if at the outset I attempt a definition of *technique*. The whole first chapter is devoted to making clear what constitutes technique in the present-day world, but as a preliminary there must be a simple idea, a definition.

The term *technique*, as I use it, does not mean machines, technology, or this or that procedure for attaining an end. In our technological society, *technique* is the *totality of methods rationally arrived at and having absolute efficiency* (for a given stage of development) in *every* field of human activity. Its characteristics are new; the technique of the present has no common measure with that of the past.

This definition is not a theoretical construct. It is arrived at by examining each activity and observing the facts of what modern man calls technique in general, as well as by investigating the different areas in which specialists declare they have a technique.

In the course of this work, the word *technique* will be used with varying emphasis on one or another aspect of this definition. At one point, the emphasis may be on rationality, at another on efficiency or procedure, but the over-all definition will remain the same.

Finally, we shall be looking at technique in its sociological aspect;

that is, we shall consider the effect of technique on social relationships, political structures, economic phenomena. Technique is not an isolated fact in society (as the term *technology* would lead us to believe) but is related to every factor in the life of modern man; it affects social facts as well as all others. Thus technique itself is a sociological phenomenon, and it is in this light that we shall study it.

JACQUES ELLUL

June 1963

Author's Foreword to the Revised American Edition

At the beginning I must try to make clear the direction and aim of this book. Although descriptive, it is not without purpose. I do not limit myself to describing my findings with cold objectivity in the manner of a research worker reporting what he sees under a microscope. I am keenly aware that I am myself involved in technological civilization, and that its history is also my own. I may be compared rather with a physician or physicist who is describing a group situation in which he is himself involved. The physician in an epidemic, the physicist exposed to radioactivity: in such situations the mind may remain cold and lucid, and the method objective, but there is inevitably a profound tension of the whole being.

Although I have deliberately not gone beyond description, the reader may perhaps receive an impression of pessimism. I am neither by nature, nor doctrinally, a pessimist, nor have I pessimistic prejudices. I am concerned only with knowing whether things are so or not. The reader tempted to brand me a pessimist should begin to examine his own conscience, and ask himself what causes him to make such a judgment. For behind this judgment, I believe, will always be found previous metaphysical value judgments, such

as: "Man is free"; "Man is lord of creation"; "Man has always overcome challenges" (so why not this one too?); "Man is good." Or again: "Progress is always positive"; "Man has an eternal soul, and so cannot be put in jeopardy." Those who hold such convictions will say that my description of technological civilization is incorrect and pessimistic. I ask only that the reader place himself on the factual level and address himself to these questions: "Are the facts analyzed here false?" "Is the analysis inaccurate?" "Are the conclusions unwarranted?" "Are there substantial gaps and omissions?" It will not do for him to challenge factual analysis on the basis of his own ethical or metaphysical presuppositions.

The reader deserves and has my assurance that I have not set out to prove anything. I do not seek to show, say, that man is determined, or that technique is bad, or anything else of the kind.

Two other factors may lead the reader to the feeling of pessimism. It may be that he feels a rigorous determinism is here described that leaves no room for effective individual action, or that he cannot find any solution for the problems raised in the book. These two factors must now engage our attention.

As to the rigorous determinism, I should explain that I have tried to perform a work of sociological reflection, involving analysis of large groups of people and of major trends, but not of individual actions. I do not deny the existence of individual action or of some inner sphere of freedom. I merely hold that these are not discernible at the most general level of analysis, and that the individual's acts or ideas do not *here and now* exert any influence on social, political, or economic mechanisms. By making this statement, I explicitly take a partisan position in a dispute between schools of sociology. To me the sociological does not consist of the addition and combination of individual actions. I believe that there is a collective sociological reality, which is independent of the individual. As I see it, individual decisions are always made within the framework of this sociological reality, itself pre-existent and more or less determinative. I have simply endeavored to describe technique as a sociological reality. We are dealing with collective mechanisms, with relationships among collective movements, and with modifications of political or economic structures. It should not be surprising, therefore, that no reference is made to the separate, independent initiative of individuals. It is not possible for me to treat the individual sphere. But I do not deny that it exists. I do not maintain that the individual is more determined today than he has been in the past; rather, that he is differently determined. Primitive man, hemmed in by prohibitions, taboos, and rites, was, of course, socially determined. But it is an illusion—unfortunately very widespread—to think that because we have broken through the prohibitions, taboos, and rites that bound primitive man, we have become free. We are conditioned by something new: technological civilization. I make no reference to a past period of history in which men were allegedly free, happy, and independent. The determinisms of the past no longer concern us; they are finished and done with. If I do refer to the past, it is only to emphasize that present determinants did not exist in the past, and men did not have to grapple with them then. The men of classical antiquity could not have found a solution to our present determinisms, and it is useless to look into the works of Plato or Aristotle for an answer to the problem of freedom.

Keeping in mind that sociological mechanisms are always significant determinants—of more or less significance—for the individual, I would maintain that we have moved from one set of determinants to another. The pressure of these mechanisms is today very great; they operate in increasingly wide areas and penetrate more and more deeply into human existence. Therein lies the specifically modern problem.

This determinism has, however, another aspect. There will be a temptation to use the word *fatalism* in connection with the phenomena described in this book. The reader may be inclined to say that, if everything happens as stated in the book, man is entirely helpless—helpless either to preserve his personal freedom or to change the course of events. Once again, I think the question is badly put. I would reverse the terms and say: if man—if each one of us—abdicates his responsibilities with regard to values; if each of us limits himself to leading a trivial existence in a technological civilization, with greater adaptation and increasing success as his sole objectives; if we do not even consider the possibility of making a stand against these determinants, then everything *will* happen as I have described it, and the determinants *will* be transformed into inevitabilities. But, in describing sociological currents, I obviously

cannot take into account the contingent decisions of this or that individual, even if these decisions could modify the course of social development. For these decisions are not visible, and if they are truly personal, they cannot be foreseen. I have tried to describe the technical phenomenon as it exists at present and to indicate its *probable* evolution. Fatalism is not involved; it is rather a question of probability, and I have indicated what I think to be its most likely development.

What is the basis for this most likely eventuality? I would say that it lies in social, economic, and political phenomena, and in certain chains of events and sequences. If we may not speak of laws, we may, at any rate, speak of repetitions. If we may not speak of mechanisms in the strict sense of the word, we may speak of interdependencies. There is a certain logic (though not a formal logic) in economic phenomena which makes certain forecasts possible. This is true of sociology and, to a lesser degree, of politics. There is a certain logic in the evolution of institutions which is easily discernible. It is possible, without resorting to imagination or science fiction, to describe the path that a social body or institutional complex will follow. An extrapolation is perfectly proper and scientific when it is made with care. Such an extrapolation is what we have attempted. But it never represents more than a probability, and may be proved false by events.

External factors could change the course of history. The probable development I describe might be forestalled by the emergence of new phenomena. I give three examples—widely different, and deliberately so—of possible disturbing phenomena:

1) If a general war breaks out, and if there are any survivors, the destruction will be so enormous, and the conditions of survival so different, that a technological society will no longer exist.

2) If an increasing number of people become fully aware of the threat the technological world poses to man's personal and spiritual life, and if they determine to assert their freedom by upsetting the course of this evolution, my forecast will be invalidated.

3) If God decides to intervene, man's freedom may be saved by a change in the direction of history or in the nature of man.

But in sociological analysis these possibilities cannot be considered. The last two lie outside the field of sociology, and confront us with an upheaval so vast that its consequences cannot be assessed. But *sociological* analysis does not permit consideration of these possibilities. In addition, the first two possibilities offer no analyzable fact on which to base any attempt at projection. They have no place in an inquiry into facts; I cannot deny that they may occur, but I cannot take them rationally into account. I am in the position of a physician who must diagnose a disease and guess its probable course, but who recognizes that God may work a miracle, that the patient may have an unexpected constitutional reaction, or that the patient—suffering from tuberculosis—may die unexpectedly of a heart attack. The reader must always keep in mind the implicit presupposition that *if* man does not pull himself together and assert himself (or if some other unpredictable but decisive phenomenon does not intervene), *then* things will go the way I describe.

The reader may be pessimistic on yet another score. In this study no solution is put forward to the problems raised. Questions are asked, but not answered. I have indeed deliberately refrained from providing solutions. One reason is that the solutions would necessarily be theoretical and abstract, since they are nowhere apparent in existing facts. I do not say that no solutions will be found; I merely aver that in the present social situation there is not even a beginning of a solution, no breach in the system of technical necessity. Any solutions I might propose would be idealistic and fanciful. In a sense, it would even be dishonest to suggest solutions: the reader might think them real rather than merely literary. I am acquainted with the "solutions" offered by Emmanuel Mounier, Pierre Teilhard de Chardin, Ragnor Frisch, Jean Fourastié, Georges Friedmann, and others. Unfortunately, all these belong to the realm of fancy and have no bearing on reality. I cannot rationally consider them in analyzing the present situation.

However, I will not make a final judgment on tomorrow before it arrives. I do not presume to put chains around man. But I do insist that a distinction be made between diagnosis and treatment. Before a remedy can be found, it is first necessary to make a detailed study of the disease and the patient, to do laboratory research, and to isolate the virus. It is necessary to establish criteria that will make it possible to recognize the disease when it occurs, and to describe the patient's symptoms at each stage of his illness.

This preliminary work is indispensable for eventual discovery and application of a remedy.

By this comparison I do not mean to suggest that technique is a disease of the body social, but rather to indicate a working procedure. Technique presents man with multiple problems. As long as the first stage of analysis is incomplete, as long as the problems are not correctly stated, it is useless to proffer solutions. And, before we can pose the problems correctly, we must have an exact description of the phenomena involved. As far as I know, there is no over-all and exact description of the facts which would make it possible to formulate the problems correctly.

The existing works on the subject either are limited to a single aspect of the problem—the effect of motion pictures on the nervous system, for example—or else propose solutions without the requisite preliminary study. I offer these pages as a first effort in laying the necessary ground; much more work will have to follow before we can see what man's true response is to the challenge before him.

But this must not lead the reader to say to himself: "All right, here is some information on the problem, and other sociologists, economists, philosophers, and theologians will carry on the work, so I have simply got to wait." This will not do, for the challenge is not to scholars and university professors, but to all of us. At stake is our very life, and we shall need all the energy, inventiveness, imagination, goodness, and strength we can muster to triumph in our predicament. While waiting for the specialists to get on with their work on behalf of society, each of us, in his own life, must seek ways of resisting and transcending technological determinants. Each man must make this effort in every area of life, in his profession and in his social, religious, and family relationships.

In my conception, freedom is not an immutable fact graven in nature and on the heart of man. It is not inherent in man or in society, and it is meaningless to write it into law. The mathematical, physical, biological, sociological, and psychological sciences reveal nothing but necessities and determinisms on all sides. As a matter of fact, reality is itself a combination of determinisms, and freedom consists in overcoming and transcending these determinisms. Freedom is completely without meaning unless it is related to necessity, unless it represents victory over necessity. To say that freedom

is graven in the nature of man, is to say that man is free because he obeys his nature, or, to put it another way, because he is conditioned by his nature. This is nonsense. We must not think of the problem in terms of a choice between being determined and being free. We must look at it dialectically, and say that man is indeed determined, but that it is open to him to overcome necessity, and that this *act* is freedom. Freedom is not static but dynamic; not a vested interest, but a prize continually to be won. The moment man stops and resigns himself, he becomes subject to determinism. He is most enslaved when he thinks he is comfortably settled in freedom.

In the modern world, the most dangerous form of determinism is the technological phenomenon. It is not a question of getting rid of it, but, by an act of freedom, of transcending it. How is this to be done? I do not yet know. That is why this book is an appeal to the individual's sense of responsibility. The first step in the quest, the first act of freedom, is to become aware of the necessity. The very fact that man can see, measure, and analyze the determinisms that press on him means that he can face them and, by so doing, act as a free man. If man were to say: "These are not necessities; I am free because of technique, or despite technique," this would prove that he is totally determined. However, by grasping the real nature of the technological phenomenon, and the extent to which it is robbing him of freedom, he confronts the blind mechanisms as a conscious being.

At the beginning of this foreword I stated that this book has a purpose. That purpose is to arouse the reader to an awareness of technological necessity and what it means. It is a call to the sleeper to awake.

JACQUES ELLUL

La Marierre, Pessac, Gironde, France
January 1964

Author's Preface to the French Edition

Let us, first of all, clear up certain misunderstandings that inevitably arise in any discussion of technique.

It is not the business of this book to describe the various techniques which, taken together, make up the technological society. It would take a whole library to describe the countless technical means invented by man; and such an undertaking would be of little value. Moreover, quite enough elementary works describing the various techniques are already available. I shall frequently allude to some of these techniques on the assumption that their applications or their mechanics are familiar to the reader.

I do not intend to draw up a balance sheet, positive or negative, of what has been so far accomplished by means of these techniques, or to compare their advantages and disadvantages. I shall not repeat what has so often been stated, that through technology the work week has been materially shortened, that living standards have risen, and so forth; or, on the other side of the ledger, that the worker has encountered many difficulties in adapting to the machine. Indeed, no one is capable of making a true and itemized account of the total effect of existing techniques. Only fragmentary and superficial surveys are possible.

Finally, it is not my intention to make ethical or aesthetic judgments on technique. A human being is, of course, human and not a mere photographic plate, so that his own point of view inevitably appears. But this does not preclude a deeper objectivity. The sign of it will be that worshippers of technique will no doubt find this work pessimistic and haters of technique will find it optimistic.

I have attempted simply to present, by means of a comprehensive analysis, a concrete and fundamental interpretation of technique.

That is the sole object of this book.

J. E.

1954

THE TECHNOLOGICAL SOCIETY

CHAPTER

[2]

THE CHARACTEROLOGY OF TECHNIQUE

In discussing technique today it is impossible not to take a position. And the position we take is determined by a historical choice, conscious or unconscious.

Acknowledging that the technical phenomenon is a constant of human history, is there anything new about its present aspect? There are two distinct positions on this question. The first maintains that there is no more real technical innovation in the modern world than there was in the Stone Age. Jean Fourastié asks humorously whether prehistoric man, the first time he saw a bronze sword used, did not feel as menaced by it as we feel by the atom bomb. It would seem, then, that technical innovations have always had the same surprising and unwelcome character for men. (This is an inexhaustible source of jokes for motion pictures and cartoons.) If we become frightened, we are merely obeying ancestral instincts. There is no more real reason to be frightened by the

atomic bomb than by any invention thousands of years old—which, as we see, has not destroyed the human race. The technique of today has the same characteristics as all preceding techniques. This normal development, however rapid and surprising, cannot be of danger to us.

In opposition to this resolutely optimistic position, there is another which maintains that we are confronted with a genuinely new phenomenon. There is nothing in common between the modern technical complex and the fragments of it which are laboriously sought out in the course of history to demonstrate that there has always been technique. For those who hold this viewpoint, the technical phenomenon represents a complete change, not only of degree, but of kind. Modern society is confronted with a transition (heralded by Marx and particularly by Engels) which involves change of quality as a consequence of change of quantity. This postulate, which Engels applied to physical phenomena, holds true for sociological phenomena as well. Beyond a certain quantity, the phenomenon, even though in a sense it remains the same, does not have the same quality, is not of the same nature.

One cannot choose between these two theses in a subjective and a priori manner. It is necessary to examine the objective characteristics of technique to determine whether there has really been a change. But what characteristics shall we examine? Not the intrinsic ones; these do not change. If we consider intrinsic characteristics, the first position is right. The mental operation by means of which Archimedes constructed certain engines of war is identical with that of any modern engineer who improves a motor. And the same instinct impels a man to catapult stones and to construct a machine gun. Likewise, the same laws of propagation of technical invention operate, no matter what the stage of technical evolution. However, these identities are not at all convincing.

Many men who have studied the problems posed by different techniques admit that there is a radical difference between the traditional situation and the situation we face today. On the basis of intrinsic characteristics, these men have established a distinction between (*a*) the fundamental techniques which, as Ducassé says, "sum up all man's relations with his environment," and (*b*) the techniques which are the results of applied science. The first group is composed of techniques which, although seldom identical in

method and form, are identical in intrinsic characteristics. They constitute the complex of fundamental techniques which sociologists such as LeRoi-Gourhan usually study and on the basis of which they elucidate the laws of technique. Primitive techniques have no reality in themselves; they are merely the intermediary between man and his environment.

The techniques which result from applied science date from the eighteenth century and characterize our own civilization. The new factor is that the multiplicity of these techniques has caused them literally to change their character. Certainly, they derive from old principles and appear to be the fruit of normal and logical evolution. However, they no longer represent the same phenomenon. In fact, technique has taken substance, has become a reality in itself. It is no longer merely a means and an intermediary. It is an object in itself, an independent reality with which we must reckon.

However, this often admitted difference does not seem to me to characterize conclusively the singularity of the technical situation today. The characterization can be challenged because it does not rest upon deep historical experience. It is not enough simply to declare, by drawing on everyone's experience of the disparity between our technique and the limited needs of our bodies, that technique is a reality in itself. We may keep this in mind, but we must also recognize that it is incomplete and not altogether convincing.

It is not, then, the intrinsic characteristics of techniques which reveal whether there have been real changes, but the characteristics of the relation between the technical phenomenon and society. Let us take a very simple comparison. A shell explodes and the explosion is normally always the same. Any fifty shells of the same caliber when exploded display approximately the same objective characteristics from a physical or chemical point of view. The sound, light, and projection of fragments remain nearly identical. The intrinsic characteristics of the fifty explosions are the same. But if forty-nine shells go off in some remote place and the fiftieth goes off in the midst of a platoon of soldiers, it cannot be maintained that the results are identical. A relation has been established which entails a change. To assess this change, it is not the intrinsic character of the explosion which must be examined, but rather its relation to the environment. In the same way, to learn if there has been, for

man, a change in modern technqiue in relation to the old, we must assess, not the internal characteristics of the technique, but the actual situation of technique in human society.

To go beyond this and to imagine, for example, what might have been the psychological reaction of primitive men when faced with technical invention is pure fantasy. The question put by Jean Fourastié, strictly speaking, has no meaning. The working of the mind varies according to place and time, and we cannot project ourselves with any assurance into the mind of primitive man. In order to remain within the limits of what can be known, we must be content to study the relation between technique and society, a relation which has the advantage of being meaningful.

Technique in Civilization

Traditional Techniques and Society. What was the position of technique in the different societies which have preceded ours? Most of these societies resembled one another in their technical aspects. But it is not enough to say that technique was restricted. We must determine the precise characteristics of the limitations, which are four in number.

First, technique was applied only in certain narrow, limited areas. When we attempt to classify techniques throughout history, we find principally techniques of production, of war and hunting, of consumption (clothing, houses, etc.), and, as we have said, magic. This complex of techniques would seem to modern man to represent a rather considerable domain and, indeed, to correspond to the whole of life. What more could there be than producing, consuming, fighting, and practicing magic? But we must look at these things in perspective.

In so-called primitive societies, the whole of life was indeed enclosed in a network of magical techniques. It is their multiplicity that lends them the qualities of rigidity and mechanization. Magic, as we have seen, may even be the origin of techniques; but the primary characteristic of these societies was not a technical but a religious preoccupation. In spite of this totalitarianism of magic, it is not possible to speak of a technical universe. Moreover, the importance of techniques gradually diminishes as we reach historical

societies. In these societies, the life of the group was essentially nontechnical. And although certain productive techniques still existed, the magical forms which had given a technique to social relations, to political acts, and to military and judicial life tended to disappear. These areas ceased to respond to techniques and became subject instead to social spontaneities. The law, which had traditionally expressed itself in certain customs, no longer had any character of technical rigor; even the state was nothing but a force which simply manifested itself. These activities depended more on private initiative, short-lived manifestations or ephemeral traditions, than on a persevering technical will and rational improvements.

Even in activities we consider technical, it was not always that aspect which was uppermost. In the achievement of a small economic goal, for example, the technical effort became secondary to the pleasure of gathering together. "Formerly, when a New England family convoked a 'bee' (that is, a meeting for working in common), it was for all concerned one of the most pleasurable times of the year. The work was scarcely more than a pretext for coming together." [1] The activity of sustaining social relations and human contacts predominated over the technical scheme of things and the obligation to work, which were secondary causes.

Society was free of technique. And even on the level of the individual, technique occupied a place much more circumscribed than we generally believe. Because we judge in modern terms, we believe that production and consumption coincided with the whole of life.

For primitive man, and for historical man until a comparatively late date, work was a punishment, not a virtue. It was better not to consume than to have to work hard; the rule was to work only as much as absolutely necessary in order to survive. Man worked as little as possible and was content with a restricted consumption of goods (as, for example, among the Negroes and the Hindus)—a prevalent attitude, which limits both techniques of production and techniques of consumption. Sometimes slavery was the answer: an entire segment of the population did not work at all and depended on the labor of a minority of slaves. In general, the slaves

[1] George C. Homans, quoted by Jerome Scott and R. P. Lynton.

did constitute a minority. We must not be misled by Imperial Rome, Greece under Pericles, or the Antilles in the eighteenth century. In most slaveholding nations, slaves were in a minority.

The time given to the use of techniques was short, compared with the leisure time devoted to sleep, conversation, games, or, best of all, to meditation. As a corollary, technical activities had little place in these societies. Technique functioned only at certain precise and well-defined times; this was the case in all societies before our own. Technique was not part of man's occupation nor a subject for preoccupation.

This limitation of technique is attested to by the fact that in the past technique was not considered nearly as important as it is today. Heretofore, mankind did not bind up its fate with technical progress. Man regarded technical progress more as a relative instrument than as a god. He did not hope for very much from it. Let us take an example from Giedion's admirable book, in which he elucidates the small importance technique had traditionally.

In our day, we are unable to envisage comfort except as part of the technical order of things. Comfort for us means bathrooms, easy chairs, foam-rubber mattresses, air conditioning, washing machines, and so forth. The chief concern is to avoid effort and promote rest and physical euphoria. For us, comfort is closely associated with the material life; it manifests itself in the perfection of personal goods and machines. According to Giedion, the men of the Middle Ages also were concerned with comfort, but for them comfort had an entirely different form and content. It represented a feeling of moral and aesthetic order. Space was the primary element in comfort. Man sought open spaces, large rooms, the possibility of moving about, of seeing beyond his nose, of not constantly colliding with other people. These preoccupations are altogether foreign to us.

Moreover, comfort consisted of a certain arrangement of space. In the Middle Ages, a room could be completely "finished," even though it might contain no furniture. Everything depended on proportions, material, form. The goal was not convenience, but rather a certain atmosphere. Comfort was the mark of the man's personality on the place where he lived. This, at least in part, explains the extreme diversity of architectural interiors in the houses of the period. Nor was this the result of mere whim; it represented an

adaptation to character; and when it had been realized, the man of the Middle Ages did not care if his rooms were not well heated or his chairs hard.

This concept of comfort, closely bound up with the person, clearly takes death for granted, as did man himself; man's awareness of death likewise profoundly influences his search for an adequate milieu. Giedion's study is convincing. Medieval man did not dream for an instant that technique had any influence at all, even on objects which today we consider completely material and consequently of a technical order.

This limitation of the sphere of action of technique was increased even more by the limitation of the technical means employed in these fields. There was no great variety of means for attaining a desired result, and there was almost no attempt to perfect the means which did exist. It seems, on the contrary, that a conscious Malthusian tendency prevailed. It was expressed, for example, in the regulations of the guilds concerning tools, and in Roman law, by the principle of the economy of forms. Man tended to exploit to the limit such means as he possessed, and took care not to replace them or create other means as long as the old ones were effective. From the judicial point of view, the principle of the economy of forms led to the creation of the fewest possible legal instruments. Laws were few, and so were institutions. Man used the utmost ingenuity to obtain a maximum of results from a minimum of means at the price of fictions, transpositions, applications *a pari* and *a contrario,* and so on. This was also true industrially. Society was not oriented toward the creation of a new instrument in response to a new need. The emphasis was rather on the application of old means, which were constantly extended, refined, and perfected.

The deficiency of the tool was to be compensated for by the skill of the worker. Professional know-how, the expert eye were what counted: man's talents could make his crude tools yield the maximum efficiency. This was a kind of technique, but it had none of the characteristics of instrumental technique. Everything varied from man to man according to his gifts, whereas technique in the modern sense seeks to eliminate such variability. It is understandable that technique in itself played a very feeble role. Everything was done by men who employed the most rudimentary means. The

search for the "finished," for perfection in use, for ingenuity of application, took the place of a search for new tools which would have permitted men to simplify their work, but also would have involved giving up the pursuit of real skill.

Here we have two antithetical orders of inquiry. When there is an abundance of instruments that answer all needs, it is impossible for one man to have a perfect knowledge of each or the skill to use each. This knowledge would be useless in any case; the perfection of the instrument is what is required, and not the perfection of the human being. But, until the eighteenth century, all societies were primarily oriented toward improvement in the use of tools and were little concerned with the tools themselves. No clean-cut division can be made between the two orientations. Human skill, having attained a certain degree of perfection in practice, necessarily entails improvement of the tool itself. The question is one of transcending the stage of total utilization of the tool by improving it. There is, therefore, no doubt that the two phenomena do interpenetrate. But traditionally the accent was on the human being who used the tool and not on the tool he used.

The improvement of tools, essentially the result of the practice of a personal art, came about in a completely pragmatic way. For this reason, we can put in the first category all the techniques we have classified with regard to intrinsic characteristics. A small number of techniques, not very efficient: this was the situation in Eastern and Western society from the tenth century B.C. to the tenth century A.D.

The world of technique had still a third characteristic prior to the eighteenth century: it was local. Social groups were very strong and closed to outsiders. There was little communication, materially speaking, and even less from the spiritual point of view. Technique spread slowly. Certain examples of technical propagation are always cited; the introduction of the wheel into Egypt by the Hyksos; the Crusades; and so on. But such events took millennia and were accidental. In the majority of cases, there was little transmission. Imitation took place very slowly and mankind passed from one technical stage to the next with great difficulty. This is true of material techniques, and even more so of non-material techniques.

Greek art remained Greek in industrial projects such as pottery-making, even when imitated by the Romans. Roman law did not

extend beyond the Roman borders, whereas the Napoleonic code was adopted by Turkey and Japan. As for magic, that technique remained completely secret.

Every technical phenomenon was isolated from similar movements elsewhere. There was no transmission, only fruitless gropings. Geographically, we can trace the compass of a given technique, follow the zones of its influence, imitation, and extension; in almost every case we find how small was the extent of its radiation.

Why was this so? The explanation is simple: technique was an intrinsic part of civilization. And civilization consisted of numerous and diversified elements—natural elements such as temperament and flora, climate and population; and artificial elements such as art, technique, the political regime, etc. Among all these factors, which mingled with one another, technique was only one. It was inexorably linked with them and depended on them, as they depended on it. It was part of a whole, part of the determinate society, and it developed as a function of the whole and shared its fate.

Just as one society is not interchangeable with another, so technique remained enclosed in its proper framework; no more would it become universal than the society in which it was embedded. Geographically there could be no technical transmission because technique was not some anonymous piece of merchandise but rather bore the stamp of the whole culture. This entails much more than the existence of a simple barrier between social groups. Technique was unable to spread from one social group to another except when the two were in the same stage of evolution and except when civilizations were of the same type. In the past, in other words, technique was not objective, but subjective in relation to its own culture.

It is understandable, therefore, that technique, incorporated in its proper framework, did not evolve autonomously. On the contrary, it depended on a whole ensemble of factors which had to vary with it. It is not accurate to conceive the movement in the oversimplified manner of Marxism, as first the evolution of technique, and subsequently the alignment of the other factors. This veiw is accurate for the nineteenth century but it is false for history as a whole. Certain important covariations traditionally existed, and these factors, covariant with technique, changed according

to the type of civilization. There was, for example, the association of technique and the state among the Egyptians and the Incas; of technique and philosophy in Greece and China. Francastel has shown how technique could be "absorbed and directed by the arts," as happened, say, in the fifteenth century, when it was subordinated to a plastic vision of the world, which imposed on it limits and demands. At that time, there existed a whole "civilization well provided with technical inventions, but which deliberately undertook to use them only to the degree in which these inventions would allow it to realize an imaginative construction." Thereafter, we find a complicated "art technique" and, as elsewhere, we almost never find technique in a pure state.

The consequence was an extreme local diversity of techniques for attaining the same result. No comparison or competition existed yet between these different systems; the formulation: "The one best way in the world" had not yet been made. It was a question of the "best way" in a given locality. Because of this, arms and tools took very different forms, and social organizations were extremely diverse.

It is impossible to speak of slavery as all of a piece. Roman slavery, for example, had nothing to do with Teutonic slavery, or Teutonic slavery with Chaldean. We habitually use one term to cover very different realities. This extreme diversity divested technique of its most crucial characteristic. There was no single means which was judged best and able to eliminate all others by virtue of its efficiency. This diversity has made us believe that there was an epoch of experimentation, when man was groping to find his way. This is a false notion; it springs from our modern prejudice that the stage we find ourselves in today represents the highest level of humanity. In reality, diversity resulted not from various experimental attempts on the part of various peoples, but from the fact that technique was always embedded in a particular culture.

Alongside this spatial limitation of technique, we find a time limitation. Until the eighteenth century, techniques evolved very slowly. Technical work was purely pragmatic, inquiry was empirical, and transmission slow and feeble. Centuries were required for: (*a*) utilization of an invention (for example, the water mill); (*b*) transition from a plaything to a useful object (gunpowder, automatons); (*c*) transition from a magical to an economic operation (breeding of animals); (*d*) simple perfecting of an instrument (the horse yoke and the transition from the simple stick plow to the train plow). This was even more true for abstract techniques. Abstract techniques, I maintain, are almost nontransmissible in time from a given civilization to its successor. We must be somewhat skeptical, and in any case prudent, when the evolution of techniques is presented as an evolution of inventions; actually this development was never more than potential. There is nothing to prove that true technique existed heretofore, that is, in the sense of generalized application. It is possible to compile a fine catalogue of seventeenth-century inventions, and to deduce from it that a great technical movement was in force at that time. Many writers have fallen into this error—among them, Jean Laloup and Jean Nelis. It is not because Pascal invented a calculating machine and Papin a steam engine that there was a technical evolution; nor was it because a "prototype" of a power loom was built; nor because the process of the dry distillation of coal was discovered. As Gille has very judiciously noted: "The best-described machines in the eighteenth century *Encyclopédie* are possibly better conceived than those of the fifteenth century, but scarcely constitute a revolution." The initial problem was to construct the machine, to make the invented technique actually work. The second consisted in the diffusion of the machine throughout the society; and this second step proceeded very slowly.

This divergence between invention and technique, which is the cause of the time lag we have spoken of, is correctly interpreted by Gille in these words: "There was a discontinuity of technical progress but there was probably a continuity of research." Gille shows clearly that technical progress develops according to a discontinuous rhythm: "It is tied up with demographic or economic rhythms and with certain internal contradictions." This discontinuity still contributes to evolutionary lag today.

Slowness in the evolution of techniques is evident throughout history. Very few variations seem to have occurred in this constant. But it cannot be maintained that this slowness was completely uniform. Yet, even in periods that appear rather fertile, it is clear that evolution was slow. For example, Roman law, which was particularly rich in the classical period, took two centuries to find a perfect form. Moreover, the number of applied inventions was sharply re-

stricted. The fifteenth century, in spite of its importance, produced no more than four or five important technical applications. The natural consequence of this evolutionary slowness was that technique could be adapted to men. Almost unconsciously, men kept abreast of techniques and controlled their use and influence. This resulted not from an adaptation of men to techniques (as in modern times), but rather from the subordination of techniques to men. Technique did not pose the problem of adaptation because it was firmly enmeshed in the framework of life and culture. It developed so slowly that it did not outstrip the slow evolution of man himself. The progress of the two was so evenly matched that man was able to keep pace with his techniques. From the physical point of view, techniques did not intrude into his life; neither his moral evolution nor his psychic life were influenced by them. Techniques enabled man to make individual progress and facilitated certain developments, but they did not influence him directly. Social equilibrium corresponded to the slowness of general evolution.

This evolutionary slowness was accompanied by a great irrational diversification of designs. The evolution of techniques was produced by individual efforts accompanied by a multitude of scattered experiments. Men made incoherent modifications on instruments and institutions which already existed; but these modifications did not constitute adaptations. We are amazed when we inspect, say, a museum of arms or tools, and note the extreme diversity of form of a single instrument in the same place and time. The great sword used by Swiss soldiers in the sixteenth century had at least nine different forms (hooked, racked, double-handed, hexagonal blades, blades shaped like a fleur-de-lis, grooved, etc.). This diversity was evidently due to various modes of fabrication peculiar to the smiths; it cannot be explained as a manifestation of a technical inquiry. The modifications of a given type were not the outcome of calculation or of an exclusively technical will. They resulted from aesthetic considerations. It is important to emphasize that technical operations, like the instruments themselves, almost always depended on aesthetic preoccupations. It was impossible to conceive of a tool that was not beautiful. As for the idea, frequently accepted since the triumph of efficiency, that the beautiful is that which is well adapted to use—assuredly no such notion guided the aesthetic searchings of the past. No such conception of

beauty (however true) moved the artisan who carved a Toledo blade or fabricated a harness. On the contrary, aesthetic considerations are gratuitous and permit the introduction of uselessness into an eminently useful and efficient apparatus.

This diversity of forms was manifestly conditioned by vainglory and pleasure—the vainglory of the user, the pleasure of the artisan. Both caused changes in the classic type. And why not include as well that pure fantasy which runs through all the creations of Greece and the Middle Ages?

All this led to a modification of the given type. The search for greater efficiency likewise played a role, but it was one factor among several. The different forms were subject to trial and error, and certain forms were progressively stabilized and imitated, either because of their plastic perfection or because of their usefulness. The final result was the establishment of a new type derived from its predecessor.

This diversity of influences, which operated on all technical mechanisms, explains in part the slow tempo of progress in these areas. To obey a multiplicity of motives and not reason alone seems to be an important keynote of man. When, in the nineteenth century, society began to elaborate an exclusively rational technique which acknowledged only considerations of efficiency, it was felt that not only the traditions but the deepest instincts of humankind had been violated. Men sought to reintroduce indispensable factors of aesthetics and morals. Out of this effort came the unprecedented creation of certain aspects of style in the 1880's: the tool with machine-made embellishments. Sewing machines were decorated with cast-iron flowers, and the first tractors bore engraved bulls' heads. That it was wasteful to supply such embellishments soon became evident; their ugliness doubtless contributed to the realization. Moreover, these flourishes represented a wrong road, technically speaking. The machine can become precise only to the degree that its design is elaborated with mathematical rigor in accordance with use. And an embellishment could increase air resistance, throw a wheel out of balance, alter velocity or precision. There was no room in practical activity for gratuitous aesthetic preoccupations. The two had to be separated. A style then developed based on the idea that the line best adapted to use is the most beautiful.

Abstract techniques and their relation to morals underwent the

same evolution. Earlier, economic or political inquiries were inextricably bound with ethical inquiry, and men attempted to maintain this union artificially even after they had recognized the independence of economic technique. Modern society is, in fact, conducted on the basis of purely technical considerations. But when men found themselves going counter to the human factor, they reintroduced—and in an absurd way—all manner of moral theories related to the rights of man, the League of Nations, liberty, justice. None of that has any more importance than the ruffled sunshade of McCormick's first reaper. When these moral flourishes overly encumber technical progress, they are discarded—more or less speedily, with more or less ceremony, but with determination nonetheless. This is the state we are in today.

The elimination of these evolutionary factors and of technical diversification has brought about a transformation of the basic process of this evolution. Technical progress today is no longer conditioned by anything other than its own calculus of efficiency. The search is no longer personal, experimental, workmanlike; it is abstract, mathematical, and industrial. This does not mean that the individual no longer participates. On the contrary, progress is made only after innumerable individual experiments. But the individual participates only to the degree that he is subordinate to the search for efficiency, to the degree that he resists all the currents today considered secondary, such as aesthetics, ethics, fantasy. Insofar as the individual represents this abstract tendency, he is permitted to participate in technical creation, which is increasingly independent of him and increasingly linked to its own mathematical law.

It was long believed that rational systematization would act to reduce the number of technical types: in the measure that the factors of diversification were eliminated, the result would be fewer and more simple and precise types. Thus, during the latter part of the nineteenth century—in the mechanical, medical, and administrative spheres—exact instruments were available from which fantasy and irrationality had been totally eliminated. The result was fewer instruments. As further progress was made, however, a new element of diversification came into play: in order that an instrument be perfectly efficient, it had to be perfectly adapted. But the most rational instrument possible takes no account of the extreme diversity of the operational environment. This represents an essential characteristic of technique. Every procedure implies a single, specific result. As Porter Gale Perrin puts it: "Just as a word evokes an idea which exactly corresponds to no other word," so a fixed technical procedure generates a fixed result. Technical methods are not multipurposive, or adaptable, or interchangeable. Perrin has demonstrated this in detail with reference to judicial technique, but it also holds for everything else. Take the well-known example, cited by Pierre de Latil, of a machine, brought to the highest possible pitch of perfection, the purpose of which was to produce from cast iron, at a single stroke, cylinder heads for aircraft engines. The machine was 28 meters long and cost $100,000. But the moment the required type of cylinder head was changed, the machine became good for nothing; it was unadaptable to any new operation. A judicial system may function perfectly adequately in France but not in Turkey. For true efficiency, not only must the rational aspect of the machine be taken into account, but also its adaptation to the environment. A military tank will have a different form depending on whether it is to be used in mountainous terrain or in rice paddies. The more an instrument is designed to execute a single operation efficiently and with utmost precision, the less can it be multipurposive. A new diversification of technical apparatus thus appears: today instruments are differentiated as a result of the continually more specialized usage demanded of them.

The field of aviation gives us one of the best examples of this. Aircraft are described by the use to which they are put. We have, correspondingly, extremely precise and more and more diversified types. The list of French military aircraft, consisting at the present of five great categories, is as follows: (1) strategic bombers, (2) tactical bombers, (3) pursuit planes, (4) reconnaissance planes, and (5) transport planes. These five categories are subdivided further; there are altogether thirteen different subtypes, none of which are interchangeable with one another. Each has very different characteristics resulting from more and more refined technical adaptations.

The same extensive differentiation is found in much less important areas. A recent brochure of the world's largest refiner of lubricating oils lists fifteen different kinds of lubricants designed exclusively for automobiles. Each type corresponds to a definite use, each possessing specific qualities, and all equally necessary.

A fourth characteristic of technique, which results from the characteristics just enumerated, is the possibility, reserved to the human being, of choice. Inasmuch as all techniques were geographically and historically limited, societies of many different types were able to exist. For the most part, there was an equilibrium between two major types of civilization—the active and the passive. This distinction is well known. Some societies are oriented toward the exploitation of the earth, toward war, conquest, and expansion in all its forms. Other societies are inwardly oriented; they labor just enough to support themselves, concentrate on themselves, are not concerned with material expansion, and erect solid barriers against anything from without. From the spiritual point of view, these societies are characterized by a mystical attitude, by a desire for self-dissolution and absorption into the divine.

Human societies are variable, however. A group which has hitherto been active might become passive. The Tibetans, for instance, were conquerors and believers in magic until their conversion to Buddhism. Thereafter they became the world's most passive and mystical people. The reverse can also take place.

The two types of society coexisted throughout history; indeed, this seemed necessary to the equilibrium of world and man. Until the nineteenth century, technique had not yet excluded one of them. Moreover, man could isolate himself from the influence of technique by attaching himself to a given group and exerting influence on this group. Of course, other constraints acted on him; the individual was never completely free with respect to his group, but these constraints were not completely decisive or imperative in character.

Whether we are considering unconscious sociological cohesion or the power of the state, we find these forces always necessarily counterbalanced by the existence of other neighboring groups and other loyalties. There was no irrefutable constraint on man, because nothing absolutely good in respect to everything else had been discovered. We have noted the diversity of technical form and the slowness of imitation. But it was always human action which was decisive. When several technical forms came into contact, the individual made his choice on the basis of numerous reasons. Efficiency was only one of them, as Pierre Deffontaines has demonstrated in his work on religious geography.

Although the individual existing in the framework of a civilization of a certain type was always confronted with certain techniques, he was nevertheless free to break with that civilization and to control his own individual destiny. The constraints to which he was subject did not function decisively because they were of a nontechnical nature and could be broken through. In an active civilization, even one with a fairly good technical development, the individual could always break away and lead, say, a mystical and contemplative life. The fact that techniques and man were more or less on the same level permitted the individual to repudiate techniques and get along without them. Choice was a real possibility for him, not only with regard to his inner life, but with regard to the outer form of his life as well. The essential elements of life were safeguarded and provided for, more or less liberally, by the very civilization whose forms he rejected. In the Roman Empire (a technical civilization in a good many respects), it was possible for a man to withdraw and live as a hermit or in the country, apart from the evolution and the principal technical power of the Empire. Roman law was powerless in the face of an individual's decision to evade military service or, to a very great degree, imperial taxes and jurisdiction. Even greater was the possibility of the individual's freedom with respect to material techniques.

There was reserved for the individual an area of free choice at the cost of minimal effort. The choice involved a conscious decision and was possible only because the material burden of technique had not yet become more than a man could shoulder. The existence of choice, a result of characteristics we have already discussed, appears to have been one of the most important historical factors governing technical evolution and revolution. Evolution was not, then, a logic of discovery or an inevitable progression of techniques. It was an interaction of technical effectiveness and effective human decision. Whenever either one of these elements disappeared, social and human stagnation necessarily followed. Such was the case, for example, when effective technique was (or became) rudimentary and inefficacious among the Negroes of Africa. As to the consequences of a lapse in the second element, we are experiencing them today.

The New Characteristics. The characteristics of the relationship of technique, society, and the individual which we have analyzed

were, I believe, common to all civilizations up to the eighteenth century. Historically, their existence admits of little discussion. Today, however, the most cursory review enables us to conclude that all these characteristics have disappeared. The relation is not the same; it does not present any of the constants recognizable until now. But that is not sufficient to characterize the technical phenomenon of our own day. This description would situate it in a purely negative perspective, whereas the technical phenomemon is a positive thing; it presents positive characteristics which are peculiar to it. The old characteristics of technique have indeed disappeared; but new ones have taken their place. Today's technical phenomenon, consequently, has almost nothing in common with the technical phenomenon of the past. I shall not insist on demonstrating the negative aspect of the case, the disappearance of the traditional characteristics. To do so would be artificial, didactic, and difficult to defend. I shall point out, then, in a summary fashion, that in our civilization technique is in no way limited. It has been extended to all spheres and encompasses every activity, including human activities. It has led to a multiplication of means without limit. It has perfected indefinitely the instruments available to man, and put at his disposal an almost limitless variety of intermediaries and auxiliaries. Technique has been extended geographically so that it covers the whole earth. It is evolving with a rapidity disconcerting not only to the man in the street but to the technician himself. It poses problems which recur endlessly and every more acutely in human social groups. Moreover, technique has become objective and is transmitted like a physical thing; it leads thereby to a certain unity of civilization, regardless of the environment or the country in which it operates. We are faced with the exact opposite of the traits previously in force. We must, therefore, examine carefully the positive characteristics of the technique of the present.

There are two essential characteristics of today's technical phenomenon which I shall not belabor because of their obviousness. These two, incidentally, are the only ones which, in general, are emphasized by the "best authors."

The first of these obvious characteristics is rationality. In technique, whatever its aspect or the domain in which it is applied, a rational process is present which tends to bring mechanics to bear

on all that is spontaneous or irrational. This rationality, best exemplified in systematization, division of labor, creation of standards, production norms, and the like, involves two distinct phases: first, the use of "discourse" in every operation; this excludes spontaneity and personal creativity. Second, there is the reduction of method to its logical dimension alone. Every intervention of technique is, in effect, a reduction of facts, forces, phenomena, means, and instruments to the schema of logic.

The second obvious characteristic of the technical phenomenon is artificiality. Technique is opposed to nature. Art, artifice, artificial: technique as art is the creation of an artificial system. This is not a matter of opinion. The means man has at his disposal as a function of technique are artificial means. For this reason, the comparison proposed by Emmanuel Mounier between the machine and the human body is valueless. The world that is being created by the accumulation of technical means is an artificial world and hence radically different from the natural world.

It destroys, eliminates, or subordinates the natural world, and does not allow this world to restore itself or even to enter into a symbiotic relation with it. The two worlds obey different imperatives, different directives, and different laws which have nothing in common. Just as hydroelectric installations take waterfalls and lead them into conduits, so the technical milieu absorbs the natural. We are rapidly approaching the time when there will be no longer any natural environment at all. When we succeed in producing artificial *aurorae boreales,* night will disappear and perpetual day will reign over the planet.

I have given only brief descriptions of these two well-known characteristics. But I shall analyze the others at greater length; they are technical automatism, self-augmentation, monism, universalism, and autonomy.

Characteristics of Modern Technique

Automatism of Technical Choice. "The one best way": so runs the formula to which our technique corresponds. When everything has been measured and calculated mathematically so that the method which has been decided upon is satisfactory from the rational point

of view, and when, from the practical point of view, the method is manifestly the most efficient of all those hitherto employed or those in competition with it, then the technical movement becomes self-directing. I call the process *automatism.*

There is no personal choice, in respect to magnitude, between, say, 3 and 4; 4 is greater than 3; this is a fact which has no personal reference. No one can change it or assert the contrary or personally escape it. Similarly, there is no choice between two technical methods. One of them asserts itself inescapably: its results are calculated, measured, obvious, and indisputable.

A surgical operation which was formerly not feasible but can now be performed is not an object of choice. It simply is. Here we see the prime aspect of technical automatism. Technique itself, *ipso facto* and without indulgence or possible discussion, selects among the means to be employed. The human being is no longer in any sense the agent of choice. Let no one say that man is the agent of technical progress (a question I shall discuss later) and that it is he who chooses among possible techniques. In reality, he neither is nor does anything of the sort. He is a device for recording effects and results obtained by various techniques. He does not make a choice of complex and, in some way, human motives. He can decide only in favor of the technique that gives the maximum efficiency. But this is not choice. A machine could effect the same operation. Man still appears to be choosing when he abandons a given method that has proved excellent from some point of view. But his action comes solely from the fact that he has thoroughly analyzed the results and determined that from another point of view the method in question is less efficient. A good example is furnished by the attempts to deconcentrate our great industrial plants after we had concentrated them to the maximum possible degree. Another example would be the decision to abandon certain systems of high production in order to obtain a more constant productivity, although it might be less per capita. It is always a question of the improvement of the method in itself.

The worst reproach modern society can level is the charge that some person or system is impeding this technical automatism. When a labor union leader says: "In a period of recession, productivity is a social scourge," his declaration stirs up a storm of protest and condemnation, because he is putting a personal judgment before the

technical axiom that what can be produced must be produced. If a machine can yield a given result, it must be used to capacity, and it is considered criminal and antisocial not to do so. Technical automatism may not be judged or questioned; immediate use must be found for the most recent, efficient, and technical process.

Communism's fundamental criticism of capitalism is that financial capitalism checks technical progress that produces no profits; or that it promotes technical progress only in order to reserve for itself a monopoly. In any case, as Rubinstein points out, technical progress occurs under capitalism for reasons which have nothing to do with technique, and it is this fact which is to be criticized. Since the Communist regime is oriented toward technical progress, the mark of the superiority of Communism is that it adopts all technical progress. Rubinstein concludes his study by remarking that this progress is the goal of all efforts in the Soviet Union, where it is said to be possible to allow free play to technical automatism without checking it in any way.

Another traditional analysis supplements Rubinstein's. This serious study, carried out by Thorstein Veblen, maintains that there is a conflict between the machine and business. Financial investment, which originally accelerated invention, now prolongs technical inactivity. Capitalism does not give free play to technical activity, the goal of which is that a more efficient method or a more rapidly acting machine should *ipso facto* and automatically replace the preceding method or machine. Capitalism does not give free play to these factors because it inadmissibly subordinates technique to ends other than technique itself, and because it is incapable of absorbing technical progress. The replacement of machines at the tempo of technical invention is completely impossible for capitalist enterprise because there is no time to amortize one machine before new ones appear. Moreover, the more these machines are improved, and hence become more efficient, the more they cost.

The pursuit of technical automatism would condemn capitalist enterprises to failure. The reaction of capitalism is well known: the patents of new machines are acquired and the machines are never put into operation. Sometimes machines that are already in operation are acquired, as in the case of England's largest glass factory in 1932, and destroyed. Capitalism is no longer in a position to pursue technical automatism on the economic or social plane. It

is incapable of developing a system of distribution that would permit the absorption of all the goods which technique allows to be produced. It is led inevitably to crises of overproduction. And in the same way it is unable to utilize the manpower freed by every new technical improvement. Crises of unemployment ensue.

Thus we return to the old schema of Marx: it is the automatism of technique, with its demand that everything be brought into line with it, that endangers capitalism and heralds its final disappearance. This is an accurate criticism, and reveals two things. First, that we are correct in speaking of automatism. If the situation of capitalism is indeed as described, it is so because technical progress acts automatically. The choice between methods is no longer made according to human measure, but occurs as a mechanical process which nothing can prevent. Capitalism, in spite of all its power, will be crushed by this automatism. Second, that for the men of our time, this automatism is just and good. If Communism can make this critique of capitalism a successful springboard for propaganda, it is only because the criticism is valid. And it is valid because everything can be called into question (God first of all), except technical progress. There is nothing left to do but wonder at a mechanism that functions so well and, apparently, so tirelessly. But, above all else, no finger must be laid upon it, nor its automatism interfered with. It is in this that the headway of technical progress becomes automatic; when modern man renounces control over it and cannot bring himself to raise his hand against it so as to make the choice himself.

This, then, is the first aspect of technical automatism. Inside the technical circle, the choice among methods, mechanism, organizations, and formulas is carried out automatically. Man is stripped of his faculty of choice and he is satisfied. He accepts the situation when he sides with technique.

Let us examine the second aspect of automatism. When we leave the technical domain proper, we find a whole ensemble of nontechnical means; among them a kind of preliminary process of elimination is taking place. The various technical systems have invaded all spheres to the point that they are everywhere in collision with modes of life which were heretofore nontechnical. Human life as a whole is not inundated by technique. It has room for activities that are not rationally or systematically ordered. But the collision

between spontaneous activities and technique is catastrophic for the spontaneous activities.

Technical activity automatically eliminates every nontechnical activity or transforms it into technical activity. This does not mean, however, that there is any conscious effort or directive will.

From the point of view which most interests modern man, that of yield, every technical activity is superior to every nontechnical activity. Take, for example, politics. It used to be said that politics was an art, consisting of finesse, aptness, a particular kind of ability, even genius; in short, of personal qualities which seemed to operate by chance. If politics was to become a technical activity, chance must be eliminated. The results to be obtained must be certain. Unpredictability, which all men share to a greater or lesser degree, must also be eliminated. Rules had to be established for this particularly unstable game if certainty of result was to be achieved. The difficulty was great, but not greater, perhaps, than the difficulty involved in harnessing atomic energy.

It was Lenin who established political technique. He did not succeed in formulating a complete set of principles for it, but from the beginning he attained a twofold result. Even a mediocre politician, by the application of the "method," was able to achieve a good average policy, to ward off catastrophes, and to assure a coherent political line. Moreover, the method was far superior to nontechnical policy; the same result could be obtained with fewer resources and with much less expense.

On the military plane, the technique applied by Hitler (and it was a technique, not military genius as with Napoleon—although it is a mark of genius to develop a technique for war or for politics) not only enabled him to achieve what was not necessarily a direct result of his technique but, more important, it enabled him to resist for three years an adversary who possessed approximately a fivefold superiority in all areas—in numbers of men and military machines, in economic power, and so on. This capacity to resist resulted from the remarkable military technique of the Germans and from the perfectly developed relationship they worked out between nation and army.

In the same way, the political technique of Lenin's school made, and is making, possible the achievement of successes over all other political forms, even when these political forms are able to bring

infinitely superior resources to bear. The tide of Leninian policy retreats for certain periods before the superior weight of the enormous politico-economic machines of the opponents. But to such a political technique only another political technique can be opposed; and since the American political technique, for example, is so inferior, it must deploy instead an enormous expenditure of resources. The superiority of a technique to enormous but inefficiently used resources and machinery means that the point at which technique inserts itself becomes a real turning point. The milieu into which a technique penetrates becomes completely, and often at a stroke, a technical milieu. If a desired result is stipulated, there is no choice possible between technical means and nontechnical means based on imagination, individual qualities, or tradition. Nothing can compete with the technical means. The choice is made a priori. It is not in the power of the individual or of the group to decide to follow some method other than the technical. The individual is in a dilemma: either he decides to safeguard his freedom of choice, chooses to use traditional, personal, moral, or empirical means, thereby entering into competition with a power against which there is no efficacious defense and before which he must suffer defeat; or he decides to accept technical necessity, in which case he will himself be the victor, but only by submitting irreparably to technical slavery. In effect he has no freedom of choice.

We are today at the stage of historical evolution in which everything that is not technique is being eliminated. The challenge to a country, an individual, or a system is solely a technical challenge. Only a technical force can be opposed to a technical force. All else is swept away. Serge Tchakotin reminds us of this constantly. In the face of the psychological outrages of propaganda, what reply can there be? It is useless to appeal to culture or religion. It is useless to educate the populace. Only propaganda can retort to propaganda, or psychological rape to psychological rape. Hitler formulated this long before Tchakotin. He writes, in *Mein Kampf:* "Unless the enemy learns to combat poison gas with poison gas, this tactic, which is based on an accurate evaluation of human weaknesses, must lead almost mathematically to success."

The exclusive character of technique gives us one of the reasons for its lightning progress. There is no place for an individual today unless he is a technician. No social group is able to resist the pressures of the environment unless it utilizes technique. To be in possession of the lightning thrust of technique is a matter of life or death for individuals and groups alike; no power on earth can withstand its pressures.

Will the technical phenomena of today be able to maintain itself, or must it suffer in its turn impairment or even liquidation? It is difficult to see ahead, and, in any case, this is not the place to try to do so. Doubtless, technique has its limits. But when it has reached these limits, will anything exist outside them? Its limits are presupposed by its object and its method. But is it not succeeding in undermining everything which is outside it? Beyond its precise and limited compass, whatever its size, will there remain anything in existence? We shall be answering this question all through this book. Within the technical circle nothing else can subsist because technique's proper motion, as Jünger has shown, tends irresistibly toward completeness. To the degree that this completeness is not yet attained, technique is advancing, eliminating every lesser force. And when it has received full satisfaction and accomplished its vocation, it will remain alone in the field. Technique thus reveals itself at once destroyer and creator, and no one wishes or is able to master it.

Self-augmentation. The self-augmentation of technique also has two aspects. At the present time, technique has arrived at such a point in its evolution that it is being transformed and is progressing almost without decisive intervention by man. Modern men are so enthusiastic about technique, so assured of its superiority, so immersed in the technical milieu, that without exception they are oriented toward technical progress. They all work at it, and in every profession or trade everyone seeks to introduce technical improvement. Essentially, technique progresses as a result of this common effort. Technical progress and common human effort come to the same thing. Vincent analyzes with great subtlety the multitude of factors which intervene, each in its small way, in technical progress: the consumer, accumulation of capital, research bureaus and laboratories, and the organization of production, which acts "in some sense mechanically." Technical progress appears to Vincent to be "the resultant" of all these factors. In one sense, technique indeed progresses by means of minute improvements which are the result of common human efforts and are indefinitely additive until

they form a mass of new conditions that permit a decisive forward step. But it is equally true that technique sharply reduces the role of human invention. It is no longer the man of genius who discovers something. It is no longer the vision of a Newton which is decisive. What is decisive is this anonymous accretion of conditions for the leap ahead. When all the conditions concur, only minimal human intervention is needed to produce important advances. It might almost be maintained that, at this stage of evolution of a technical problem, whoever attacked the problem would find the solution.

The example of the steam engine and its manifold successive small alterations is well known. This example is being repeated today in all fields.

The accretion of manifold minute details, all tending to perfect the ensemble, is much more decisive than the intervention of the individual who assembles the new data, adds some element which transforms the situation, and thus gives birth to a machine or to some spectacular system that will bear his name.

This is the way progress takes place in the field of education, too. After the general direction given by initiators (like Decroly or Montessori), it is the findings of thousands of educators which ceaselessly nourish the improvement of technique. In fact, educational systems are completely transformed as a result of practice—without any one's being quite aware of it. In industrial plants, the discovery of details is utilized in another way: to create interest on the part of the worker in his work. The worker is asked not only to use the machine he operates, but also to study it to find flaws in its operation, then to find remedies against these faults, and in addition to determine how its productivity might be improved. The result is the "suggestion box" by means of which workers may indicate their ideas and plans for improvement.

This collective, anonymous research advances techniques almost everywhere in the world by a like impulse, a striking result of self-augmentation. It is noticeable that identical technical inventions are produced simultaneously in many countries. To the degree that science is taking on a more and more technical aspect, these discoveries are made everywhere at the same time—a further indication that scientific discoveries are, in reality, governed by technique.

The smashing of the atom and the atomic bomb are characteristic of this simultaneity. In Germany, Norway, the U.S.S.R., the United States, and France, research had reached almost the same point in 1939. But circumstances upset European technical evolution and gave superiority to the United States. Among these circumstances were the invasion of Norway and France, the collapse of Germany several months after the discovery, and the lack of means and raw material in the U.S.S.R. What is true of scientific inventions is much more true of technical inventions. Only lack of means halts progress in certain countries. The more advanced a country is in the employment of technique, the more material is required, whether in numbers of men, raw materials, or complexity of machines. A country must be wealthy to exploit techniques to a maximum. And when the country is able to do this, technique returns a hundredfold increase in its wealth. This is another element in self-augmentation.

It is still necessary to justify the term *self-augmentation,* since it appears to be contradicted by what I have just been saying. If technical advance is assured by the joint effort of thousands of technicians, each of whom makes his contribution, it would seem impossible to speak of self-augmentation. But there is another aspect which must be brought to light.

There is an automatic growth (that is, a growth which is not calculated, desired, or chosen) of everything which concerns technique. This applies even to men. Statistically, the number of scientists and technicians has doubled every decade for a century and a half. Apparently this is a self-generating process: technique engenders itself. When a new technical form appears, it makes possible and conditions a number of others. To take a plain and elementary example: the internal-combustion engine made possible and conditioned the techniques of the automobile, the submarine, and so on. In the same way, once a technical procedure has been discovered, it is applicable in many fields other than the one for which it was primarly invented. The techniques of "operational research," for example, were devised to help make certain military decisions. But it was immediately noted that they could be applied wherever any decision had to be made. As Baraché, a specialist in these techniques, says: "The nature of the problems themselves was secondary . . . the methods of approach and the tech-

niques employed proved to have a general scope." The same could be said for the techniques of organization. There is, therefore, a self-augmentation of the areas of application.

This does not necessarily mean an infinite or indefinite augmentation of technique. I do not wish at this point to enter the realm of prognosis, but predictions of the more or less rapid extinction of technical progress seem to me to be contradicted by the facts. Whether it be Lewis Mumford, say, declaring that the era of mechanical progress is almost at an end, or Colin Clark announcing the transition of secondary mechanical activities to tertiary activities, they are exhibiting what can only be termed a dangerous confidence.

Lewis Mumford shows that certain of our inventions cannot be improved, that the possible domain of mechanical activity cannot be extended, and that mechanical progress is limited by the nature of the physical world. This last is true. But we are far from knowing the total possibilities of the physical world. And after Mumford had written that statement fifteen years ago, servomechanisms, radar, and atom smashing were discovered. It is obvious that the augmentation of machines cannot be unlimited. But, so as not to rest our hopes on an alleged stagnation, it will be enough for this progress to continue for another century.

What is true of mechnical techniques is also true of economic techniques. I agree fully with the remarks of Léon Hugo Dupriez when he points out the error of the "stagnationists"—of Wolf, for example, who writes: "The law of the limit of technico-economic development is that past progress closes the door to future progress. For future progress there remains in every case only a margin, only a fraction, indeed only a small fraction, of past progress." Dupriez's exposure of the error of statements like this seems to me so convincing that I shall content myself with referring the reader to his work.

On the other hand, Lewis Mumford shows (and, from another perspective, this is also Colin Clark's thought) that the best organization will tend to reduce the use of certain machines. This is rigorously exact. But this "best organization" is precisely technique itself and, moreover, it comprises a mechanical element as well. When Fourastié announces an augmentation of the tertiary, non-mechanized sector, the extraordinary progress of administrative

mechanization of the last ten years must be considered. This mechanization completely modifies the conditions of human work by what has been termed "the replacement of the organic and the psychological by the mechanical." It is certain that this fact will entail the same social crisis of unemployment as in the "secondary" sector. To take an example, the tabulator adds and prints 45,000 numbers an hour (as compared with 1,500 for a trained employee). It reads, calculates, analyzes, and prints 150 lines a minute. A punching machine, attached to it, produces the punched cards which recapitulate the results. The Gamma (a magnetic-drum machine) has a "memory" with a capacity for 200,000 individual items of data. A 1960-model calculating machine can handle 40,000 operations a second. The machine, along with organizational development, is now the means of reducing both the number of employees and expenses, and also of reducing, on the collective plane, the tertiary sector of manpower.

We can hardly agree that mechanical augmentation is decelerating. We are simply in another phase of technical progress: the phase of assimilation, organization, and conquest of the other areas. Here the progress to be made seems limitless, and consists primarily in the efficient systematization of society and the conquest of the human being. All that can be said is that, at best, technical activity has changed its field of operation; it cannot be said that it has slowed down.

Moreover, nothing argues that subsequently technical activity will not again turn toward the world of machines with renewed vigor. On the whole, it is the principle of the combination of techniques which causes self-augmentation.

Self-augmentation can be formulated in two laws:

1. *In a given civilization, technical progress is irreversible.*
2. *Technical progress tends to act, not according to an arithmetic, but according to a geometric progression.*

The first of these laws—and we base our conviction on the whole of history—makes us certain that every invention calls forth other technical inventions in other domains. There is never any question of an arrest of the process, and even less of a backward movement. Arrest and retreat only occur when an entire society collapses. In the transition to a successor, a certain number of technical procedures are lost. But, in the framework of the same civilization,

technical progress is never in question. Later I shall examine the reasons for this. Technical progression is of the same nature as the process of numbering; there is no good ground for halting the progression, because after each number we can always add 1. In technical evolution also, it seems that limits no longer exist. Improvements that result from the application of technique to the matter at hand (whether it be physical or social) can be added uninterruptedly; there is no reason for arresting the process. In arguing thus, the qualification must be made that this can be said only of the *ensemble* of techniques, of the technical phenomenon, and not of any particular technique. For every technique taken by itself there apparently exist barriers that act to impede further progress, barriers to the addition of new inventions—but these can sometimes be cleared, as the sound barrier has been for aircraft. For the technical phenomenon in its ensemble, however, a limitless progress is open. This progress, as Wiener has shown, is a necessity. Since techniques, proportionally to their development, exhaust the resources of nature, it is indispensable to fill the vacuum so created by a more rapid technical progress. Only inventions perpetually more numerous and automatically increasing can make good the unheard-of expenditures and the irremediable consumption of raw materials such as wood, coal, petroleum, and even water.

What is it that determines this progression today? We can no longer argue that it is an economic or a social condition, or education, or any other human factor. Essentially, the preceding technical situation alone is determinative. When a given technical discovery occurs, it has followed almost of necessity certain other discoveries. Human intervention in this succession appears only as an incidental cause, and no one man can do this by himself. But anyone who is sufficiently up-to-date technically can make a valid discovery which rationally follows its predecessors and rationally heralds what is to follow.

Two points must be made more precise here. First, the technical consequences of a technical improvement are not necessarily of a kind. Thus, a purely mechanical discovery may have repercussions in the domain of social techniques or in that of organizational techniques. For example, machines that use perforated cards affect statistics and the organization of certain business enterprises. Conversely, some kind of social technique (for instance, full employment) may entail an improvement in the techniques of economic production.

Here we note the interdependence of techniques which is stated in the second law of self-augmentation: technical progress tends to be brought about according to a geometric progression. A technical discovery has repercussions and entails progress in several branches of technique and not merely in one. Moreover, techniques combine with one another, and the more given techniques there are to be combined, the more combinations are possible. Thus, almost without deliberate will, by a simple combination of new data, incessant discoveries take place everywhere; and whole fields are opened up to technique because of the meeting of several currents. Material techniques of communication, psychological techniques, commercial techniques, techniques of authoritarian government, all combine to produce the important phenomenon of propaganda, which represents a new technique independent of all the rest and necessarily produced as a consequence of the preceding phenomena.

This second law of self-augmentation explains a characteristic of the technical movement which has engaged the attention of contemporary sociologists. This is the unevenness of technical development. Enormous disparities exist not only in the various global areas of technical expansion but also in each field within the various sectors. Technique progresses more rapidly in one branch than in another—and certain retrogressions are always possible. To Frankel this unevenness of development is the key to the disturbances of equilibrium and the social difficulties that the technical phenomenon provokes. According to Frankel, if all branches evolved in the same rhythm, there would be no problem. Frankel's view, certainly too simple, is probably not inexact. However, it explains little. In fact, these clashing rhythms cannot be altered because of technical automatism.

Fourastié is right in arguing that technical progress is unpredictable. It cannot be known with certainty even a short time in advance in what quarter the new technical invention will be produced, precisely because such inventions are, for the most part, the result of self-augmentation. (Of course, a distinction must be made between invention and discovery.) Short of halting progress by force

in an advanced sector, there are no means of bringing these rhythms back into harmony; and the role of the individual is progressively weakened.

The final point to make in discussing self-augmentation is that technique, in its development, poses primarily technical problems which consequently can be resolved only by technique. The present level of technique brings on new advances, and these in turn add to existing technical difficulties and technical problems, which demand further advances still. This is a concrete problem in town planning. A large city supposes a concentration of the means of transport, air control, traffic organization, and so on. Each of these permits the city to grow even larger and promotes new technical advances. For example, to make housework easier, garbage-disposal units have been put into use which allow the garbage to run off through the kitchen sinks. The result is enormous pollution of the rivers. It is then necessary to find some new means of purifying the rivers so that water can be used for drinking. A great quantity of oxygen is required for bacteria to destroy these organic materials. And how shall we oxygenate rivers? This is an example of the way in which technique engenders itself.

The mechanization of administrative work in business offices raises the problem of a necessarily different kind of organization. It is not merely a question of replacing human beings with machines or of speeding up the work (of bookkeeping, for example), but rather of effecting operations of a new type which must be integrated into a new kind of organization. For example, the organization of the whole system of inventory analysis (with its four functions of entering, grouping, totaling, and comparing) becomes necessary. An ensemble of new techniques must be elaborated without which the machine in question would be good for nothing, resulting only in what Mas terms "pseudo-systematization."

The implications of self-augmentation become clearer: the individual's role is less and less important in technical evolution. The more factors there are, the more readily they combine and the more evident is the urgent need for each technical advance. Advance for its own sake becomes proportionately greater and the expression of human autonomy proportionately feebler.

Human beings are, indeed, always necessary. But literally anyone

can do the job, provided he is trained to it. Henceforth, men will be able to act only in virtue of their commonest and lowest nature, and not in virtue of what they possess of superiority and individuality. The qualities which technique requires for its advance are precisely those characteristics of a technical order which do not represent individual intelligence. And here we enter into another area, the nature of the technician.

In this decisive evolution, the human being does not play a part. Technical elements combine among themselves, and they do so more and more spontaneously. In the future, man will apparently be confined to the role of a recording device; he will note the effects of techniques upon one another, and register the results.

A whole new kind of spontaneous action is taking place here, and we know neither its laws nor its ends. In this sense it is possible to speak of the "reality" of technique—with its own substance, its own particular mode of being, and a life independent of our power of decision. The evolution of techniques then becomes exclusively causal; it loses all finality. This is what economists such as Alfred Sauvy mean when they say that "by a slow reversal . . . production is more and more determined by the wishes of individuals in their capacity as producers, than by their decisions as consumers." In reality, it is not the "wishes" of the "producers" which control, but the technical necessity of production which forces itself on the consumers. Anything and everything which technique is able to produce *is* produced and accepted by the consumer. The belief that the human producer is still master of production is a dangerous illusion.

Technique is organized as a closed world. It utilizes what the mass of men do not understand. It is even based on human ignorance. As Charles Camichel says: "The worker cannot understand the workings of modern industry." The individual, in order to make use of technical instruments, no longer needs to know about his civilization. And no single technician dominates the whole complex any longer. The bond that unites the fragmentary actions and disjointedness of individuals, co-ordinating and systematizing their work, is no longer a human one, but the internal laws of technique. The human hand no longer spans the complex of means, nor does the human brain synthesize man's acts. Only the intrinsic monism

of technique assures cohesion between human means and acts. Technique reigns alone, a blind force and more clear-sighted than the best human intelligence.

This phenomenon of self-augmentation gives technique a strangely harsh aspect. It resembles nothing other than itself. Whatever the domain to which it is applied, man or God, technique simply *is;* it undergoes no modifications in the movement which is its being and essence. It is the only locus where form and being are identical. It is only a form, but everything conforms to it. Here technique assumes the peculiar characteristics which make it a thing apart. A precise and well-defined boundary surrounds it: there is that which is technique, and there is everything else, which is not. Whoever passes this boundary and enters into technique is constrained to adopt its characteristics. Technique modifies whatever it touches, but it is itself untouchable. Nothing in nature, or in social or human life, is comparable with it. The intelligence of art or war comes nowhere near that of technique, no more than does the industry of ants or bees. A hybrid but not sterile being, and capable of self-generation, technique traces its own limits and fashions its own image.

Whatever the adaptations nature or circumstances demand of it, technique remains self-identical in its characteristics and its course. Hindrances seem to compel it to become, not something else, but even more itself. Everything it assimilates strengthens it in its traits. There is no hope of seeing it change into a fine and gracious being: it is neither Caliban nor Ariel, but it has been able to take Ariel and Caliban into the unconditioned circles of its universal method.

Monism.[2] The technical phenomenon, embracing all the separate techniques, forms a whole. This monism of technique was already obvious to us when we determined, on the basis of the evidence, that the technical phenomenon presents, everywhere and essentially, the same characteristics. It is useless to look for differentiations. They do exist, but only secondarily. The common features of the technical phenomenon are so sharply

[2] The French word is *unicité* or *insécabilité*. I have adopted "monism" as the English equivalent. "Holism" might have been better. In any case, the accumulated philosophical baggage of both these terms must be rejected and the meaning of the term understood contextually. (Trans.)

drawn that it is easy to discern that which is the technical phenomenon and that which is not. The difficulties experienced in the study of technique arise partly from the method to be used and partly from terminology. They do not arise from the phenomenon itself, which is eminently simple to fix.

To analyze these common features is tricky, but it is simple to grasp them. Just as there are principles common to things as different as a wireless set and an internal-combustion engine, so the organization of an office and the construction of an aircraft have certain identical features. This identity is the primary mark of that thoroughgoing unity which makes the technical phenomenon a single essence despite the extreme diversity of its appearances.

As a corollary, it is impossible to analyze this or that element out of it—a truth which is today particularly misunderstood. The great tendency of all persons who study techniques is to make distinctions. They distinguish between the different elements of technique, maintaining some and discarding others. They distinguish between technique and the use to which it is put. These distinctions are completely invalid and show only that he who makes them has understood nothing of the technical phenomenon. Its parts are ontologically tied together; in it, use is inseparable from being.

It is common practice, for example, to deny the unity of the technical complex so as to be able to fasten one's hopes on one or another of its branches. Mumford gives a remarkable example of this when he contrasts the grandeur of the printing press with the horridness of the newspaper. "On the one side there is the gigantic printing press, a miracle of fine articulation . . . On the other the content of the papers themselves recording the most vulgar and elementary emotional states . . . There the impersonal, the cooperative, the objective; here the limited, the subjective, the recalcitrant, the ego, violent and full of hate and fear, etc. . . ." Unfortunately, it did not occur to Mumford to ask whether the content of our newspapers is not really necessitated by the social form imposed on man by the machine.

This content is not the product of chance or of some economic form. It is the result of precise psychological and psychoanalytical techniques. These techniques have as their goal the bringing to the individual of that which is indispensable for his satisfaction in the conditions in which the machine has placed him, of inhibiting in

him the sense of revolution, of subjugating him by flattering him. In other words, journalistic content is a technical complex expressly intended to adapt the man to the machine.

It is certain that a press of high intellectual tone and great moral elevation either would not be read (and then one would scarcely see the wherefore of these beautiful machines) or would provoke in the long run a violent reaction against every form of technical society, including the machine. This reaction would come about not because of the ideas such a press would disseminate, but because the reader would no longer find in it the indispensable instrument for releasing his repressed passions.

In a sound evaluation of the problem, it ought never to be said: on the one side, technique; on the other, the abuse of it. There are different techniques which correspond to different necessities. But all techniques are inseparably united. Everything hangs together in the technical world, as it does in the mechanical; in both, the advisability of the isolated means must be distinguished from the advisability of the mechanical "complex." The claims of the mechanical "complex" must prevail when, for example, a machine too costly or overrefined threatens to wreck the ensemble.

There is an attractive notion which would apparently resolve all technical problems: that it is not the technique that is wrong, but the use men make of it. Consequently, if the use is changed, there will no longer be any objection to the technique.

I shall return more than once to this conception. Let us examine a single aspect of it now. First, it manifestly rests on the confusion between machine and technique. A man can use his automobile to take a trip or to kill his neighbors. But the second use is not a use; it is a crime. The automobile was not created to kill people, so the fact is not important. I know, of course, that killing people is not what those who explain things in this way have in mind. They prefer to say that man orients his pursuits in the direction of good and not of evil. They mean that technique seeks to invent rational therapies and not poison gases, useful sources of energy and not atomic bombs, commercial and not military aircraft, etc. This leads them straight back to man—man who decides in what direction to orient his researches. (Must it not be, then, that man is becoming better?) But all this is an error. It resolutely refuses to recognize technical reality. It supposes, to begin with, that men orient technique in a

given direction for moral, and consequently nontechnical, reasons. But a principal characteristic of technique (which we shall study at length) is its refusal to tolerate moral judgments. It is absolutely independent of them and eliminates them from its domain. Technique never observes the distinction between moral and immoral use. It tends, on the contrary, to create a completely independent technical morality.

Here, then, is one of the elements of weakness of this point of view. It does not perceive technique's rigorous autonomy with respect to morals; it does not see that the infusion of some more or less vague sentiment of human welfare cannot alter it. Not even the moral conversion of the technicians could make a difference. At best, they would cease to be good technicians.

This attitude supposes further that technique evolves with some end in view, and that this end is human good. Technique, as I believe I have shown, is totally irrelevant to this notion and pursues no end, professed or unprofessed. It evolves in a purely causal way: the combination of preceding elements furnishes the new technical elements. There is no purpose or plan that is being progressively realized. There is not even a tendency toward human ends. We are dealing with a phenomenon blind to the future, in a domain of integral causality. Hence, to pose arbitrarily some goal or other, to propose a direction for technique, is to deny technique and divest it of its character and its strength.

There is a final argument against this position. It was said that the use made of technique is bad. But this assertion has no meaning at all. As I have pointed out, a number of uses can always be made of the machine, but only one of them is the technical use. The use of the automobile as a murder weapon does not represent the technical use, that is, the one best way of doing something. Technique is a means with a set of rules for the game. It is a "method of being used" which is unique and not open to arbitrary choice; we gain no advantage from the machine or from organization if it is not used as it ought to be. There is but one method for its use, one possibility. Lacking this, it is not a technique. Technique is in itself a method of action, which is exactly what a use means. To say of such a technical means that a bad use has been made of it is to say that no technical use has been made of it, that it has not been made to yield what it could have yielded and ought to have yielded. The

driver who uses his automobile carelessly makes a bad use of it. Such use, incidentally, has nothing to do with the use which moralists wish to ascribe to technique. Technique *is* a use. Moralists wish to apply another use, with other criteria. What they wish, to be precise, is that technique no longer be technique. Under the circumstances, there are no further significant problems.

There is no difference at all between technique and its use. The individual is faced with an exclusive choice, either to use the technique as it should be used according to the technical rules, or not to use it at all. It is impossible to use it otherwise than according to the technical rules.

Unfortunately, men today accept this reality only with difficulty. Thus, when Mumford makes the statement: "The army is the ideal form towards which a purely mechanical industrial system must tend," he is unable to restrain himself from adding: "But the result is not ideal." What is the "ideal" doing here? The ideal is not the problem. The problem is solely to know whether this mode of organization responds to technical criteria. Mumford is able to show that it is nothing of the kind, because he limits techniques to machines. But if he were to accept the role of human techniques in the organization of the army he could account for the fact that the army indeed remains the irreproachable model of a technical organization, and its value has nothing to do with an ideal. It is infantile to wish to submit the machine to the criterion of the ideal.

It is also held that technique could be directed toward that which is positive, constructive, and enriching, omitting that which is negative, destructive, and impoverishing. In demagogic formulation, techniques of peace must be developed and techniques of war rejected. In a less simple-minded version, it is held that means ought to be sought which palliate, without increasing, the drawbacks of technique. Could not atomic engines and atomic power have been discovered without creating the bomb? To reason thus is to separate technical elements with no justification. Techniques of peace and alongside them other and different techniques of war simply do not exist, despite what good folk think to the contrary.

The organization of an army comes to resemble more and more that of a great industrial plant. It is the technical phenomenon presenting a formidable unity in all its parts, which are inseparable. The fact that the atomic bomb was created before the atomic

engine was not essentially the result of the perversity of technical men. Nor was it solely the attitude of the state which determined this order. The action of the state was certainly the deciding factor in atomic research (I shall take up this point later). Research was greatly accelerated by the necessities of war and consequently directed toward a bomb. If the state had not been oriented toward the ends of war, it would not have devoted so much money to atomic research. All this caused an undeniable factor of orientation to intervene. But if the state had not promoted such efforts, it would have been the whole complex of atomic research which would have been halted without distinction between the uses of war and peace.

If atomic research is encouraged, it is obligatory to pass through the stage of the atomic bomb; the bomb represents by far the simplest utilization of atomic energy. The problems involved in the military use of atomic energy are infinitely more simple to resolve than are those involved in its industrial use. For industrial use, all the problems involved in the bomb must be solved, and in addition certain others, a fact corroborated by J. Robert Oppenheimer in his Paris lecture of 1958. The experience of Great Britain between 1955 and 1960 in producing electricity of nuclear origin is very significant in this respect.

It was, then, necessary to pass through the period of research which culminated in the bomb before proceeding to its normal sequel, atomic motive power. The atomic-bomb period is a transitory, but unfortunately necessary, stage in the general evolution of this technique. In the interim period represented by the bomb, the possessor, finding himself with so powerful an instrument, is led to use it. Why? Because everything which is technique is necessarily used as soon as it is available, without distinction of good or evil. This is the principal law of our age. We may quote here Jacques Soustelle's well-known remark of May, 1960, in reference to the atomic bomb. It expresses the deep feeling of us all: "Since it was possible, it was necessary." Really a master phrase for all technical evolution.

Even an author as well disposed toward the machine as Mumford recognizes that there is a tendency to utilize all inventions whether there is need for them or not. "Our grandparents used sheet iron for walls although they knew that iron is a good conductor of

heat . . . The introduction of anesthetics led to the performance of superfluous operations. . . ." To say that it could be otherwise is simply to make an abstraction of man.

Another example is the police. The police have perfected to an unheard of degree technical methods both of research and of action. Everyone is delighted with this development because it would seem to guarantee an increasingly efficient protection against criminals. Let us put aside for the moment the problem of police corruption and concentrate on the technical apparatus, which, as I have noted, is becoming extremely precise. Will this apparatus be applied only to criminals? We know that this is not the case; and we are tempted to react by saying that it is the *state* which applies this technical apparatus without discrimination. But there is an error of perspective here. The instrument tends to be applied *everywhere* it *can* be applied. It functions without discrimination—because it exists without discrimination. The techniques of the police, which are developing at an extremely rapid tempo, have as their necessary end the transformation of the entire nation into a concentration camp. This is no perverse decision on the part of some party or government. To be sure of apprehending criminals, it is necessary that *everyone* be supervised. It is necessary to know exactly what every citizen is up to, to know his relations, his amusements, etc. And the state is increasingly in a position to know these things.

This does not imply a reign of terror or of arbitrary arrests. The best technique is one which makes itself felt the least and which represents the least burden. But every citizen must be thoroughly known to the police and must live under conditions of discreet surveillance. All this results from the perfection of technical methods.

The police cannot attain technical perfection unless they have total control. And, as Ernst Kohn-Bramstedt has remarked, this total control has both an objective and a subjective side. Subjectively, control satisfies the desire for power and certain sadistic tendencies. But the subjective aspect is not the dominant one. It is not the major aspect, the expression of what is to come. In reality, the objective aspect of control—more and more, that is to say, the pure technique which creates a milieu, an atmosphere, an environment, and even a model of behavior in social relations—dominates more and more. The police must move in the direction of anticipating and forestalling crime. Eventually intervention will be useless. This state of affairs can come about in two ways: first, by constant surveillance, to the end that noxious intentions be known in advance and the police be able to act before the premeditated crime takes place; second, by the climate of social conformity which we have mentioned. This goal presupposes the paternal surveillance of every citizen and, in addition, the closest possible tie-in with all other techniques—administrative, organizational, and psychological. The technique of police control has value only if the police are in close contact with the trade unions and the schools. In particular, it is allied with propaganda. Wherever the phenomenon is observed, this connection exists. Propaganda itself cannot be efficient unless it brings into play the whole state organization, and particularly the police power. Conversely, police power is a genuine technique only when it is supplemented by propaganda, which plays a leading role in the psychological environment necessary to the completeness of the police power. But propaganda must also teach acceptance of what the police power is and what it can do. It must make the police power palatable, justify its actions, and give it its psychosociological structure among the masses of the people.

All this is equally true for dictatorial regimes in which police and propaganda concentrate on terror, and for democratic regimes in which the motion pictures, for example, show the good offices of the police and procure it the friendly feeling of the public. The vicious circle mentioned by Ernst Kohn-Bramstedt (past terror accentuates present propaganda, and present propaganda paves the way for future terror) is as true of democratic as of dictatorial regimes, if the term *terror* is replaced by *efficiency*.

This type of police organization is not an arbitrary prospect. It is maintained by every authoritarian government, where every citizen is regarded as a suspect ignorant of his own capabilities. It is the tendency in the United States, and we are beginning to see the first elements of it in France. The administration of the French police was oriented, in 1951, toward an organization of the system "in depth." This took place, for example, at the level of the Record Office. Certain elements of this are simple and well known: fingerprint files, records of firearms, application of statistical methods which allow the police to obtain in a minimum of time the most varied kinds of information and to know from day to day the current

state of criminality in all its forms. Other elements are somewhat more complicated and new. For example, a punched-card mechanical index system (*Recherches*) has been installed in the Criminal Division. This system offers four hundred possible combinations and permits investigations to begin with any element of the crime: hour of commission, nature, objects stolen, weapons used, etc. The combination obviously does not give the solution but a series of approximations.

The most important item in this catalogue of police techniques is the creation of the so-called "suspect files," which show whether the police ever suspected any individual for any reason or at any time whatsoever, even though no legal document or procedure ever existed against him (from the press conference of M. Baylot, Prefect of Police, 1951). This means that any citizen who, once in his life, had anything to do with the police, even for noncriminal reasons, is put under observation—a fact which ought to affect, speaking conservatively, half the adult male population. It is obvious that these lists are only a point of departure, because it will be tempting, as well as necessary, to complete the files with all observations which may have been collected.

Finally, this technical conception of the police supposes the institution of concentration camps, not in their dramatic aspects, but in their administrative aspects. The Nazi's use of concentration camps has warped our perspectives. The concentration camp is based on two ideas which derive directly from the technical conception of the police: preventive detention (which completes prevention), and re-education. It is not because the use of these terms has not corresponded to reality that we feel it necessary to refuse to see in the concentration camp a very advanced form of the system. Nor is it because the so-called methods of re-education have, on the whole, been methods of destruction that we feel we must consider such a concept of "re-education" an odious joke. The further we advance, the more will the police be considered responsible for the re-education of social misfits, a goal that is a part of the very order which they are charged with protecting.

We are experiencing at present the justification of this development. It is not true that the perfection of police power is the result of the state's Machiavellianism or of some transitory influence. The whole structure of society implies it, of necessity. The more we mobilize the forces of nature, the more must we mobilize men and the more do we require order, which today represents the highest value. To deny this is to deny the whole course of modern times. This order has nothing spontaneous in it. It is rather a patient accretion of a thousand technical details. And each of us derives a feeling of security from every one of the improvements which make this order more efficient and the future safer. Order receives our complete approval; even when we are hostile to the police, we are, by a strange contradiction, partisans of order. In the blossoming of modern discoveries and of our own power, a vertigo has taken hold of us which makes us feel this need to an extreme degree. After all, it is the police who are charged, from the external point of view, with insuring this order which covers organization and morals. How then can we possibly deny to the police indispensable improvements in their methods?

We in France are still in the preparatory phase of this development, but the organization of police power has been pushed very far in Canada and New Zealand, to take two examples. Technical necessity imposes the national concentration camp (which, I must point out, does not involve the suffering usually associated with it).

Let us take another example. A new machine of great productive power put into circulation "releases" a great quantity of work; it replaces many workers. This is an inevitable consequence of technique. In the crude order of things, these workers are simply thrown out of work. Capitalism is blamed for this state of affairs and we are told that technique itself is not responsible for technological unemployment and that the establishment of socialism would set things right. The capitalist replies: "Technological unemployment always dies out of itself. For example, it creates certain new activities which will in the long run create employment for qualified workers." This appears to be a dreadful prospect because it implies a readaptation in *time* and a more or less lengthy period of unemployment. But what does socialism propose? That the "liberated" worker will be used somewhere else and in some other capacity. In the Soviet Union the worker is either adapted to a new skill by means of vocational training or he is sent to another part of the country. In the Beveridge Plan the worker is employed wherever the state opens a plant of any sort. This socialist solution involves readaptation in space. But this solution, too, appears to be com-

pletely alien to human nature. Man is not a mere package to be moved about, an object to be molded and applied wherever there is need. These two forms of readaptation, the only ones possible, are both inhumane. The New Work Code promulgated in the (East) German Democratic Republic in November, 1960, shows this inhumanity in operation in the socialist camp. And none of these adaptations can be separated from the machine which replaces human labor. They are its necessary and inevitable consequence. Of course, idealists will speak of the reduction of the work week. But this reduction can only be effected when equivalent technical improvements are produced in all fields of work. According to Colin Clark, it seems that this reduction, too, must "ceiling out" before long. But this consideration passes over into the area of economics.

I could cite innumerable examples, but the ones I have given suffice to show that technique in itself (and not the use made of it, or its non-necessary consequences) leads to a certain amount of suffering and to social scourges which cannot be completely separated from it. This is its very mechanism.

Of course, a technique can be abandoned when it proves to have evil effects which were not provided for. From then on, there will be an improvement in the technique. A characteristic example is furnished by J. de Castro in *The Geography of Hunger*. De Castro shows in detail, with regard to Brazil, what was already known superficially about other countries, that certain techniques of exploitation have proved disastrous. According to de Castro, certain regions were deforested in order to grow sugar cane. But only the immediate technical productivity was considered. In a further work, de Castro seeks to show that the hunger problem was created by application of the capitalist and colonialist system to agriculture. His reasoning, however, is correct only to a very limited extent. It is true that when an agriculture of diversified crops is replaced by a single-crop economy for commercial ends (tobacco and sugar cane), capitalism is to blame. But most often crop diversification is not disturbed. What happens is that new areas are brought under cultivation, producing a population increase and also a unilateral utilization of the labor forces. And this is less a capitalist than a technical fact. If the possibility of industrializing agriculture exists, why not use it? Any engineer, agronomist, or economist of a hundred years ago would have agreed that bringing uncultivated lands under cultivation constituted a great advance. The application of European agricultural techniques represented an incomparable forward step, when compared, for example, to Indian methods. But it involved certain unforeseen consequences: the resulting deforestation modified hydrographic features, the rivers became torrents, and the drainage waters provoked catastrophic erosion. The topsoil was completely carried away and agriculture became impossible. The fauna, dependent on the existence of the forest, disappeared. In this way, the food-producing possibilities of vast regions vanished. The same situation is developing as a result of the cultivation of peanuts in Senegal, of cotton in the South of the United States, and so on. None of this represents, as is commonly said, a poor application of technique—one guided by selfish interest. It is simply technique. And if the situation is rectified "too late" by the abandonment of the old technique, it will only be as a consequence of some new technical advance. In any case, the first step was inevitable; man can never foresee the totality of consequences of a given technical action. History shows that every technical application from its beginnings presents certain unforeseeable secondary effects which are much more disastrous than the lack of the technique would have been. These effects exist alongside those effects which were foreseen and expected and which represent something valuable and positive.

Technique demands the most rapid possible application; the problems of our day are evolving rapidly and require immediate solutions. Modern man is held by the throat by certain demands which will not be resolved simply by the passage of time. The quickest possible counter-thrust, often a matter of life or death, is necessary. When the parry specific to the attack is found, it is used. It would be foolish not to use the available means. But there is never time to estimate all the repercussions. And, in any case, they are most often unforeseeable. The more we understand the interrelation of all disciplines and the interaction of the instruments, the less time there is to measure these effects accurately.

Moreover, technique demands the most immediate application because it is so expensive. It must "pay off," in money, prestige, or force (depending on whether the regime is capitalist, Communist, or Fascist, respectively). There is no time for precautions

when the distribution of dividends or the salvation of the proletariat is at stake. Nor can we permit ourselves to say that these motives are no affair of technique. If none of them existed, there would be no money for technical research and there would be no technique. Technique cannot be considered in itself, apart from its actual modes of existence.

We are brought back, then, to serious facts of this order: in certain agricultural research in England, antiparasitic agents called *systemics* were applied. An injection was made into a fruit tree, which as a consequence was infected with the agent from its roots to its leaves. Every parasite died. But nothing is known of the effects on the fruit, or of the effects on man, and *in the long run* of the effects on the tree. All that is known is that the agent is not an immediate deadly poison for the consumer. Such products are already commercially available, and it is probable that they will shortly be used on a large scale. What we have said about systemics holds for the specific insecticide, D.D.T. It was announced originally that this insecticide was completely harmless for warm-blooded animals. Subsequently, D.D.T. was widely used. But it was noted in 1951 that D.D.T. in fatty solution (oily or otherwise) is actually a poison for warm-blooded animals and causes a whole complex of disturbances and diseases, in particular, rickets. This fatty solution may be produced entirely by accident, as when cows treated with this chemical produce milk containing D.D.T. Rickets has been detected in calves nourished with such milk. And several international medical congresses since 1956 have drawn attention to the grave danger to children.

But the real question is not the question of error. Errors are always possible. Two facts alone concern us: it is impossible to foresee all the consequences of a technical action; and technique demands that everything it produces be brought into a domain that affects the entire public.

The weight of technique is such that no obstacle can stop it. And every technical advance is matched by a negative reverse side. An excellent study of the effect of petroleum explorations in the Sahara (1958) concludes with the observation that the most serious problem is the increase in the wretchedness of the local population. The causes of this growing misery, among others, are: the supplanting of caravan traffic by motor vehicles; the disappearance of the date

palms (diseased through widespread chemical wastes); and the disappearance of cereal grains because of nonmaintenance of the irrigation works. This complex seems to represent a typical example.

The human being is delivered helpless, in respect to life's most important and most trivial affairs, to a power which is in no sense under his control. For there can be no question today of man's controlling the milk he drinks or the bread he eats, any more than of his controlling his government. The same holds for the development of great industrial plants, transport systems, motion pictures, and so on. It is only after a period of dubious experimentation that a technique is refined and its secondary consequences are modified through a series of technical improvements. Henceforth, someone will say, it will be possible to tame the monster and separate the good results of a technical operation from the bad. That may be. But, in the same framework, the new technical advance will in its turn produce further secondary and unpredictable effects which are no less disastrous than the preceding ones (aithough they will be of another kind). De Castro declares that the new techniques of soil cultivation presuppose more and more powerful state control, with its police power, its ideology, and its propaganda machinery. This is the price we must pay.

William Vogt, surveying the same problem, is still more precise: in order to avoid famine, resulting from the systematic destruction of the topsoil, we must apply the latest technical methods. But conservation will not be put into practice spontaneously by individuals; yet, these methods must be applied globally or they will not amount to anything. Who can do this? Vogt, like all good Americans, asserts that he detests the authoritarian police state. However, he agrees that only state controls can possibly produce the desired results. He extols the efforts made by the liberal administration of the United States in this respect, but he agrees that the United States continues "to lose ground literally and figuratively," simply because the methods of American agricultural administration are not authoritarian enough.

What measures are to be recommended? The various soils must be classified as to possible ways to cultivate them without destroying them. Authoritarian methods must be applied in order (*a*) to evacuate the population and to prevent it from working the imperiled soil; and (*b*) to grow only certain products on certain types

of soil. The peasant can no longer be allowed freedom in these respects. This evolution is to be facilitated by centralization of the great land holdings. In Latin America there are today from 20 to 40 million ecologically displaced persons, persons occupying lands which ought not to be under cultivation. They are living on hillsides from which it is absolutely necessary to drive them if the means of existence of their countries are to be saved from destruction. It will be difficult and costly to relocate these people, but Latin America has no choice. If she does not solve this problem, she will be reduced to the most miserable standard of living.

All experts on agricultural questions are in fact in fundamental agreement. De Castro (although hostile to the ideas of Vogt) and Dumont (critical of de Castro on certain points) come to the conclusion that only strict planning on a world scale can solve the problems of agriculture, and that only human relocation and collective distribution of wealth can solve the problem of famine. This can only mean that man, if he is to improve the traditional agricultural techniques and be rid of their drawbacks, will be obliged to apply extremely rigorous administrative and police techniques. Here again we have a good example of the interconnection of different elements and of the unpredictability of the secondary effects.

It was believed for a long time that the TVA was a praiseworthy response to certain problems raised by technique. Today, however, certain major flaws have become apparent. For example, the correct application of methods of reforestation and animal reproduction were not understood. Flood control was not carried out by retention of the water in the soil but by submerging permanently a good part of the lands which have been saved to protect others. Man, we repeat, is never able to foresee the totality of effects of his technique. No one could have foreseen that regulating the Colorado River for irrigation purposes would lead the Pacific Ocean to encroach upon the coast of California, or that it would endanger the valleys (which had been "regulated") by the removal of up to 500 tons a day of sand and rock. It is likewise impossible to foresee the effect of techniques intended to control the weather, dispel clouds, precipitate rain or snow, and so on. In another area, Professor Lemaire, in a study of narcotic drugs, shows that technique permits the manufacture of synthetic narcotics with greater and greater ease and in increasing quantities. But, according to

Lemaire, the control of these drugs is thereby rendered more and more difficult because "we cannot predict whether they will or will not be dangerous. The only proof is their habitual use by addicts. But to obtain this proof requires years of experience."

There is scarcely need to recall that universal famine, the most serious danger known to humanity,[3] is caused by the advance of certain medical techniques which have brought with them good and evil inextricably mixed. This is not a question of good or bad use. No more so is the problem, posed by atomic techniques, of the disposal of atomic waste. Atomic explosions are not the real problem. The real problem continues to be that of the disposal of the ceaselessly accumulating waste materials, despite the reassuring but unfortunately partisan explanations of some atomic scientists. The International Agency for Atomic Energy recognized, in 1959, that these wastes represent a deadly peril and that there is no sure way of avoiding it, except perhaps by means of the difficult process of "vitrification" being undertaken in Canada. And all this involves the *peaceful* use of the atom!

In every case, what can really be foreseen more or less clearly is the need of state intervention to control the effects of technical applications. But by the time a technique is modified in the light of these effects, the evil has already been done. When it is proposed to "choose" between effects, it is always too late. It is doubtless still possible to modify any given element, but only at the price of secondary repercussions. Again, it is doubtless possible to produce, by means of rational exploitation of natural resources, enough food to nourish five billion human beings. But this can be accomplished only at the price of forced labor and a new kind of slavery. Whatever point we choose to examine, we always perceive this interrelation of techniques. In 1960, the World Congress for the Study of Nutrition considered the problem of how modern nutrition is vitiated by the use of chemical products which are themselves significant contributory causes of the so-called diseases of civilization (cancer, cardiovascular illnesses, etc.). But the Congress's studies indicate that the solution can no longer be a return to a "natural" nutrition. On the contrary, a further step must be taken which involves *completely* artificial alimentation, so-called rational ali-

[3] That this problem can be solved seems doubtful to most recent congresses, the Vevey Congress of 1960 among them.

mentation. It will not be sufficient merely to control grains, meat, butter, and so forth. The stage at which this would have been feasible has been passed. New technical methods must be found. But can we be assured that this new alimentation will in its turn present no danger?

Every rejection of a technique judged to be bad entails the application of a new technique, the value of which is estimated from the point of view of efficiency alone. But we are always unaware of the more remote repercussions. History shows us that these are seldom positive, at least when we consider history as a whole instead of contenting ourselves with examining disconnected phenomena such as the population increase, the prolongation of the average life span, or the shortening of the work week. These are symptoms which perhaps would have meaning if man were merely an animal, but which have no conclusive significance if man is something more than a production machine.

However, it is not my intention to show that technique will end in disaster. On the contrary, technique has only one principle: efficient ordering. Everything, for technique, is centered on the concept of order. This explains the development of moral and political doctrines at the beginning of the nineteenth century. Everything which represented an ordering principle was taken in deadly earnest. At the same time the means destined to elaborate this order were exploited as never before. Order and peace were required for the development of the individual techniques (after society had reached the necessary stage of disintegration). Peace is indispensable to the triumph of industrialization. It will be hastily concluded from this that industrialization will promote peace. But, as always, logical deductions falsify reality. J. U. Nef has shown admirably that industrialization cannot act otherwise than to promote wars. This is no accident, but rather an organic relation. It holds not only because of the direct influence of industrialization on the means of destruction but also because of its influence on the means of existence. Technical progress favors war, according to Nef, because (*a*) the new weapons have rendered more difficult the distinction between offense and defense; and (*b*) they have enormously reduced the pain and anguish implied in the act of killing.

On another plane, the distinction between peaceful industry and military industry is no longer possible. Every industry, every technique, however humane its intentions, has military value. "The humanitarian scientist finds himself confronted by a new dilemma: Must he look for ways to make people live longer so that they are better able to destroy one another?" Nef has described all this remarkably well. It is no longer a question of simple human behavior, but of technical necessity.

The technical phenomenon cannot be broken down in such a way as to retain the good and reject the bad. It has a "mass" which renders it monistic. To show this we have taken only the simplest, and hence the most easily debatable, examples. To enable the reader to grasp fully the reality of this monism, it would be necessary to present every problem with all its implications and ramifications into other fields. The case of the police, for example, cannot be considred merely within its specific confines; police technique is closely connected with the techniques of propaganda, administration, and even economics. Economics demands, in effect, an increasing productivity; it is impossible to accept the nonproducers into the body social—the loafers, the coupon-clippers, the social misfits, and the saboteurs—none of these have any place. The police must develop methods to put these useless consumers to work. The problem is the same in a capitalist state (where the Communist is the saboteur) and in a Communist state (where the saboteur is the internationalist in the pay of capitalism).

The necessities and the modes of action of all these techniques combine to form a whole, each part supporting and reinforcing the others. They constitute a co-ordinated phenomenon, no element of which can be detached from the others. It is an illusion, a perfectly understandable one, to hope to be able to suppress the "bad" side of technique and preserve the "good." This belief means that the essence of the technical phenomenon has not been grasped.

The Necessary Linking Together of Techniques. We have seen how the two technical characteristics, self-augmentation and monism, combine. Now we must consider the historical, necessary linking up of all the different techniques. This analysis will complete my discussion of these two characteristics.

Machine technique appeared after 1750. The technical state of mind was first manifested in the application of the principles of science. We already know how this necessity arose (it is emphasized in all textbooks). The flying shuttle of 1733 made a greater pro-

duction of yarn necessary. But production was impossible without a suitable machine. The response to this dilemma was the invention of the spinning jenny by James Hargreaves. But then yarn was produced in much greater quantities than could possibly be used by the weavers. To solve this new problem, Cartwright manufactured his celebrated loom. In this series of events we see in its simplest form the interaction that accelerates the development of machines. Each new machine disturbs the equilibrium of production; the restoration of equilibrium entails the creation of one or more additional machines in other areas of operation.

Production becomes more and more complex. The combination of machines within the same enterprise is a notable characteristic of the nineteenth century. It is impossible, in effect, to have an isolated machine. There must be adjunct machines, if not preparatory ones. This need, which is not clearly evident in the textile industry (a loom is relatively self-sufficient), is singularly well defined in the metallurgical industry. Fabrication in this area consists of multiple inseparable operations. For each of these operations, one or more machines are needed. This gives rise to a complex enterprise which demands the application of the organization of production. The need for organization of machines is found even in the textile industry. A large number of looms must be grouped together in order to utilize the prime mover most effectively, since no individual loom consumes very much energy. To obtain maximum yield, machines cannot be disposed in a haphazard way. Nor can production take place irregularly. A plan must be followed in all technical domains. And this plan, which becomes more and more inflexible in proportion to increasing production, is the product of a technique of organization and of operation.

Organizational technique was still very sketchy at the beginning of the nineteenth century. But with the increase in the number of manufactured products, new commercial methods had to be created. Capital, labor, producers, and consumers had to be found. Three new kinds of technique emerged: commercial, industrial, and transportational. Commercial techniques developed at the beginning of the nineteenth century with the same velocity as industrial techniques. These commercial techniques exploited all the old systems which had previously existed sporadically and

without much vigor. Bills of exchange, banks, clearing houses, double-entry bookkeeping, and the like, were further developed.

The need to distribute manufactured goods thus acted to produce a powerful commercial technique, which, however, proved to be incapable of assuring proper distribution. The accumulation of capital (produced by the machine and also necessitated by it) became the source of an international financial organization, with its systems of great firms, insurance, credit, and the corporation with limited liabilities. The corporation was indispensable in view of the magnitude of the commercial traffic generated by sheer concentration.

But the two systems, commercial and financial, were only able to function at full capacity if they were in a position to dispose of their merchandise at the most favorable point, as determined by commercial techniques. This implied the rapid, regular, and certain transport of merchandise. Hence, systems of transport had to be assured if financial and commercial techniques were to be able to operate. A new technique came into being, transport, which was not a direct result of the machine. It was a separate branch; and organization played a greater role in it than the machine itself (in railway routes and timetables, problems of eminent domain, etc.).

At the period this technical torrent was emerging from industrial enterprise, a crowd of human beings began to gather about the machine. A great number of individuals were necessary to service it; an equally great number were required to collect about it to consume its products. The first great change consisted in forcing the consumer to come to the machine, inasmuch as adequate means of transportation were to come fifty years too late. With this development came the hitherto unknown phenomenon of the big city. At the beginning, the big city engendered no particular technique; people were merely unhappy in it. But it soon appeared that megalopolis represented a new and special kind of environment, calling for special treatment. The technique of city planning made its appearance. At first, urban planning was only a clumsy kind of adaptation which was little concerned, for example, with slums (despite the efforts of the utopian planners of the middle of the century). Somewhat later, as big city life became for the most part intolerable, techniques of amusement were developed. It became indis-

pensable to make urban suffering acceptable by furnishing amusements, a necessity which was to assure the rise, for example, of a monstrous motion-picture industry.

This phase of development was still dominated by the machine, and corresponded to what Mumford has called the paleotechnical period. During this period the instruments of the power mentality developed. It became apparent that mechanical improvements alone do not suffice to yield socially valuable results. This was clearly a period of transition in which inventions had not yet completely overthrown the older institutions. And they had not yet touched human life, except indirectly. It was a period of disorder. And the most glaring manifestation of this disorder was man's exploitation of man. This disorder, however, led to a strenuous search for order, which developed first in the economic field. For some time it had been possible to believe that the increasing flow of merchandise would be absorbed automatically. But the illusions of liberalism collapsed very quickly. Little by little, the liberal system broke down before the profusion of goods which the machine blindly poured forth. It was inescapable that only technical methods of distribution would be able to cope with the problems created by technical methods of production. There was no way around it. A mechanism of distribution and consumption was necessary, as precise as the mechanism of production, which itself was not yet sufficiently precise, merely because it was mechanical. It was imperative that the different parts of the productive mechanism be adjusted and that the goods produced correspond exactly to the need, in quantity as well as in quality. It was no longer sufficient to organize enterprise. The entire production had to be organized in all its details. And if production were completely organized, there could be no question of allowing consumption (which had, in the meantime, become mechanized) to operate without its own world-wide organization. These logical interactions, which emerged first on the national level, were soon found on the international level as well.

The development of this mechanism inevitably implied the most perfect possible economic technique. This economic technique in turn would permit the utilization of new machines. Reciprocally, certain other instruments would facilitate the improvement of the economic technique. Moreover, nothing could be left to chance,

in this kind of organization; the labor supply in particular could not be entrusted to the whim of the individual. Economic organization presupposes a technique of labor. (The precise form of this technique is of little consequence to us here. We are interested only in the principle.) Labor had to be systematized; it had to become scientific. Thus, of necessity a new technique was added to the preceding ones. But at the same time it became mandatory to compensate the workers for the fatigue generated by technical labor. Here we meet again the necessity for additional mass amusement —a necessity which the existence of the big city had already provoked. The cycle was inevitable.

The whole edifice was constructed little by little, and all its individual techniques were improved by mutual interaction. Before long, however, the need for still another instrument appeared. Who was to co-ordinate this multiplicity of techniques? Who was to build the mechanism necessary to the new economic technique? Who was to make binding the decisions necessary to service the machines? The individual is not by himself rational enough to accept what is necessary to the machines. He rebels too easily. He requires an agency to constrain him, and the state had to play this role—but the state now could not be the incoherent, powerless, and arbitrary state of tradition. It had to be an effective state, equal to the functioning of the economic regime and in control of everything, to the end that machines which had developed at random should become "coherent." To this end, the state itself must be coherent. Thus, the techniques of the state—military, police, administrative, and political—made their appearance. Without them, all the rest would have been no more than faint hopes unable to attain maximum development. They intermingled, necessitating one another, and all of them necessitated by the economy.

It soon became evident that such external action was insufficient. A great effort was required of the individual, and this effort he could not make unless he was genuinely convinced, not merely constrained. He must be made to yield his heart and will, as he had yielded his body and brain. And so the techniques of propaganda, education, and psychic manipulation came to reinforce the others. Without them, man could scarcely have been equal to his organizations and his machines. Without them, technique could not have been completely certain of its operation. To the degree that material

techniques became more precise, intellectual and psychic techniques became more necessary. By these means man acquired the conviction and strength needed to make possible the maximum utilization of the others. So the edifice was completed.

It is impossible to amputate a part of the system or to modify it in any way without modifying the whole. The system was not built through whim or personal ambition. Its factors were all reciprocally engendered.

In this description we have constantly encountered the term *necessity;* it is necessity which characterizes the technical universe. Everything must accommodate itself to it with mathematical certainty. Every successive technique has appeared because the ones which preceded it rendered necessary the ones which followed. Otherwise they would have been inefficacious and would not have been able to deliver their maximum yield.

It is useless to hope for modification of a system like this—so complex and precisely adjusted that no single part can be modified by itself. Moreover, the system perfects and completes itself unremittingly. And, except in print, I see no sign of any modification of the technical edifice, no principle of a different social organization that would not be founded on technical necessity.

Technical Universalism. This characteristic of the technical phenomenon manifests itself under two aspects, the first geographic and the second qualitative.

From the geographic point of view, it is easy to see that technique is constantly gaining ground, country by country, and that its area of action is the whole world. In all countries, whatever their degree of "civilization," there is a tendency to apply the same technical procedures. Even when the population of a given country is not completely assimilated technically, it is nevertheless able to use the instruments which technique puts into its hands. The people of these countries have no need to be Westernized. Technique, to be used, does not require a "civilized" man. Technique, whatever hand uses it, produces its effect more or less totally in proportion to the individual's more or less total absorption in it.

Vogt emphasizes this fact, for example, when he shows that in the domain of agriculture the most up-to-date techniques have become universal. Never before, says Vogt, has man destroyed his natural environment "with the inexorableness of an armored division. These 'civilized' forces of destruction, which have been developed under our influence, have conquered the entire globe to such a degree that Malays, Hottentots and Ainos are spreading the plague."

In the course of history there have always been different principles of civilization according to regions, nations, and continents. But today everything tends to align itself on technical principles. In the past, different civilizations took different "paths"; today all peoples follow the same road and the same impulse. This does not mean that they have all reached the same point, but they are situated at different points along the same trajectory. The United States represents the type that France will represent in thirty years, and China in possibly eighty. All the business of life, from work and amusement to love and death, is seen from the technical point of view. The number of "technical slaves" is growing rapidly, and the ideal of all governments is to push as fast as possible toward industrialization and technical enslavement.

I am well acquainted with the perfectly valid arguments which turn on economic necessity and the misery of the so-called "backward" peoples. But the problem is not the process involved; it is simply to note that different societies are adopting Western technique. The Vevey Congress of 1960 forcefully emphasized this point. Although, understandably, the primary problem of the underdeveloped peoples is undernourishment, obsession with technique has befuddled them to such a point that what they are demanding, and what we are offering, is the very industrialization that will aggravate the evil. Technique is the same in all latitudes and hence acts to make different civilizations uniform. This tendency arises directly from technique itself. The Oriental, Russian, and South American societies were by no means historically prepared, as was ours, to favor technical development.

The best sociologists have noted that technique involves the same effects everywhere. R. P. Lynton writes: "The industrialization of a community of Europe or America, on the one hand; or of Siam, Nigeria, Turkey, or Uruguay, on the other, poses the same problems." If the technical movement had had its inception in one of these "backward" countries, it would have aborted. But these societies are presented with a technical movement in full vigor and in all its expansive power. No longer is there any question as to

whether circumstances favorable to its flowering exist. The technical movement is strong enough to impose itself and to break down all barriers to its progress.

But why does this expansion exist at all? Until now it was generally accepted that very similar social environments were necessary if propagation of techniques were to occur. This is no longer true. Today technique imposes itself, whatever the environment. This expansive force can be explained by a whole ensemble of historical reasons (more or less superficial, though true), and by one profound reason (to be examined later on).

The historical reasons are bound up with two great currents which have occasioned the technical invasion: commerce and war. Colonial war opened the door to those European nations that possessed the whole complex of technical means. The conquering nations exported their machines and their organization through their armies. The vanquished peoples, in a state of mind compounded of admiration and fear, adopted the machines, which came to replace their gods. Not only were the machines the means their conquerors had used to subdue them, but the machines represented the possible means for liberation from these conquerors. In these colonies traffic in arms and in all the instruments of power began to flourish as a means of provoking insurrection. At first, rebellion was incoherent, but to the degree that these peoples became better organized and technicized, rebellion became a national affair.

War also involved the backward peoples globally. I have in mind not so much the direct effects of colonial war as the effects of wars among so-called civilized nations. The colonies of Germany and France became involved in the war between these nations. Later on, China and Siberia came in. Yakuts rode in tanks in the front line of the Red Army. War provokes the sudden and stupefying adaptation of the "savage" to machinery and discipline.

The second factor governing technical invasion is commerce. It was mandatory for the Western powers to conquer the markets necessary for Western industry and technical life. No barrier could oppose this necessity; and primitive peoples were literally swamped by the products of modern technique. In 1945 the Americans sent tons of individual military rations to the Bulgarians, who had no desire at all to adapt themselves to a new kind of butter and

to other substitutes. But their resistance necessarily yielded to technical adaptation and, very rapidly, to plain abundance. The excessiveness of the means broke down all traditional and individual desires.

After consumer goods came an invasion of productive techniques. Technical invasion is a question not only of colonialism but also, for the less powerful countries, of simple technical subordination. This, and this only, explains the formation of the two blocs today. All political or economic explanations are superficial and ridiculous. There are two great technical powers, the United States and the Soviet Union. Every other country must subordinate itself to one or the other of the two simply because of their technical superiority. Technical invasion is not exclusively colonial invasion but assumes other forms as well.

The phenomenon of present-day decolonialization is closely related to the possibilities of the technical development of peoples who, up to now, have lived in symbiosis with colonial powers. From the very moment of "independence," these peoples are constrained to appeal for assistance to the two major powers; after all, they cannot possibly be self-sufficient on the technical plane. The major powers then equip them in a "disinterested" way. In fact, of course, the major powers have no choice if they cherish any hope at all that the poverty of these new "free" nations will not make them theatres of endemic war (not to mention the fact that the major powers are themselves in competition). Thus, the best and most moral intentions (as, for example, Harry S. Truman's Point Four aid to colonial lands) lead to a rapid technicization of the world; and every political phenomenon accelerates this technicization, which necessarily assumes a Western look.

The expensive factors are clearly favored by the elementary technical facts. Consider, for example, the speed and thoroughness of the means of communication, which permit technical products to be transported anywhere in the world soon after their appearance in the country of origin. The result of this must be speedy unification.

The very means of communication presuppose such unification. Great ocean-going vessels necessitate continually improved port installations everywhere. Railroads demand identical roadbeds in all countries. Aviation requires a whole technical substructure,

which is becoming more important day by day and which must become ever more uniform as tonnage and speed increase.

The creation of the port of Lavera, near Port-de-Bouc, is a case in point. To construct a harbor for oil tankers to meet the demands of the French market, it was necessary to conform exactly to the international requirements of petroleum shipping. These demands are wholly technical: depth of channel for modern tankers of more than 30,000 tons, special docks, relay reservoirs fitted with technical improvements exactly adapted to the tankers, and so on. It was clearly impossible to continue to do without these facilities. In French home ports today, the petroleum brought in by the large tankers must first be discharged by small lighters to plants which are either floating installations or of insufficient pumping capacity. This results in loss of time and excessive handling. Every ton of crude oil bears an extra burden of approximately three dollars. These factors are clear and are leading to the acceptance of the most modern procedures—which reciprocally contributes to world-wide technical unification.

There is still another element in the mechanism of technical expansion: the export of technicians. This is not only a question of German technicians going, for example, to the United States or to Russia. (This exodus, incidentally, was accompanied by a certain technical flowering which rendered German technique truly international.) There is the same diffusion of American technique to underdeveloped countries by the application of President Truman's Point Four Program. Academicians are supplied who are charged with blueprinting the future of underdeveloped peoples. (This form of technical assistance assimilates intellectually the inhabitants of the countries in question.) In addition, the United States directly supplies the necessary technicians for exploiting the natural resources of these countries. The immediate purpose is to raise the standard of living of the population, beginning with a realistic appraisal of the possibilities of the given country, and the final objective is a perfectly humanitarian one; we can refrain from passing judgment on whether American imperialism is involved. Nevertheless, this leads to a diffusion of techniques throughout the world in an accelerated tempo, and at the same time it leads to technical identity in all countries.

A certain educational unity is also involved here. Every citizen

of an underdeveloped country must become adept in the use of the new techniques. This leads to the extension of European-style education, allows the colored peoples to participate actively in scientific progress, and provokes as a consequence a kind of a priori adhesion to technical diffusion. Since 1956 we have been witnessing the same diffusion of technicians from the Soviet Union, and more recently from China, to Syria, Guinea, Ghana, and Cuba. Without entertaining political suspicions of these acts, let us bear in mind only that these factors, among others, are an active aid to technical invasion.

Technical invasion does not involve the simple addition of new values to old ones. It does not put new wine into old bottles; it does not introduce new content into old forms. The old bottles are all being broken. The old civilizations collapse on contact with the new. And the same phenomenon appears under every possible cultural form. Take, for example, religion. We have seen one religion disappear under our very eyes as a result of a technical fact: Mikado worship vanished after the bomb was dropped at Hiroshima. We are witnessing the collapse of Buddhism under Communist pressure in Tibet and China. And, according to recent studies, Buddhism is vanishing for technical reasons, not because of the ideological effect of Communism. The phenomenon is due, on the one hand, to a brutal and massive infusion of industrial techniques and, on the other, to the use of propaganda techniques which entail the abandonment of religion by the ever growing population. In a certain sense these religious people are not left without religion. To their transcendental religion a "social" religion is opposed, a religion which is but an expression of technical progress.

Even the most classically oriented sociologists today recognize that the impact of techniques is producing a collapse of the non-Western civilizations. This involves the collapse of cultural as well as of economic forms, and of the traditional psychological and sociological structures.

UNESCO has been greatly preoccupied with these questions, and both the *Bulletin of the Social Sciences* and the reports of Dr. Margaret Mead strike an alarming note. Investigators find, in effect, that it is easy to transfer technical procedures, but that the elaboration of sociological and psychological methods of controlling them is slow, difficult, and laborious.

One is always running up against the simple-minded tendency to say, as Charles F. Frankel puts it, that "it is sufficient to give technical procedures and their accumulated blessings to the backward peoples in order to put them on their feet, as one might give an injection to a sick man." This kind of injection may conceivably help. But in giving it, we destroy the traditional ways of life. Technique does not, of itself, carry its own equilibrium. The opposite is nearer the truth. We have seen in the West how technique destroyed communities and brought the relevance of the human being into question, even though technique was born in the Western milieu and grew only slowly. How much more formidable are its effects when it is suddenly implanted in a foreign environment, appearing in all its power at a single stroke. In Africa the worker is separated from his family and, as S. Herbert Frankel says, "his social ego remains attached to the rural group while he himself has been transplanted into an industrial milieu. When his family comes to the city they are completely unprepared for urban life and are destroyed in that environment morally and sociologically." In Australia we find the same collapse of the traditional way of life. A. P. Elkin says: "In the tribe, authority belonged to the elders . . . but it is now in process of passing to the corral boss, or to the ranch owner. . . . The mysterious rites, which are associated with the succession of the seasons and with the search for food, and which in the past occupied a great deal of time, are tending to lose their meaning." It would be easy enough to give many more examples.

Every culture must be considered as a whole. The transformation of a given element through the effect of technique produces shocks in all areas. All the peoples of the world today live in a cultural breakdown provoked by the conflicts and the internal strife resulting from technique. Over and above this—as Margaret Mead points out—since every human being incorporates in his own person the cultural environment in which he lives, its disagreements and incoherences are to be met with again in each individual personality.

Moreover, we are poorly equipped to respond to this cultural collapse. We have few studies of the mentality and the needs of these peoples, and even fewer studies of their psychological reactions to technique. We have no studies of the social and administrative measures that might meet their needs, or of their changes in aptitudes. We never send along with our technique any civilized environment or adaptable value capable of replacing what is being destroyed. This, at any rate, is the diagnosis of UNESCO, an agency generally characterized by optimism.

The situation is being studied now, but for the most part we are too late. All the instruments ought long since to have been prepared, for no natural adaptation or spontaneous reorganization can be counted upon. No hope of this exists. We have no instruments ready. And while the problem is being studied, the ravages of technique are making steady inroads. We are in a veritable race, but it is evident that we are beaten before we begin. The effects of technique are already too far advanced for us to begin again at the beginning. There is no doubt that all the traditional cultures and sociological structures will be destroyed by technique before we can discover or invent social, economic, and psychological forms of adaptation which might possibly have preserved the equilibrium of these peoples and societies.

In the political sphere the phenomenon takes the form of the brutal transition from elementary forms of society to the fully developed modern dictatorship. A major part of the world's population has passed in a few years from serfdom or feudalism to the most punctilious dictatorial state, by virtue and necessity of productive and administrative techniques. The Soviet Union, Turkey, and Japan are well-known examples.

The problem of dictatorship is likewise posed by decolonialization. Either one succeeds in organizing the country and in establishing a centralized authoritarian state (as has occurred in Ghana, Guinea, Ivory Coast, Sudan) or anarchy reigns (as in the Belgian Congo, Cameroon). Halfway liberal successes (as, for example, Tunisia) are infinitely rare and fragile.

As to economics, it seems scarcely necessary to discuss these problems. All the traditional economic structures of production and distribution in Africa and Asia are exploding in the presence of the new technical means. Up to the time of Western intervention, life on the Asiatic continent was highly stable; populations and environments were in equilibrium. Of course, things were far from being perfect; undernourishment, for example, was always a danger. But certain civilizations were harmonious enough; some of them

endured much longer than our own. Everyone, I believe, agrees that the tribulations of modern Asia stem in part from the complexity that the West has imposed on it, the complexity and density of structure provoked by the indispensable application of techniques.

In all areas, then, technique is producing the rapid collapse of all other civilizations. When we speak of the collapse of these civilizations, we are speaking only of sociological forms. Even the weakest civilizations preserve certain values which, in Roger Bastide's words, permit them to "maintain a mental equilibrium which cultural shock might shatter. . . . The social situation allows the old complexes to remain alive which, not being fulfilled any longer through ancestral customs, create for themselves new defense mechanisms." But it is very probable that this situation is only temporary; even these psychological reserves will be attacked and absorbed by technique when the so-called human techniques (those which have man for their object) are applied to them.

Obviously, the effect of technique on these groups will not be the same everywhere. Detailed sociological studies have been made of the various phenomena of assimilation, regrouping, functioning, and marasmus or progressive dissolution. According to these studies, there has not been comparable and identical progression in every case. However, behind this diversity is to be noted an absolute incompatibility between the technical type of civilization and all the others. Technicians have not willed this outcome; no one seeks consciously to destroy a civilization. This is simply the proverbial collision between the earthenware pot and the iron pot. What happens, happens, despite the best possible intentions of the iron pot.

It might be said: "This is not necessary. Why should the simple fact of bringing more well-being to India ruin the Hindu civilization?" I do not know if it is necessary, but nevertheless it is so. A civilization which is collapsing cannot be re-created abstractly. It is too late to turn back and enable these worlds to live. What has been given them is not simply well-being. This well-being presupposes a transformation of all of life: work where there had been only laziness; machines and their accessories, organs of co-ordination and rational administration, and internal adherence to the regime.

Technique cannot be otherwise than totalitarian. It can be truly efficient and scientific only if it absorbs an enormous number of phenomena and brings into play the maximum of data. In order to co-ordinate and exploit synthetically, technique must be brought to bear on the great masses in every area. But the existence of technique in every area leads to monopoly. This is noted by Jacques Driencourt when he declares that the technique of propaganda is totalitarian by its very nature. It is totalitarian in message, methods, field of action, and means. What more could be required?

One could require more. Totalitarianism extends to whatever touches it, even things which seem, at first sight, very remote from it. When technique has fastened upon a method, everything must be subordinated to it. There are no longer any neutral objects or situations. Claude Munson forcefully demonstrates that psychological technique, as it operates in the army or in a great industrial plant, entails a direct action on the family. It involves psychological adaptation of family life to military or industrial methods, supervision of family life, and training family life for military or industrial service. Technique can leave nothing untouched in a civilization. Everything is its concern.

It will be objected: "If these transformations do take place, technique alone is not responsible. Many other factors have contributed; for example, the intellectual superiority of the white race, the corruption of these other civilizations, and the population growth." In fact, all these factors refer back to the problems of techniques. Indeed, Western intellectual superiority is only manifested in the technical domain. And the alleged corruption of the Chinese and Islamic civilizations depends solely on the criteria by which they are judged. In making the objection, we are in effect judging solely on the basis of technical criteria.

Again, it will be objected: "Granting all this, is it not the case that coexistence, and even synthesis, has been possible between these two kinds of life? After all, when the Barbarians invaded the Roman Empire, a successful synthesis eventually took place." But the historical situation was clearly not the same then as it is today. In fact, it was the Roman civilization which, being technical, endured. The civilizations threatened today by our own can offer no effective resistance because they are nontechnical.

The decisive factor which leads me to reject the three objections

just stated is that our technique, which is destroying all other civilizations, is more than a simple mechanism: it is a whole civilization in itself.

We have analyzed the combination of circumstances that favored technical development in the West and guaranteed its easy diffusion. Since technique has engulfed civilization, a very remarkable effect has been observed—in fact, a complete reversal. When technique penetrates a new milieu, it tends to reproduce in this milieu the circumstances which, in a fortuitous way, it found favorable to itself in the nineteenth century in France and England. At least, it reproduces those features which it is possible and necessary to reproduce. It is of small importance for technique to hit upon a long cultural experience or a favorable demographic situation. On the contrary, social plasticity and a clear technical consciousness are the general terms which it forcibly imposes in every area of the world. It dissociates the sociological forms, destroys the moral framework, desacralizes men and things, explodes social and religious taboos, and reduces the body social to a collection of individuals. The most recent sociological studies (even those made by optimists) hold that technique is the destroyer of social groups, of communities (whatever their kind), and of human relations. Technical progress causes the disappearance, as Jerome Scott and R. P. Lynton put it, of that "amalgam of attitudes, customs and social institutions which constitute a community." Communities break up into their component parts. But no new communities form. The individual in contact with technique loses his social and community sense as the frameworks in which he operated disintegrate under the influence of techniques. This fact is established beyond question by the disappearance of responsibilities, functional autonomies, and social spontaneities, the absence of contact between the technical and the human environment, and so forth. In the area of industrial labor, for example, sociologists point out the physical separation between the industrial plant and the social group in which the plant is situated (the city, say). In traditional societies, the social and the economic aspects of life were inextricably meshed into a social whole. But in a technical society the two aspects are strictly separated; this in itself brings about the dissolution of the entire group. Related activities such as production and social relations cannot be separated without ruining

the whole society. However, to the degree that production is technique and social relations is not, the two are of necessity dissociated. This is the conclusion reached by innumerable detailed studies of social groups at the point at which technique begins to function. The conclusion is equally true of the industrialized milieus of Europe, America, Asia, and Africa. The situation cannot be otherwise. The technicians themselves are very clear on this point. For example, an official report of 1958 on the perspectives of economic development in Algeria indicated that this development can only be brought about by changing the Algerians' whole way of life, in particular, by putting the still seminomad masses to work. Development involves economic planning, displacement of populations, mobilization of the local economy, acceptance of authoritarian political power, modification of local moral habits and traditional mentalities; in short, a New Deal of the Emotions! These are the conditions proposed and (and considered normal) for technical progress in the "Third World."[4] Technique makes its sociological compost pile where it does not find one already made. And it possesses sufficient power and efficiency today to succeed. Before long, it will produce everywhere that clear technical consciousness which is the easiest of its creations to bring about, and which man falls in with so willingly. The world that technique creates cannot be any other than that which was favorable to it from the very beginning. In spite of all the men of good will, all the optimists, all the doers of history, the civilizations of the world are being ringed about with a band of steel. We in the West became familiar with this iron constraint in the nineteenth century. Now technique is mechanically reproducing it everywhere as necessary to its existence. What force could prevent technique from so acting, or make it be otherwise than it is?

Technique has progressively mastered *all* the elements of civilization. We have already pointed this out with regard to man's economic and intellectual activities. But man himself is overpowered by technique and becomes its object. The technique which takes man for its object thus becomes the center of society; this extraordinary event (which seems to surprise no one) is often designated as *technical civilization*. The terminology is exact and we must fully

[4] Sauvy, Balandier, et al.: *Le Tiers Monde.*

grasp its importance. *Technical civilization* means that our civilization is constructed *by* technique (makes a part of civilization only what belongs to technique), *for* technique (in that everything in this civilization must serve a technical end), and *is* exclusively technique (in that it excludes whatever is not technique or reduces it to technical form).

We can see that this is actually the case in certain phenomena considered essential to a civilization, for example, art and literature. These activities in modern society are tightly subordinated in different ways to technical necessities by the direct interference of technique. Take, for example, the motion pictures, radio, and television. These media require great capital investments. As a result, artistic expression is subordinated to a censorship of money or of the state. This censorship most often takes the form of indirect influences, which, again, may assume different guises. Personal music is supplanted by the radio; and painting, threatened by photography, is obliged to modify itself by becoming abstract so as not to be a mere substitute for reproduction. Modern art and literature manifest in all points their subordination to the technique which has extended its power over all activity, and hence over all culture.

Herein lies the inversion we are witnessing. Without exception in the course of history, *technique belonged to a civilization* and was merely a single element among a host of nontechnical activities. Today *technique has taken over the whole of civilization.* Certainly, technique is no longer the simple machine substitute for human labor. It has come to be the "intervention into the very substance not only of the inorganic but also of the organic."

This intervention into the inorganic world is represented, for example, by the exploration of the atom and its use for purposes as yet unknown. But the world which is most clearly taking on a technical form is the organic. In this realm the necessity of production penetrates to the very sources of life. It controls procreation, influences growth, and alters the individual and the species. Death, procreation, birth, habitat; all must submit to technical efficiency and systematization, the end point of the industrial assembly line. What seems to be most personal in the life of man is now technicized. The manner in which he rests and relaxes becomes the object of techniques of relaxation. The way in which he makes a decision is no longer the domain of the personal and voluntary; it has

become the object of the techniques of "operations research." As Giedion says, all this represents experimentation at the very roots of being.

How is it possible, then, not to believe that all of civilization is affected and engulfed when the very substance of man is questioned? The essence of civilization is thus absorbed.

Concerning art, Giedion goes on to say: "What happened to art in this period gives us the most intimate vision possible of the penetration in depth of the human being by mechanization. Barr's revealing selections in his *Cubism and Abstract Art* show us how the artist, who reacts like a seismograph, expresses the influence of full mechanization . . . Mechanization has penetrated into the subconscious of the artist. Chirico expresses it in a remarkable way in the mixture he makes of man and machine . . . The anxiety, the solitude of man forms a melancholy architecture of the preceding epoch and its mechanical dolls, painted in the smallest details with a tragic expression."

We have the large-scale frescoes of Léger which construct the image of cities out of signs, traffic signals, and machine parts. Even the Russians and Hungarians, who in 1920 were far from mechanization, were inspired by his creative power. In the hands of Duchanu and others, the machine, marvel of efficiency, was transformed into an irrational object, charged with irony. At the same time, a new aesthetic language was introduced.

To free themselves from a corrupt art and the prevailing taste, artists have recourse to objects such as machines and mechanisms because these objects contain an objective truth. What is true of the plastic arts is likewise true of music. Preoccupation with "objectivity" is prevalent there, too. Igor Stravinsky writes: "My work is architectonic and not anecdotal; objective construction and not descriptive." These are the words of a man unconsciously steeped in the technical milieu. Since Stravinsky wrote this, music has been still further transformed by means of techniques which were not originally musical techniques, that is, neither musical methodology nor instrument construction. I have in mind Schaeffer's "concrete music," Ussachewsky's "music for tape," and Eimert's electronic music, all of which make use of technical means that are not a priori musical. In none of these types of music is there any longer the need for a performer. The ancestral musical structures disin-

tegrate and are atomized and we have a phenomenon that is fundamentally new. We shall doubtless see ever more refined and exacting research into musical technique, and the dominant musical structure and rhythm will undoubtedly correspond entirely to the technical environment.

The external structures imposed by technique can no longer, by themselves, modify the components of a society; here the internal influence of technique on the human being becomes decisive. Henceforth, every component of civilization is subject to the law that technique is itself civilization. Civilization no longer exists of itself. Every activity—intellectual, artistic, moral—is only a part of technique. This fact is so enormous and unpredictable that we are simply unable to foresee its consequences. Most of us, blinded by traditional and well-established situations, are unable to grasp its meaning. Henceforth, there will be no conflict between contending forces among which technique is only one. The victory of technique has already been secured. It is too late to set limits to it or to put it in doubt. The fatal flaw in all systems designed to counterbalance the power of technique is that they come too late.

Under these circumstances, it is understandable that technique, in all the lands it has penetrated, has exploded the local, national cultures. Two cultures, of which technique is one, cannot coexist. This does not mean, of course, that uniformity prevails. There are still great differences from region to region. But for the most part these differences are due to the fact that the vestiges of a civilization take a long time to disappear completely. Technique has already gained its victory over Buddhism. It is clear, however, that it will take two or three generations to modify the mode of life and thought engendered by Buddhism. A certain diversity will persist while this mode of life is weakening. Technique does not lead to general uniformity. In fact, it creates a certain diversity. Its objectives are always the same, and so is its influence on man. But though it is axiomatic that the one best way will prevail, this one best way will vary with climate, country, and population. The more technique is refined, the more it varies its means of action. Therefore, we shall continue to have the appearance of different civilizations in India and in Greenland. They will indeed be different in certain aspects. But their essence will be identical; they will be techniques. And what differences there are will result from the cold

calculation of some technician, instead of being the result of the profound spiritual and material effort of generations of human beings. Instead of being the expression of man's essence, they will be the accidents of what is essential: technique.

The differences which exist today are therefore without importance in relation to the fact of technical identity. The differences to come will bear upon the most diverse activities and give the illusion of liberty. But they will nevertheless be no more than the expression of the monism of technique. Geographically and qualitatively, technique is universal in its manifestations. It is devoted, by nature and necessity, to the universal. It could not be otherwise. It depends upon a science itself devoted to the universal, and it is becoming the universal language understood by all men. We need not belabor the fact, which everyone recognizes, that science is universal. And this fact in turn leads of necessity to the technical universalism which stems from it.

The second of the two elements we referred to (production and social relations) requires more explication. In his relation to the world, man has always made use of multiple means, none of which were universal because none were objective. Technique is a means of apprehending reality, of acting on the world, which allows us to neglect all individual differences, all subjectivity. Technique alone is rigorously objective. It blots out all personal opinions. It effaces all individual, and even all collective, modes of expression. Today man lives by virtue of his participation in a truth become objective. Technique is no more than a neutral bridge between reality and the abstract man.

Technique, moreover, creates a bond between men. All those who follow the same technique are bound together in a tacit fraternity and all of them take the same attitude toward reality. There is no need for them to converse together or to understand one another. A team of surgeons and assistants who know the technique of a given operation have no need to address one another in order that the necessary motions be correctly performed at the right moment.

Industrial labor likewise tends more and more to dispense with orders and personal contact. This was pushed to an extreme in the concentration camps, where men of different nations were mixed together so that they should have no contacts and yet be able to

perform collective work. It was hasty and superficial work, to be sure, but a little more rigor could easily make this labor really productive (as seems to be the case in the Soviet Union). One cannot speak merely of isolation. These men work in teams, but there is no need for them to know or understand one another. They need only understand the technique involved and know in advance what their teammate will do. It is not necessary for the crew to understand one another in order to run an aircraft. The indicator panel controls the actions to be performed; and every crew member, submitting by necessity and conscience to the automatic indications, obeys for the safety of all. Each man's actions are dictated by the conditions of life and its preservation. This is clear in the case of flying an aircraft. But it is equally clear in every other situation involving technique—and this encompasses the most important areas of life. Men do not need to understand each other in order to carry out the most important endeavors of our times.

Technique is of necessity, and as compensation, our universal language. It is the fruit of specialization. But this very specialization prevents mutual understanding. Everyone today has his own professional jargon, modes of thought, and peculiar perception of the world. There was a time when the distortion of overspecialization was the butt of jokes and a subject for vaudeville. Today the sharp knife of specialization has passed like a razor into the living flesh. It has cut the umbilical cord which linked men with each other and with nature. The man of today is no longer able to understand his neighbor because his profession is his whole life, and the technical specialization of this life has forced him to live in a closed universe. He no longer understands the vocabulary of the others. Nor does he comprehend the underlying motivations of the others. Yet technique, having ruptured the relations between man and man, proceeds to rebuild the bridge which links them. It bridges the specializations because it produces a new type of man always and everywhere like his duplicate, who develops along technical lines. He listens to himself and speaks to himself, but he obeys the slightest indications of the apparatus, confident that his neighbor will do the same. Technique has become the bond between men. By its agency they communicate, whatever their languages, beliefs, or race. It has become, for life or death, the universal language which compensates for all the deficiencies and separations it has itself produced. This is the major reason for the great impetus of technique toward the universal.

The Autonomy of Technique. The primary aspect of autonomy is perfectly expressed by Frederick Winslow Taylor, a leading technician. He takes, as his point of departure, the view that the industrial plant is a whole in itself, a "closed organism," an end in itself. Giedion adds: "What is fabricated in this plant and what is the goal of its labor—these are questions outside its design." The complete separation of the goal from the mechanism, the limitation of the problem to the means, and the refusal to interfere in any way with efficiency; all this is clearly expressed by Taylor and lies at the basis of technical autonomy.

Autonomy is the essential condition for the development of technique, as Ernst Kohn-Bramstedt's study of the police clearly indicates. The police must be independent if they are to become efficient. They must form a closed, autonomous organization in order to operate by the most direct and efficient means and not be shackled by subsidiary considerations. And in this autonomy, they must be self-confident in respect to the law. It matters little whether police action is legal, if it is efficient. The rules obeyed by a technical organization are no longer rules of justice or injustice. They are "laws" in a purely technical sense. As far as the police are concerned, the highest stage is reached when the legislature legalizes their independence of the legislature itself and recognizes the primacy of technical laws. This is the opinion of Best, a leading German specialist in police matters.

The autonomy of technique must be examined in different perspectives on the basis of the different spheres in relation to which it has this characteristic. First, technique is autonomous with respect to economics and politics. We have already seen that, at the present, neither economic nor political evolution conditions technical progress. Its progress is likewise independent of the social situation. The converse is actually the case, a point I shall develop at length. Technique elicits and conditions social, political, and economic change. It is the prime mover of all the rest, in spite of any appearance to the contrary and in spite of human pride, which pretends that man's philosophical theories are still determining influences and man's political regimes decisive factors in technical evolution. External necessities no longer determine technique.

Technique's own internal necessities are determinative. Technique has become a reality in itself, self-sufficient, with its special laws and its own determinations.

Let us not deceive ourselves on this point. Suppose that the state, for example, intervenes in a technical domain. Either it intervenes for sentimental, theoretical, or intellectual reasons, and the effect of its intervention will be negative or nil; or it intervenes for reasons of political technique, and we have the combined effect of two techniques. There is no other possiblity. The historical experience of the last years shows this fully.

To go one step further, technical autonomy is apparent in respect to morality and spiritual values. Technique tolerates no judgment from without and accepts no limitation. It is by virtue of technique rather than science that the great principle has become established: *chacun chez soi*. Morality judges moral problems; as far as technical problems are concerned, it has nothing to say. Only technical criteria are relevant. Technique, in sitting in judgment on itself, is clearly freed from this principal obstacle to human action. (Whether the obstacle is valid is not the question here. For the moment we merely record that it is an obstacle.) Thus, technique theoretically and systematically assures to itself that liberty which it has been able to win practically. Since it has put itself beyond good and evil, it need fear no limitation whatever. It was long claimed that technique was neutral. Today this is no longer a useful distinction. The power and autonomy of technique are so well secured that it, in its turn, has become the judge of what is moral, the creator of a new morality. Thus, it plays the role of creator of a new civilization as well. This morality—internal to technique—is assured of not having to suffer from technique. In any case, in respect to traditional morality, technique affirms itself as an independent power. Man alone is subject, it would seem, to moral judgment. We no longer live in that primitive epoch in which things were good or bad in themselves. Technique in itself is neither, and can therefore do what it will. It is truly autonomous.

However, technique cannot assert its autonomy in respect to physical or biological laws. Instead, it puts them to work; it seeks to dominate them.

Giedion, in his probing study of mechanization and the manufacture of bread, shows that "wherever mechanization encounters

a living substance, bacterial or animal, the organic substance determines the laws." For this reason, the mechanization of bakeries was a failure. More subdivisions, intervals, and precautions of various kinds were required in the mechanized bakery than in the nonmechanized bakery. The size of the machines did not save time; it merely gave work to larger numbers of people. Giedion shows how the attempt was made to change the nature of the bread in order to adapt it to mechanical manipulations. In the last resort, the ultimate success of mechanization turned on the transformation of human taste. Whenever technique collides with a natural obstacle, it tends to get around it either by replacing the living organism by a machine, or by modifying the organism so that it no longer presents any specifically organic reaction.

The same phenomenon is evident in yet another area in which technical autonomy asserts itself: the relations between techniques and man. We have already seen, in connection with technical self-augmentation, that technique pursues its own course more and more independently of man. This means that man participates less and less actively in technical creation, which, by the automatic combination of prior elements, becomes a kind of fate. Man is reduced to the level of a catalyst. Better still, he resembles a slug inserted into a slot machine: he starts the operation without participating in it.

But this autonomy with respect to man goes much further. To the degree that technique must attain its result with mathematical precision, it has for its object the elimination of all human variability and elasticity. It is a commonplace to say that the machine replaces the human being. But it replaces him to a greater degree than has been believed.

Industrial technique will soon succeed in completely replacing the effort of the worker, and it would do so even sooner if capitalism were not an obstacle. The worker, no longer needed to guide or move the machine to action, will be required merely to watch it and to repair it when it breaks down. He will not participate in the work any more than a boxer's manager participates in a prize fight. This is no dream. The automated factory has already been realized for a great number of operations, and it is realizable for a far greater number. Examples multiply from day to day in all areas. Man indicates how this automation and its attendant exclusion of men op-

erates in business offices; for example, in the case of the so-called tabulating machine. The machine itself interprets the data, the elementary bits of information fed into it. It arranges them in texts and distinct numbers. It adds them together and classifies the results in groups and subgroups, and so on. We have here an administrative circuit accomplished by a single, self-controlled machine. It is scarcely necessary to dwell on the astounding growth of automation in the last ten years. The multiple applications of the automatic assembly line, of automatic control of production operations (so-called cybernetics) are well known. Another case in point is the automatic pilot. Until recently the automatic pilot was used only in rectilinear flight; the finer operations were carried out by the living pilot. As early as 1952 the automatic pilot effected the operations of take-off and landing for certain supersonic aircraft. The same kind of feat is performed by automatic direction finders in anti-aircraft defense. Man's role is limited to inspection. This automation results from the development servomechanisms which act as substitutes for human beings in more and more subtle operations by virtue of their "feedback" capacity.

This progressive elimination of man from the circuit must inexorably continue. Is the elimination of man so unavoidably necessary? Certainly! Freeing man from toil is in itself an ideal. Beyond this, every intervention of man, however educated or used to machinery he may be, is a source of error and unpredictability. The combination of man and technique is a happy one only if man has no responsibility. Otherwise, he is ceaselessly tempted to make unpredictable choices and is susceptible to emotional motivations which invalidate the mathematical precision of the machinery. He is also susceptible to fatigue and discouragement. All this disturbs the forward thrust of technique.

Man must have nothing decisive to perform in the course of technical operations; after all, he is the source of error. Political technique is still troubled by certain unpredictable phenomena, in spite of all the precision of the apparatus and the skill of those involved. (But this technique is still in its childhood.) In human reactions, howsoever well calculated they may be, a "coefficient of elasticity" causes imprecision, and imprecision is intolerable to technique. As far as possible, this source of error must be eliminated. Eliminate the individual, and excellent results ensue. Any

technical man who is aware of this fact is forced to support the opinions voiced by Robert Jungk, which can be summed up thus: "The individual is a brake on progress." Or: "Considered from the modern technical point of view, man is a useless appendage." For instance, ten per cent of all telephone calls are wrong numbers, due to human error. An excellent use by man of so perfect an apparatus!

Now that statistical operations are carried out by perforated-card machines instead of human beings, they have become exact. Machines no longer perform merely gross operations. They perform a whole complex of subtle ones as well. And before long—what with the electronic brain—they will attain an intellectual power of which man is incapable.

Thus, the "great changing of the guard" is occurring much more extensively than Jacques Duboin envisaged some decades ago. Gaston Bouthoul, a leading sociologist of the phenomena of war, concludes that war breaks out in a social group when there is a "plethora of young men surpassing the indispensable tasks of the economy." When for one reason or another these men are not employed, they become ready for war. It is the multiplication of men who are excluded from working which provokes war. We ought at least to bear this in mind when we boast of the continual decrease in human participation in technical operations.

However, there are spheres in which it is impossible to eliminate human influence. The autonomy of technique then develops in another direction. Technique is not, for example, autonomous in respect to clock time. Machines, like abstract technical laws, are subject to the law of speed, and co-ordination presupposes time adjustment. In his description of the assembly line, Giedion writes: "Extremely precise time tables guide the automatic cooperation of the instruments, which, like the atoms in a planetary system, consist of separate units but gravitate with respect to each other in obedience to their inherent laws." This image shows in a remarkable way how technique became simultaneously independent of man and obedient to the chronometer. Technique obeys its own specific laws, as every machine obeys laws. Each element of the technical complex follows certain laws determined by its relations with the other elements, and these laws are internal to the system and in no way influenced by external factors. It is not a question of causing the human being to disappear, but of making him capitulate, of in-

ducing him to accommodate himself to techniques and not to experience personal feelings and reactions.

No technique is possible when men are free. When technique enters into the realm of social life, it collides ceaselessly with the human being to the degree that the combination of man and technique is unavoidable, and that technical action necessarily results in a determined result. Technique requires predictability and, no less, exactness of prediction. It is necessary, then, that technique prevail over the human being. For technique, this is a matter of life or death. Technique must reduce man to a technical animal, the king of the slaves of technique. Human caprice crumbles before this necessity; there can be no human autonomy in the face of technical autonomy. The individual must be fashioned by techniques, either negatively (by the techniques of understanding man) or positively (by the adaptation of man to the technical framework), in order to wipe out the blots his personal determination introduces into the perfect design of the organization.

But it is requisite that man have certain precise inner characteristics. An extreme example is the atomic worker or the jet pilot. He must be of calm temperament, and even temper, he must be phlegmatic, he must not have too much initiative, and he must be devoid of egotism. The ideal jet pilot is already along in years (perhaps thirty-five) and has a settled direction in life. He flies his jet in the way a good civil servant goes to his office. Human joys and sorrows are fetters on technical aptitude. Jungk cites the case of a test pilot who had to abandon his profession because "his wife behaved in such a way as to lessen his capacity to fly. Every day, when he returned home, he found her shedding tears of joy. Having become in this way accident conscious, he dreaded catastrophe when he had to face a delicate situation." The individual who is a servant of technique must be completely unconscious of himself. Without this quality, his reflexes and his inclinations are not properly adapted to technique.

Moreover, the physiological condition of the individual must answer to technical demands. Jungk gives an impressive picture of the experiments in training and control that jet pilots have to undergo. The pilot is whilred on centrifuges until he "blacks out" (in order to measure his toleration of acceleration). There are catapults, ultrasonic chambers, etc., in which the candidate is forced

to undergo unheard-of tortures in order to determine whether he has adequate resistance and whether he is capable of piloting the new machines. That the human organism is, technically speaking, an imperfect one is demonstrated by the experiments. The sufferings the individual endures in these "laboratories" are considered to be due to "biological weaknesses," which must be eliminated. New experiments have pushed even further to determine the reactions of "space pilots" and to prepare these heroes for their roles of tomorrow. This has given birth to new sciences, biometry for example; their one aim is to create the new man, the man adapted to technical functions.

It will be objected that these examples are extreme. This is certainly the case, but to a greater or lesser degree the same problem exists everywhere. And the more technique evolves, the more extreme its character becomes. The object of all the modern "human sciences" (which I will examine later on) is to find answers to these problems.

The enormous effort required to put this technical civilization into motion supposes that all individual effort is directed toward this goal alone and that all social forces are mobilized to attain the mathematically perfect structure of the edifice. ("Mathematically" does not mean "rigidly." The perfect technique is the most adaptable and, consequently, the most plastic one. True technique will know how to maintain the illusion of liberty, choice, and individuality; but these will have been carefully calculated so that they will be integrated into the mathematical reality merely as appearances!) Henceforth it will be wrong for a man to escape this universal effort. It will be inadmissible for any part of the individual not to be integrated in the drive toward technicization; it will be inadmissible that any man even aspire to escape this necessity of the whole society. The individual will no longer be able, materially or spiritually, to disengage himself from society. Materially, he will not be able to release himself because the technical means are so numerous that they invade his whole life and make it impossible for him to escape the collective phenomena. There is no longer an uninhabited place, or any other geographical locale, for the would-be solitary. It is no longer possible to refuse entrance into a community to a highway, a high-tension line, or a dam. It is vain to aspire to live alone when one is obliged to participate in all col-

lective phenomena and to use all the collective's tools, without which it is impossible to earn a bare subsistence. Nothing is gratis any longer in our society; and to live on charity is less and less possible. "Social advantages" are for the workers alone, not for "useless mouths." The solitary is a useless mouth and will have no ration card—up to the day he is transported to a penal colony. (An attempt was made to institute this procedure during the French Revolution, with deportations to Cayenne.)

Spiritually, it will be impossible for the individual to disassociate himself from society. This is due not to the existence of spiritual techniques which have increasing force in our society, but rather to our situation. We are constrained to be "engaged," as the existentialists say, with technique. Positively or negatively, our spiritual attitude is constantly urged, if not determined, by this situation. Only bestiality, because it is unconscious, would seem to escape this situation, and it is itself only a product of the machine.

Every conscious being today is walking the narrow ridge of a decision with regard to technique. He who maintains that he can escape it is either a hypocrite or unconscious. The autonomy of technique forbids the man of today to choose his destiny. Doubtless, someone will ask if it has not always been the case that social conditions, environment, manorial oppression, and the family conditioned man's fate. The answer is, of course, yes. But there is no common denominator between the suppression of ration cards in an authoritarian state and the family pressure of two centuries ago. In the past, when an individual entered into conflict with society, he led a harsh and miserable life that required a vigor which either hardened or broke him. Today the concentration camp and death await him; technique cannot tolerate aberrant activities.

Because of the autonomy of technique, modern man cannot choose his means any more than his ends. In spite of variability and flexibility according to place and circumstance (which are characteristic of technique) there is still only a single employable technique in the given place and time in which an individual is situated. We have already examined the reasons for this.

At this point, we must consider the major consequences of the autonomy of technique. This will bring us to the climax of this analysis.

Technical autonomy explains the "specific weight" with which

technique is endowed. It is not a kind of neutral matter, with no direction, quality, or structure. It is a power endowed with its own peculiar force. It refracts in its own specific sense the wills which make use of it and the ends porposed for it. Indeed, independently of the objectives that man pretends to assign to any given technical means, that means always conceals in itself a finality which cannot be evaded. And if there is a competition between this intrinsic finality and an extrinsic end proposed by man, it is always the intrinsic finality which carries the day. If the technique in question is not exactly adapted to a proposed human end, and if an individual pretends that he is adapting the technique to this end, it is generally quickly evident that it is the end which is being modified, not the technique. Of course, this statement must be qualified by what has already been said concerning the endless refinement of techniques and their adaptation. But this adaptation is effected with reference to the techniques concerned and to the conditions of their applicability. It does not depend on external ends. Perrot has demonstrated this in the case of judicial techniques, and Giedion in the case of mechanical techniques. Concerning the over-all problem of the relation between the ends and the means, I take the liberty of referring to my own work, *Présence au monde moderne.*

Once again we are faced with a choice of "all or nothing." If we make use of technique, we must accept the specificity and autonomy of its ends, and the totality of its rules. Our own desires and aspirations can change nothing.

The second consequence of technical autonomy is that it renders technique at once sacrilegious and sacred. (*Sacrilegious* is not used here in the theological but in the sociological sense.) Sociologists have recognized that the world in which man lives is for him not only a material but also a spiritual world; that forces act in it which are unknown and perhaps unknowable; that there are phenomena in it which man interprets as magical; that there are relations and correspondences between things and beings in which material connections are of little consequence. This whole area is mysterious. Mystery (but not in the Catholic sense) is an element of man's life. Jung has shown that it is catastrophic to make superficially clear what is hidden in man's innermost depths. Man must make allowance for a background, a great deep above which lie his reason and his clear consciousness. The mystery of man perhaps creates the

mystery of the world he inhabits. Or perhaps this mystery is a reality in itself. There is no way to decide between these two alternatives. But, one way or the other, mystery is a necessity of human life.

Man cannot live without a sense of the secret. The psychoanalysts agree on this point. But the invasion of technique desacralizes the world in which man is called upon to live. For technique nothing is sacred, there is no mystery, no taboo. Autonomy makes this so. Technique does not accept the existence of rules outside itself, or of any norm. Still less will it accept any judgment upon it. As a consequence, no matter where it penetrates, what it does is permitted, lawful, justified.

To a great extent, mystery is desired by man. It is not that he cannot understand, or enter into, or grasp mystery, but that he does not desire to do so. The sacred is what man decides unconsciously to respect. The taboo becomes compelling from a social standpoint, but there is always a factor of adoration and respect which does not derive from compulsion and fear.

Technique worships nothing, respects nothing. It has a single role: to strip off externals, to bring everything to light, and by rational use to transform everything into means. More than science, which limits itself to explaining the "how," technique desacralizes because it demonstrates (by evidence and not by reason, through use and not through books) that mystery does not exist. Science brings to the light of day everything man had believed sacred. Technique takes possession of it and enslaves it. The sacred cannot resist. Science penetrates to the great depths of the sea to photograph the unknown fish of the deep. Technique captures them, hauls them up to see if they are edible—but before they arrive on deck they burst. And why should technique not act thus? It is autonomous and recognizes as barriers only the temporary limits of its action. In its eyes, this terrain, which is for the moment unknown but not mysterious, must be attacked. Far from being restrained by any scruples before the sacred, technique constantly assails it. Everything which is not yet technique becomes so. It is driven onward by itself, by its character of self-augmentation. Technique denies mystery a priori. The mysterious is merely that which has not yet been technicized.

Technique advocates the entire remaking of life and its framework because they have been badly made. Since heredity is full of chance, technique proposes to suppress it so as to engender the kind of men necessary for its ideal of service. The creation of the ideal man will soon be a simple technical operation. It is no longer necessary to rely on the chances of the family or on the personal vigor which is called virtue. Applied biogenetics is an obvious point at which technique desacralizes;[5] but we must not forget psychoanalysis, which holds that dreams, visions, and the psychic life in general are nothing more than objects. Nor must we forget the penetration and exploitation of the earth's secrets. Crash programs, particularly in the United States, are attempting to reconstruct the soil which massive exploitation and the use of chemical fertilizers have impaired. We shall soon discover the functions of chlorophyll and thus entirely transform the conditions of life. Recent investigations in electronic techniques applied to biology have emphasized the importance of DNA and will possibly result in the discovery of the link between the living and the nonliving.

Nothing belongs any longer to the realm of the gods or the supernatural. The individual who lives in the technical milieu knows very well that there is nothing spiritual anywhere. But man cannot live without the sacred. He therefore transfers his sense of the sacred to the very thing which has destroyed its former object: to technique itself. In the world in which we live, technique has become the essential mystery, taking widely diverse forms according to place and race. Those who have preserved some of the notions of magic both admire and fear technique. Radio presents an inexplicable mystery, an obvious and recurrent miracle. It is no less astonishing than the highest manifestations of magic once were, and it is worshipped as an idol would have been worshipped, with the same simplicity and fear.

But custom and the recurrence of the miracle eventually wear out this primitive adoration. It is scarcely found today in European countries; the proletariat, workers and peasants alike, with their motorcycles, radios, and electrical appliances, have an attitude of condescending pride toward the jinn who is their slave. Their ideal is incarnated in certain things which serve them. Yet they retain some feeling of the sacred, in the sense that life is not worth the

[5] See, in this connection, the previous note.

trouble of living unless a man has these jinns in his home. This attitude goes much further in the case of the conscious segment of the proletariat, among whom technique is seen as a whole and not merely in its occasional aspects. For them, technique is the instrument of liberation for the proletariat. All that is needed is for technique to make a little more headway, and they will be freed proportionately from their chains. Stalin pointed to industrialization as the sole condition for the realization of Communism. Every gain made by technique is a gain for the proletariat. This represents indeed a belief in the sacred. Technique is the god which brings salvation. It is good in its essence. Capitalism is an abomination because on occasion it opposes technique. Technique is the hope of the proletarians; they can have faith in it because its miracles are visible and progressive. A great part of their sense of the mysterious remains attached to it. Karl Marx may have been able to explain rationally how technique would free the proletariat, but the proletariat itself is scarcely equal to a full understanding of this "how." It remains mysterious for them. They retain merely the formula of faith. But their faith addresses itself with enthusiasm to the mysterious agent of their liberation.

The nonintellectual classes of the *bourgeoisie* are perhaps less caught up in this worship of technique. But the technicians of the *bourgeoisie* are without doubt the ones most powerfully taken with it. For them, technique *is* sacred, since they have no reason to feel a passion for it. Technical men are always disconcerted when one asks them the motives for their faith. No, they do not expect to be liberated; they expect nothing, yet they sacrifice themselves and devote their lives with frenzy to the development of industrial plants and the organization of banks. The happiness of the human race and suchlike nonsense are the commonplaces they allege. But these are no longer of any service even as justifications, and they certainly have nothing at all to do with man's passion for technique.

The technician uses technique perhaps because it is his profession, but he does so with adoration because for him technique is the locus of the sacred. There is neither reason nor explanation in his attitude. The power of technique, mysterious though scientific, which covers the whole earth with its networks of waves, wires, and paper, is to the technician an abstract idol which gives him a

reason for living and even for joy. One sign, among many, of the feeling of the sacred that man experiences in the face of technique is the care he takes to treat it with familiarity. Laughter and humor are common human reactions in the presence of the sacred. This is true for primitive peoples; and for the same reason the first atomic bomb was called "Gilda," the giant cyclotron of Los Alamos "Clementine," the atomic piles "water pots," and radioactive contamination "scalding." The technicians of Los Alamos have banned the word *atom* from their vocabulary. These things are significant.

In view of the very different forms of technique, there is no question of a technical religion. But there is associated with it the feeling of the sacred, which expresses itself in different ways. The way differs from man to man, but for all men the feeling of the sacred is expressed in this marvelous instrument of the power instinct which is always joined to mystery and magic. The worker brags about his job because it offers him joyous confirmation of his superiority. The young snob speeds along at 100 m.p.h. in his Porsche. The technician contemplates with satisfaction the gradients of his charts, no matter what their reference is. For these men, technique is in every way sacred: it is the common expression of human power without which they would find themselves poor, alone, naked, and stripped of all pretentions. They would no longer be the heroes, geniuses, or archangels which a motor permits them to be at little expense.

What shall we say of the outburst of frenzy when the Sputnik went into orbit? What of the poems of the Soviets, the metaphysical affirmations of the French, the speculations on the conquest of the universe? What of the identification of this artificial satellite with the sun, or of its invention with the creation of the earth? And, on the other side of the Atlantic, what was the real meaning of the excessive consternation of the Americans? All these bore witness to a marked social attitude with regard to a simple technical fact.

Even people put out of work or ruined by technique, even those who criticize or attack it (without daring to go so far as to turn worshippers against them) have the bad conscience of all iconoclasts. They find neither within nor without themselves a compensating force for the one they call into question. They do not even live in despair, which would be a sign of their freedom. This bad

conscience appears to me to be perhaps the most revealing fact about the new sacralization of modern technique.

The characteristics we have examined permit me to assert with confidence that there is no common denominator between the technique of today and that of yesterday. Today we are dealing with an utterly different phenomenon. Those who claim to deduce from man's technical situation in past centuries his situation in this one show that they have grasped nothing of the technical phenomenon. These deductions prove that all their reasonings are without foundation and all their analogies are astigmatic.

The celebrated formula of Alain has been invalidated: "Tools, instruments of necessity, instruments that neither lie nor cheat, tools with which necessity can be subjugated by obeying her, without the help of false laws; tools that make it possible to conquer by obeying." This formula is true of the tool which puts man squarely in contact with a reality that will bear no excuses, in contact with matter to be mastered, and the only way to use it is to obey it. Obedience to the plow and the plane was indeed the only means of dominating earth and wood. But the formula is not true for our techniques. He who serves these techniques enters another realm of necessity. This new necessity is not natural necessity; natural necessity, in fact, no longer exists. It is technique's necessity, which becomes the more constraining the more nature's necessity fades and disappears. It cannot be escaped or mastered. The tool was not false. But technique causes us to penetrate into the innermost realm of falsehood, showing us all the while the noble face of objectivity of result. In this innermost recess, man is no longer able to recognize himself because of the instruments he employs.

The tool enables man to conquer. But, man, dost thou not know there is no more victory which is thy victory? The victory of our days belongs to the tool. The tool alone has the power and carries off the victory. Man bestows on himself the laurel crown, after the example of Napoleon III, who stayed in Paris to plan the strategy of the Crimean War and claimed the bay leaves of the victor.

But this delusion cannot last much longer. The individual obeys and no longer has victory which is his own. He cannot have access even to his apparent triumphs except by becoming himself the object of technique and the offspring of the mating of man and

machine. All his accounts are falsified. Alain's definition no longer corresponds to anything in the modern world. In writing this, I have, of course, omitted innumerable facets of our world. There are still artisans, petty tradesmen, butchers, domestics, and small agricultural landowners. But theirs are the faces of yesterday, the more or less hardy survivals of our past. Our world is not made of these static residues of history, and I have attempted to consider only moving forces. In the complexity of the present world, residues do exist, but they have no future and are consequently disappearing.

Only the things which have a future interest us. But how are we to discern them? By making a comparison of three planes of civilization which coexist today: India, Western Europe, and the United States. And by considering the line of historical progression from one to the other—all of this powerfully reinforced by the evolution of the Soviet Union, which is causing history to boil.

In this chapter we have sketched the psychology of the tyrant. Now we must study his biology: the circulatory apparatus, the state; the digestive apparatus, the economy; the cellular tissue, man.