



MAN THE TECHNICIAN

I FIRST SKIRMISH WITH THE SUBJECT

A SUBJECT to be ardently discussed in the coming years is that of the advantages, the threat, and the limitation of technology. I have always considered it the task of the writer to foresee in leisurely anticipation the problems which will be confronting his readers in days to come, and to provide them in time, i. e., before the discussion opens, with clear ideas about the question, so as to enable them to enter the fray with the serene mind of people who, in principle, see the solution. "*On ne doit écrire que pour faire connaître la vérité,*" said Malebranche, turning his back on literature of fiction. Consciously or not, Western man years ago gave up expecting anything of such writings; he thirsts and hungers for clear and distinct ideas about those things that really matter.

Here, then, we are embarked on the altogether unlit-

erary undertaking of finding an answer to the question: what is technology? The first attack on our problem will still be awkward and at long range.

When winter comes man is cold, and this "being cold" contains two disparate ingredients. One is the fact that he encounters around him the reality called cold, the other that this reality is offensive to him, that it impresses him as negative. What does this negative mean? It is clear. Let us take the extreme case. The cold is such that man feels he is dying, that is, he feels that it is killing him. But man does not want to die; normally he clings to survival. We are so wont to find in ourselves and our fellow men this desire to persist, to affirm ourselves in the face of all negative circumstances, that it costs us a certain effort to realize that there is something strange about it. To ask why a man would rather live than die seems absurd and naïve. Yet it is one of the most justified and sensible questions we can ask. It is customary to answer it by talking of the instinct of self-preservation. Now in the first place, the concept of instinct is in itself highly obscure and not at all illuminating; and secondly, even if it were clear it is well known that in man the instincts are as good as eliminated. Man does not live by his instincts, but governs himself by means of other faculties, such as will and thought, which control his instincts. Proof of this is given by the resolve of those people who

prefer death to life and, for whatever reason, suppress in themselves the presumed instinct of self-preservation.

The explanation through instinct fails. With or without it, the fact remains that man persists in living because he wants to and that for this reason he feels the necessity of avoiding the cold and procuring warmth for himself. The lightning of an autumnal thunderstorm may set the woods on fire, whereupon man will draw near to warm himself at the beneficent glow chance has given him. Thus he meets his necessity by simply availing himself of a fire he has come upon. (I make due apology for uttering so trite a remark; unfortunately, I see no way of being spared, at the outset, this humiliation; but to be caught at platitudes one does not even understand would be the last straw, and not uncommon either.) So that the act of warming himself now is reduced to the performance of an activity with which man finds himself endowed by nature, viz., the capacity of walking and thus approaching the source of heat. In other cases warmth may be supplied not by a fire, but by a cave in a near-by mountain.

Another necessity of man is to feed himself, and this he does by eating fruits gathered from trees and shrubs or edible roots or such animals as fall into his hands. Another necessity is to drink. And so forth.

The satisfaction of these needs imposes a new need: to move about in space, to walk; that is, to reduce dis-

tances. And since it may be necessary to do this as fast as possible, man has to reduce time, to gain time. When attacked by an enemy—a wild beast or another man—he must flee, i. e., cover much ground in the shortest time possible. Proceeding in this way we should, with a little patience, arrive at a definition of the system of necessities under which man finds himself, much in the same way as he finds himself equipped with a certain stock of activities—walking, eating, warming himself—which meet these necessities.

Obvious though all this sounds—I repeat, it makes me blush to propound it—we must dwell upon the meaning the term “necessity” has here. What does it mean that, to be warm, to be fed, to walk, are necessities of man? Undoubtedly this: that they are necessary natural conditions of life. Man is aware of their material or objective “necessariness” and therefore feels them subjectively as necessities. But, be it noted, their necessariness is purely conditional. The stone suspended in the air falls necessarily, with a categorical and unconditional necessity. But man may decide against meeting his need—of food, for instance, as Mahatma Gandhi does from time to time. Feeding, we observe, is not necessary in itself; it is necessary “for” living. It has the same degree of necessity as has living “if” there is to be living. Hence, living is the original necessity of which all others are mere conse-

quences. Now, as I said above, man lives because he wants to. The necessity of living is not imposed on him by force as the incapability of destroying itself is imposed on matter. Life—necessity of necessities—is necessary only in a subjective sense: simply because of man's peremptory resolve to live. Its necessity arises from an act of the will—an act into the meaning and origin of which we shall look no further, taking it as a crude fact to start from. For whatever reasons, man happens to have a keen desire to go on living, to "be in the world," although he is the sole known being endowed with the faculty—such a strange, paradoxical, frightening faculty from the ontological or metaphysical point of view—of annihilating himself and voluntarily renouncing his existence in the world.

So ardent is this desire that, when he is unable to satisfy his vital necessities because nature does not grant him the indispensable means, man will not resign himself. If, for lack of fire or a cave, he is unable to perform the act of warming himself, or for lack of fruits, roots, animals he is unable to eat, man mobilizes a second line of activities. He lights a fire, he builds a house, he tills and hunts. These necessities, it is true, and the activities that satisfy them directly—by using means which if they are there at all are there already—are common to both men and animals. The one thing we cannot be sure of is whether the animal

has the same desire to live as man. This much, however, is certain: the animal, when it cannot satisfy its vital needs—when there is neither fire nor a cave, for example—does nothing about it and lets itself die. Man, on the contrary, comes forward with a new type of activity; he produces what he does not find in nature, whether because it does not exist at all or because it is not to hand when he needs it. Thus he lights a fire, he makes a cave, that is, a house, if these are not available in his setting; he rides a horse or builds an automobile to gain time and space. Be it well noted: making a fire is an act very different from keeping warm; tilling is not feeding; constructing an automobile is not walking. Now it becomes clear why I had to insist on the hackneyed definition of keeping warm, feeding, moving about in space.

Kindling a fire, plowing, manufacturing an automobile are not activities with which we satisfy our necessities; on the contrary, their immediate effect is a suspension of the primary set of actions with which we meet needs directly. The ultimate aim of the secondary set of actions is the same as that of the original set; but—and this is the crucial point—it presupposes a capacity which man has, but which is lacking in animals. This capacity is not so much intelligence—about this point we shall say a word later; it is the possibility of disengaging oneself temporarily from the vital urgencies and remaining free for

activities which in themselves are not satisfaction of needs. The animal is always and inextricably bound up with the former. Its existence is nothing but the whole collection of its elemental, i. e., organic or biological, necessities and the actions which meet them. This is life in the organic or biological sense of the word.

But can we really speak of necessities when referring to a being like this? When we used the concept of necessity with reference to man we understood by it the conditions he finds imposed upon himself "for" living. Hence, they are not his life; or to put it the other way round, his life does not coincide, at least not wholly, with the system of his organic necessities. If it did, he would not feel eating, drinking, keeping warm, etc., as necessities, as inexorable impositions laid upon his authentic being from without, which this being must needs reckon with but which do not constitute his true life. In this subjective sense an animal has no necessities. It may be hungry; but feeling hungry and looking for food cannot appear to it as a necessity imposed upon its authentic being, because there is nothing else for it to do. Man, on the other hand, if he succeeded in being without necessities and consequently without concern about satisfying them, would have enough left to do, a wide scope for living, in fact just those occupations and that kind of life which he regards as most human.

This, unexpectedly, reveals to us the strange constitu-

tion of man. While all other beings coincide with their objective conditions—with their nature or circumstance—man alone is different from, and alien to, his circumstance. Yet if he wants to exist in it, there is no way but to accept the conditions it imposes. Because man is not identical with his circumstance, but only embedded in it, he is able to rid himself of it in certain moments and retire into his inner self. In these intervals of extra- and supernatural existence, in which he withdraws from attending to his natural needs, he invents and carries out the second set of actions. He lights a fire, he builds a house, he cultivates the field, he designs an automobile.

All these actions have one trait in common. They presuppose and include the invention of a procedure which guarantees, within certain limits, that we can obtain at our pleasure and convenience the things we need but do not find in nature. Thereafter it no longer matters whether or not there is fire here and now; we make it, that is to say, we perform a certain set of actions that we invent once and for all. They frequently consist in manufacturing an object which, by simply operating, procures what we need; we call it the tool or implement.

From which follows that these actions modify and reform nature, creating in it objects which had not existed before, either not at all or not where and when they were

needed. Here, then, we have at last the so-called technical acts which are exclusively human. In their entirety these acts constitute technology, which may now be defined as the improvement brought about on nature by man for the satisfaction of his necessities. The necessities, we saw, are imposed on man by nature; man answers by imposing changes on nature. Thus technology is man's reaction upon nature or circumstance. It leads to the construction of a new nature, a supernature interposed between man and original nature. Be it noted therefore: technology is not man's effort to satisfy his natural necessities. This definition would be equivocal, since it would hold likewise for the biological complex of animal actions. Technology is a reform of nature, of that nature which makes us needy and necessitous, a reform in the sense of abolishing necessities as such by guaranteeing their satisfaction under all circumstances. If nature automatically lit a fire for us as soon as we were cold, we should be unaware of the necessity of keeping warm, as we normally are unaware of the necessity of breathing and simply breathe without any problem. In fact, this is what technology does for us. It immediately meets the sensation of cold with heat and thereby rids it of its grim, dismal, negative character.

This, then, is the first clumsy approximation to an

answer for the question: what is technology? From now on things will be more intricate and, accordingly, more amusing.

II BEING AND WELL-BEING—THE “NECESSITY” OF
DRUNKENNESS—THE SUPERFLUOUS IS THE
NECESSARY—RELATIVITY OF TECHNOLOGY

Technology, in contrast to the adaptation of the individual to the medium, is the adaptation of the medium to the individual. This alone should be enough for us to surmise that we might be dealing here with a movement contrary to all biological movements.

To react upon his environment, not to resign himself to the world as it is—that is the token of man. Even when studying him from the zoological point of view we feel assured of his presence as soon as we find nature altered, e. g., when we come upon stones hewn to the shape of implements. Man without technology—that is, without reaction upon his medium—is not man.

Up to this point, we have been regarding technology as a reaction to organic and biological necessities. We insisted on a precise definition of the term “necessity.” Feeding, we said, is a necessity, because it is an indispensable condition of living and man apparently has a keen desire to live. To live, to “be in the world,” we recognized as the necessity of necessities.

But technology is not restricted to the satisfaction of necessities. As old as the invention of tools and procedures for keeping warm, feeding, etc., are many others serving to procure obviously unnecessary objects and situations. As old and as widespread as the act of lighting a fire, for instance, is that of getting drunk. I mean to say the use of substances and procedures which produce a psychophysical state of delightful exaltation or delightful stupor. The drug is as early an invention as any. So much so, in fact, that it is even open to discussion whether fire was invented primarily for the purpose of avoiding the cold—an organic necessity and a *sine qua non* of life—or of getting drunk. We know of primitive tribes who light a fire in a cave which makes them sweat so profusely that, from the combined smoke and excessive heat, they fall into a swoon akin to drunkenness. These are the so-called sweat-houses.

There are endless ways of producing delightful visions or conveying intense bodily pleasures. Notable among the latter is the kat of Yemen and Ethiopia, a substance which affects the prostate and thereby makes walking increasingly gratifying the longer it is done. Among ecstasy-producing drugs we have belladonna, Jimson weed, the Peruvian coca, etc.

Let us mention in this context that ethnologists disagree as to whether the most archaic form of the bow is

that of an instrument for war and the hunt or that of a musical instrument. We need not now decide this question. What interests us is the fact that the musical bow, whether it be the original bow or not, appears among the most primitive instruments.

These facts reveal that primitive man feels pleasurable states of mind to be as necessary as the satisfaction of his minimum needs. Thus it seems that, from the very beginning, the concept of "human necessity" comprises indiscriminately what is objectively necessary and what is objectively superfluous. Were we to decide which of our needs are strictly necessary and which we can go without, we should be in a pretty quandary. It would soon become patent that man has an incredibly elastic attitude towards those necessities which, *a priori*, would seem the most elemental and indispensable, such as food, heat, etc. Not only upon compulsion, but even from sheer zest, he reduces his food to a minimum and trains himself to stand amazingly low temperatures; whereas certain superfluous things he will give up very reluctantly or not at all, in extreme cases preferring to die rather than renounce them.

Whence we draw the conclusion that man's desire to live, to be in the world, is inseparable from his desire to live well. Nay more, he conceives of life not as simply

being, but as well-being; and he regards the objective conditions of being as necessary only because being is the necessary condition of well-being. A man who is absolutely convinced that he cannot obtain, even approximately, what he calls well-being, and will have to put up with bare being, commits suicide. Not being, but well-being, is the fundamental necessity of man, the necessity of necessities.

Herewith we arrive at a concept of "human necessity" thoroughly different from that of our first definition and different also from that which, thanks to insufficient analysis and careless thinking, tends to be generally accepted. Such books on technology as I have read—all of them falling short of their great subject—are unaware that the concept of "human necessity" is fundamental for the understanding of technology. They all, as was to be expected, make use of this concept; but since they do not recognize that the whole problem hinges upon it, they take it as they find it in circulation in everyday thinking.

Let us, before proceeding, state briefly what we have found. Food, heat, etc., we have said, are human necessities because they are objective conditions of life understood as mere existence in the world; they are necessary according as man thinks it necessary to live. And man,

we observe, clings to life. Now we recognize that this statement was equivocal. Man has no desire to "be in the world"; he wants to live well. Man is the animal that considers necessary only the objectively superfluous.

And to know this is essential for our comprehension of technology. Technology is the production of superfluities—today as in the paleolithic age. That is why animals are atechanical; they are content with the simple act of living and with what is objectively required for it. From the point of view of bare living the animal is perfect and needs no technology. Man, technology, well-being are, in the last instance, synonymous. Only when we conceive of them as such are we able to grasp the meaning of technology as an absolute fact in the universe. If technology served but to take care more comfortably of the necessities of animal life, there would be a strange case of duplication. Two sets of acts—the instinctive acts of animals and the technical acts of man—would, despite their dissimilarity, serve the same purpose of sustaining organic life in the world. For, there is no getting around it, the animal fares perfectly well with its system which is by no means basically defective, neither more nor less defective, as a matter of fact, than that of man.

Everything becomes clear, however, when we realize that there are two purposes. One to sustain organic life, mere being in nature, by adapting the individual to the

medium; the other to promote good life, well-being, by adapting the medium to the will of the individual.

Since human necessities are necessary only in connection with well-being, we cannot find out what they are unless we find out what man understands by well-being. And that complicates things immeasurably. For how shall we ever know all that man has understood, understands, and will understand by well-being, the necessity of necessities, the "one thing needful" of which Jesus spoke to Martha—Mary's being the true technology in his judgment.

Take Pompey, to whom what really mattered was not living but sailing the seven seas, once more flying the flag of the seafaring people of Miletus, the country of the *aei-nautei* (the eternal mariners) to whom Thales belonged and who had been the creators of a new bold commerce, a new bold policy, a new bold knowledge, Occidental science. Or take, on the one hand, the fakir, the ascetic, and, on the other, the sensualist, the pleasure lover! Whereas life in the biological sense is a fixed entity defined for each species once and for all, life in the human sense of good life is always mobile and infinitely variable. And with it, because they are a function of it, vary human necessities; and since technology is a system of actions called forth and directed by these necessities, it likewise is of Protean nature and ever changing.

It would be vain to attempt to study technology as though it were an independent entity; it is not directed by a single purpose known to us beforehand. The idea of progress, pernicious in all fields when applied without caution, has been disastrous here also. It assumes that man's vital desires are always the same and that the only thing that varies in the course of time is the progressive advance towards their fulfillment. But this is as wrong as wrong can be. The idea of human life, the profile of well-being, has changed countless times and sometimes so radically that definite technical advances were abandoned and their traces lost. In other cases, and they are almost the most frequent in history, invention and inventor were persecuted as immoral. The fact that we ourselves are urged on by an irresistible hunger for inventions does not justify the inference that it has always been thus. On the contrary, more often than not man has had a mysterious horror of discoveries, as though he felt lurking under their apparent beneficence the threat of a terrible danger. And we, amid all our enthusiasm for technical inventions, are we not beginning to experience something similar? It would be enormously and thrillingly instructive if somebody were to write a history of those technical achievements which, after having been attained and regarded as indelible acquisitions—*ktesis eis aei*—fell into oblivion and were completely lost.

III THE EFFORT TO SAVE EFFORT IS AN EFFORT

—THE PROBLEM OF SAVED EFFORT

—LIFE AS INVENTION

My book *The Revolt of the Masses* was written under the haunting impression—in 1928, be it noted, at the climax of prosperity—that this magnificent and miraculous technology of ours was endangered and might crumble between our fingers and vanish faster than anybody imagined. Today I am more than ever frightened. I wish it would dawn upon engineers that, in order to be an engineer, it is not enough to be an engineer. While they are minding their own business history may be pulling away the ground from under their feet.

Alertness is what we require. We are not allowed to confine ourselves within our own professions, but must live in full view of the entire scene of life, which is always total. The supreme art of living is a consummation gained by no single calling and no single science; it is the yield of all occupations and all sciences, and many things besides. It is an all-heeding circumspection. Human life and everything in it is a constant and absolute risk. The deadly blow may come from where it was least to be expected. A whole culture may run dry through an imperceptible leak. Even if the engineer puts aside forebodings, which after all are mere possibilities, what was his situation

yesterday and what can he expect of tomorrow? This much is clear: the social, economic, and political conditions under which he works are changing rapidly.

Therefore we had better give up regarding technology as the one positive thing, the only immutable reality in the hands of man. Supposing the kind of well-being we seek today changed its character perceptibly, supposing the idea of life, which is the inspiring and directing force of all our actions, underwent some sort of mutation, would not our present technology be thrown out of gear and have to take new bearings according to our new desires?

People believe modern technology more firmly established in history than all previous technologies because of its scientific foundation. But this alleged security is illusory and the unquestionable superiority of modern technology as technology even implies an element of weakness. Since it is based on the exactness of science, it is dependent on more presuppositions and conditions and is, consequently, less spontaneous and self-reliant than earlier technologies.

Indeed, it is just this feeling of security which is endangering Western civilization. The belief in progress, the conviction that on this level of history a major setback can no longer happen and the world will mechanically go the full length of prosperity, has loosened the

rivets of human caution and flung open the gates for a new invasion of barbarism.

For an example of the instability and diversity of technology consider that, at the time of Plato, Chinese technology was in many respects considerably superior to that of the Greeks; or that certain works of Egyptian engineers surpass even the miracles wrought by Western civilization—the lake of Moeris, for instance, which is mentioned by Herodotus and the ruins of which, after it had been believed a fable, were recently discovered. Owing to this gigantic power plant certain regions of the Nile valley, which today are desert, were once most fertile country.

It may be true that all technologies have in common a certain body of technical discoveries which has accumulated in spite of considerable losses and reverses. In this case it may be justified to speak of an absolute progress of technology; still, there always remains the danger lest the concept of absolute progress be defined from the standpoint of the person speaking. And this standpoint is, at best, not absolute. While the definer maintains it with blind faith, mankind may be preparing to abandon it.

We shall have a few more words to say about the different types of technology, their vicissitudes, their advantages, and their limitation. For the moment, we must

not lose sight of the general idea of technology, for it encloses the most fascinating secrets.

Technical acts are not those through which we strive directly to satisfy our necessities, whether elemental or frankly superfluous, but those in which we first invent and then carry out a plan of action which permits us to achieve such satisfaction through the least effort possible and to secure completely new possibilities beyond the nature of man, such as sailing, flying, communicating by telephone, etc.

We may regard security as one of man's effort-saving devices. Precaution, anxiety, dread, which rise from insecurity, are forms of effort, an answer, as it were, to nature's imposition upon man.

Technology, then, is the means by which we shun, entirely or in part, the "things to do" which would have kept us busy under natural circumstances. This is generally agreed upon; but, oddly enough, technology has been looked at from one side only, from its obverse, so to speak, which is less interesting, while few people have been aware of the enigma upon its reverse.

Is it not puzzling that man should make an effort to save effort? One may say that technology is a small effort to save a very much larger one and therefore perfectly justified and reasonable. Good; but there is another question. What becomes of the saved energy? Does it just lie

idle? What is man to do after he has eliminated what nature compels him to do? What fills his life? For doing nothing means to empty life, to not-live; it is incompatible with the constitution of man. The question, far from being fantastic, has grown very real during these last years. There are countries where the worker labors eight hours a day for five days a week, and under normal circumstances we might have had by now a four-day week. What is the worker to do with all that empty time on his hands?

The fact that our present technology discloses this problem so very clearly does not mean that it has not been present in all technologies at all times. They all entail a reduction of man's elemental activities and that not incidentally, as a by-product, but because the desire to save effort is the moving power behind them. This is no minor point; it concerns the very essence of technology which we have not understood rightly until we have found out where the free energy goes.

In the midst of our dissertation on technology we come upon the mystery of man's being as upon the core of a fruit. For he is an entity compelled, if he wants to live, to live in nature; he is an animal. Life in the zoological sense consists of such actions as are necessary for existence in nature. But man arranges things so that the claims of this life are reduced to a minimum. In the vacuum arising after he has left behind his animal life he devotes

himself to a series of nonbiological occupations which are not imposed by nature but invented by himself. This invented life—invented as a novel or a play is invented—man calls “human life,” well-being. Human life transcends the reality of nature. It is not given to man as its fall is given to a stone or the stock of its organic acts—eating, flying, nesting—to an animal. He makes it himself, beginning by inventing it. Have we heard right? Is human life in its most human dimension a work of fiction? Is man a sort of novelist of himself who conceives the fanciful figure of a personage with its unreal occupations and then, for the sake of converting it into reality, does all the things he does—and becomes an engineer?

IV EXCURSION TO THE SUBSTRUCTURE OF TECHNOLOGY

The answers which have been given to the question, what is technology, are appallingly superficial; and what is worse, this cannot be blamed on chance. For the same happens to all questions dealing with what is truly human in human beings. There is no way of throwing light upon them until they are tackled in those profound strata from which everything properly human evolves. As long as we continue to speak of the problems that concern man as though we knew what man really is, we shall only succeed in invariably leaving the true issue behind. That is

what happens with technology. We must realize into what fundamental depths our argument will lead us. How does it come to pass that there exists in the universe this strange thing called technology, the absolute cosmic fact of man the technician? If we seriously intend to find an answer, we must be ready to plunge into certain unavoidable profundities.

We shall then come upon the fact that an entity in the universe, man, has no other way of existing than by being in another entity, nature or the world. This relation of being one in the other, man in nature, might take on one of three possible aspects. Nature might offer man nothing but facilities for his existence in it. That would mean that the being of man coincides fully with that of nature or, what is the same, that man is a natural being. That is the case of the stone, the plant, and, probably, the animal. If it were that of man, too, he would be without necessities, he would lack nothing, he would not be needy. His desires and their satisfaction would be one and the same. He would wish for nothing that did not exist in the world and, conversely, whatever he wished for would be there of itself, as in the fairy tale of the magic wand. Such an entity could not experience the world as something alien to himself; for the world would offer him no resistance. He would be in the world as though he were in himself.

Or the opposite might happen. The world might offer to

man nothing but difficulties, i. e., the being of the world and the being of man might be completely antagonistic. In this case the world would be no abode for man; he could not exist in it, not even for the fraction of a second. There would be no human life and, consequently, no technology.

The third possibility is the one that prevails in reality. Living in the world, man finds that the world surrounds him as an intricate net woven of both facilities and difficulties. Indeed, there are not many things in it which, potentially, are not both. The earth supports him, enabling him to lie down when he is tired and to run when he has to flee. A shipwreck will bring home to him the advantage of the firm earth—a thing grown humble from habitude. But the earth also means distance. Much earth may separate him from the spring when he is thirsty. Or the earth may tower above him as a steep slope that is hard to climb. This fundamental phenomenon—perhaps the most fundamental of all—that we are surrounded by both facilities and difficulties gives to the reality called human life its peculiar ontological character.

For if man encountered no facilities it would be impossible for him to be in the world, he would not exist, and there would be no problem. Since he finds facilities to rely on, his existence is possible. But this possibility, since he also finds difficulties, is continually challenged,

disturbed, imperiled. Hence, man's existence is no passive being in the world; it is an unending struggle to accommodate himself in it. The stone is given its existence; it need not fight for being what it is—a stone in the field. Man has to be himself in spite of unfavorable circumstances; that means he has to make his own existence at every single moment. He is given the abstract possibility of existing, but not the reality. This he has to conquer hour after hour. Man must earn his life, not only economically but metaphysically.

And all this for what reason? Obviously—but this is repeating the same thing in other words—because man's being and nature's being do not fully coincide. Because man's being is made of such strange stuff as to be partly akin to nature and partly not, at once natural and extranatural, a kind of ontological centaur, half immersed in nature, half transcending it. Dante would have likened him to a boat drawn up on the beach with one end of its keel in the water and the other in the sand. What is natural in him is realized by itself; it presents no problem. That is precisely why man does not consider it his true being. His extranatural part, on the other hand, is not there from the outset and of itself; it is but an aspiration, a project of life. And this we feel to be our true being; we call it our personality, our self. Our extra- and antinatural portion, however, must not be interpreted in terms of any of the

older spiritual philosophies. I am not interested now in the so-called spirit (*Geist*), a pretty confused idea laden with speculative wizardry.

If the reader reflects a little upon the meaning of the entity he calls his life, he will find that it is the attempt to carry out a definite program or project of existence. And his self—each man's self—is nothing but this devised program. All we do we do in the service of this program. Thus man begins by being something that has no reality, neither corporeal nor spiritual; he is a project as such, something which is not yet but aspires to be. One may object that there can be no program without somebody having it, without an idea, a mind, a soul, or whatever it is called. I cannot discuss this thoroughly because it would mean embarking on a course of philosophy. But I will say this: although the project of being a great financier has to be conceived of in an idea, "being" the project is different from holding the idea. In fact, I find no difficulty in thinking this idea but I am very far from being this project.

Here we come upon the formidable and unparalleled character which makes man unique in the universe. We are dealing—and let the disquieting strangeness of the case be well noted—with an entity whose being consists not in what it is already, but in what it is not yet, a being that consists in not-yet-being. Everything else in the world

is what it is. An entity whose mode of being consists in what it is already, whose potentiality coincides at once with his reality, we call a "thing." Things are given their being ready-made.

In this sense man is not a thing but an aspiration, the aspiration to be this or that. Each epoch, each nation, each individual varies in its own way the general human aspiration.

Now, I hope, all terms of the absolute phenomenon called "my life" will be clearly understood. Existence means, for each of us, the process of realizing, under given conditions, the aspiration we are. We cannot choose the world in which to live. We find ourselves, without our previous consent, embedded in an environment, a here and now. And my environment is made up not only by heaven and earth around me, but by my own body and my own soul. I am not my body; I find myself with it, and with it I must live, be it handsome or ugly, weak or sturdy. Neither am I my soul; I find myself with it and must use it for the purpose of living although it may lack will power or memory and not be of much good. Body and soul are things; but I am a drama, if anything, an unending struggle to be what I have to be. The aspiration or program I am, impresses its peculiar profile on the world about me, and that world reacts to this impress, accepting or resisting it. My aspiration meets with

hindrance or with furtherance in my environment.

At this point one remark must be made which would have been misunderstood before. What we call nature, circumstance, or the world is essentially nothing but a conjunction of favorable and adverse conditions encountered by man in the pursuit of this program. The three names are interpretations of ours; what we first come upon is the experience of being hampered or favored in living. We are wont to conceive of nature and world as existing by themselves, independent of man. The concept "thing" likewise refers to something that has a hard and fast being and has it by itself and apart from man. But I repeat, this is the result of an interpretative reaction of our intellect upon what first confronts us. What first confronts us has no being apart from and independent of us; it consists exclusively in presenting facilities and difficulties, that is to say, in what it is in respect to our aspiration. Only in relation to our vital program is something an obstacle or an aid. And according to the aspiration animating us the facilities and difficulties, making up our pure and fundamental environment, will be such or such, greater or smaller.

This explains why to each epoch and even to each individual the world looks different. To the particular profile of our personal project, circumstance answers with another definite profile of facilities and difficulties. The

world of the businessman obviously is different from the world of the poet. Where one comes to grief, the other thrives; where one rejoices, the other frets. The two worlds, no doubt, have many elements in common, viz., those which correspond to the generic aspiration of man as a species. But the human species is incomparably less stable and more mutable than any animal species. Men have an intractable way of being enormously unequal in spite of all assurances to the contrary.

V LIFE AS AUTOFABRICATION—TECHNOLOGY
AND DESIRES

From this point of view human life, the existence of man, appears essentially problematic. To all other entities of the universe existence presents no problem. For existence means actual realization of an essence. It means, for instance, that "being a bull" actually occurs. A bull, if he exists, exists as a bull. For a man, on the contrary, to exist does not mean to exist at once as the man he is, but merely that there exists a possibility of, and an effort towards, accomplishing this. Who of us is all he should be and all he longs to be? In contrast to the rest of creation, man, in existing, has to make his existence. He has to solve the practical problem of transferring into reality the program that is himself. For this reason "my life" is pure task, a thing inexorably to be made. It is not given

to me as a present; I have to make it. Life gives me much to do; nay, it is nothing save the "to do" it has in store for me. And this "to do" is not a thing, but action in the most active sense of the word.

In the case of other beings the assumption is that somebody or something, already existing, acts; here we are dealing with an entity that has to act in order to be; its being presupposes action. Man, willy-nilly, is self-made, autofabricated. The word is not unfitting. It emphasizes the fact that in the very root of his essence man finds himself called upon to be an engineer. Life means to him at once and primarily the effort to bring into existence what does not exist offhand, to wit: himself. In short, human life "is" production. By this I mean to say that fundamentally life is not, as has been believed for so many centuries, contemplation, thinking, theory, but action. It is fabrication; and it is thinking, theory, science only because these are needed for its autofabrication, hence secondarily, not primarily. To live . . . that is to find means and ways for realizing the program we are.

The world, the environment, presents itself as *materia prima* and possible machine for this purpose. Since man, in order to exist, has to be in the world and the world does not admit forthwith of the full realization of his being, he sets out to search around for the hidden instrument that may serve his ends. The history of human thinking may be

regarded as a long series of observations made to discover what latent possibilities the world offers for the construction of machines. And it is not by chance, as we shall shortly see, that technology properly speaking, technology in the fullness of its maturity, begins around 1600, when man in the course of his theoretical thinking about the world comes to regard it as a machine. Modern technology is linked with the work of Galileo, Descartes, Huygens, i. e., with the mechanical interpretation of the universe. Before that, the corporeal world had been generally believed to be an a-mechanical entity, the ultimate essence of which was constituted by spiritual powers of more or less arbitrary and uncontrollable nature; whereas the world as pure mechanism is the machine of machines.

It is, therefore, a fundamental error to believe that man is an animal endowed with a talent for technology, in other words, that an animal might be transmuted into a man by magically grafting on it the technical gift. The opposite holds: because man has to accomplish a task fundamentally different from that of the animal, an extra-natural task, he cannot spend his energies in satisfying his elemental needs, but must stint them in this realm so as to be able to employ them freely in the odd pursuit of realizing his being in the world.

We now see why man begins where technology begins. The magic circle of leisure which technology opens up for

him in nature is the cell where he can house his extra-natural being. This is why I have previously emphasized that the meaning and the final cause of technology lie outside itself, namely in the use man makes of the unoccupied energies it sets free. The mission of technology consists in releasing man for the task of being himself.

The ancients divided life into two spheres. The first they called *otium*, leisure, by which they understood not the negative of doing, not idling, but the positive attitude of seeing to the strictly human obligations of man, such as command, organization, social intercourse, science, arts. The second, consisting of those efforts which meet the elemental necessities and make *otium* possible, they called *nec-otium*, with apposite stress on the negative character it has for man.

Instead of living haphazardly and squandering his efforts, man must act according to a plan which helps him to obtain security in his clash with natural exigencies and to dominate them to his best advantage. This is the technical activity of man in contrast to the animal's life *au bon de Dieu*.

The particular human activities which deserve and have received the name of technology are only concrete specializations of the general character of the autofabrication inherent in human life. Were man not from the start compelled to construct, with the material of nature,

the extranatural aspiration that he is, none of the technical arts would exist. The absolute fact called technology rises only from this strange, dramatic metaphysical occurrence, that two disparate entities—man and the world—find themselves under the obligation to coexist in such a way that one of them, man, has to install his extraworldly being in the other, which precisely is the world. The problem of how to do this, which indeed calls for an engineer, is the subject matter of human existence.

In spite of this, or rather because of it, technology is, strictly speaking, not the beginning of things. It will mobilize its ingenuity and perform the task life is; it will—within certain limits, of course—succeed in realizing the human project. But it does not draw up that project; the final aims it has to pursue come from elsewhere. The vital program is pretechnical. Man's technical capacity—that is, the technician—is in charge of inventing the simplest and safest way to meet man's necessities. But these, as we have seen, are in their turn inventions. They are what man in each epoch, nation, or individual aspires to be. Hence there exists a first, pretechnical invention par excellence, the original desire.

Now, desiring is by no means easy. The reader need only remember the particular quandary of the newly rich man. With all wish-fulfilling means at his command he finds himself in the awkward situation of not knowing

how to wish. At the bottom of his heart he is aware that he wishes nothing, that he himself is unable to direct his appetite and to choose among the innumerable things offered by his environment. He has to look for a middleman to orient him. And he finds one in the predominant wishes of other people, whom he will entrust with wishing for him. Consequently, the first purchases of the newly rich are an automobile, a radio, and an electric shaver. As there are hackneyed thoughts, ideas which the man who thinks them has not thought originally and for himself but repeated blindly and automatically, so there are hackneyed wishes which are but the fiction and the gesture of genuine desire.

If this happens in the realm of wishing with objects which are there and lie to hand before they are wished for, one may imagine how difficult the properly creative wish must be, the wish that reaches out for things yet non-existent and anticipates the still unreal. Every wish for this or that particular thing is ultimately connected with the person a man wants to be. This person, therefore, is the fundamental wish and the source of all other wishes. If a man is unable to wish for his own self because he has no clear vision of a self to be realized, he can have but pseudo wishes and spectral desires devoid of sincerity and vigor.

It may well be that one of the basic diseases of our

time is a crisis of wishing and that for this reason all our fabulous technical achievements seem to be of no use whatever. This now begins to dawn upon us all; but as far back as 1921 I happened to remark in my book *Invertebrate Spain* that "Europe is suffering from an exhaustion of her wishing power." When the vital program grows dim and hazy, technology, not knowing whom and what purpose to serve, is threatened with a setback.

For this is the absurd situation at which we have arrived: the wealth of material means that present-day man can count on for his living surpasses by far that of all other ages and we are clearly aware of its superabundance. Yet we suffer from an appalling restlessness because we do not know what to do with it, because we lack imagination for inventing our lives.

Why this? Well asked; but the question is not pertinent to our essay. Let us for all answer pose one in return: which part of man is it, or rather what sort of men are they, that are in special charge of the vital program? Poets, philosophers, politicians, founders of religions, discoverers of new values? We shall not venture on an answer but only state that the engineer is dependent on them all. Which explains why they all rank higher than he, a difference which has always existed and against which it would be in vain to protest.

This may have something to do with the curious fact

that technical achievements are more or less anonymous or, at least, that the glory which generally falls to great men of the former types is rarely enjoyed by technical inventors. Among the most important inventions of the last sixty years is the combustion engine. Who outside the ranks of professional engineers remembers offhand the illustrious names of its inventors?

For the same reason it is utterly improbable that a technocracy will ever be established. By the very definition of him, the engineer cannot take the helm, he cannot rule. His role is magnificent, highly admirable, but irremediably secondary.

To sum up, the reform of nature—or technology—is like all change a movement with two terms: a whence and a whither. The whence is nature, such as it is given. If nature is to be modified, the other term to which it has to conform must be fixed. The whither is man's program of life. What is the word for the fullness of its realization? Obviously well-being, happiness. And thus we have looped the loop of our argument.

VI MAN'S EXTRANATURAL DESTINY—THE ORIGIN
OF THE TIBETAN STATE—DIFFERENT
PROGRAMS OF BEING

When we said that technology is the system of activities through which man endeavors to realize the extranatural

program that is himself, we may have sounded somewhat cryptic and abstract. It may be helpful to enumerate briefly some of the vital projects realized by man in the course of history. There is the Hindu *bodhisattva*; the athletic youth of the Greek aristocracy of the sixth century; the upright citizen of the Roman Republic and the Stoic of the Empire; the medieval saint; the *hidalgo* of the sixteenth century; the *homme de bonne compagnie* of the *dix-septième*; the German *schöne Seele* of the end of the eighteenth and the *Dichter und Denker* of the beginning of the nineteenth; the English gentleman of 1850, etc.

But I must not allow myself to be lured into the fascinating task of describing the various profiles of the world that correspond to these human modes of being. I will point out only one fact which to me seems beyond all doubt. A nation where the existence of the *bodhisattva* is regarded as man's true being cannot develop the same technology as one in which people want to be gentlemen. The *bodhisattva* holds that true existence cannot come to pass in this world of mere appearances where man lives as an individual, an isolated part of the universe, but only when he has dissolved into the Whole and disappeared in it. Not to live or to live as little as possible is therefore the prime concern of the *bodhisattva*. He will reduce his food to a minimum—bad for the food indus-

tries! He will remain as motionless as possible, absorbed in meditation, the one vehicle by which he hopes to be transported into a state of ecstasy and to come to live outside this world. Not much chance of his inventing the automobile!

Instead, he will develop all those mental techniques which seem so uncanny to Western minds, the techniques of the fakir and the yogi, of ecstasy, insensibility, catalepsy, concentration which bring about changes not in the material world but in man's body and soul. This instance will make clear, I hope, why technology is a function of the variable program of man. It also throws some light on the fact we have mentioned above, but not yet fully understood, that man has an extranatural being.

A life of meditation and ecstasy, lived as though it were not lived, in continuous endeavor to annul the world and existence itself, cannot be called a natural life. To be *bodhisattva* means in principle not to move, not to be sexed, not to feel joy or pain; in one word, to be the living negation of nature. It is indeed a drastic example of the extranaturalness of human life and of the difficulty of its realization in the world. A certain preparedness, a pre-accommodation of the world seems indispensable if it is to house at all an entity so radically at variance with it. A scientist, bent on giving a naturalistic explanation to all things human, is likely to jump at this remark, declaring

that such preparedness of nature is the main thing and that we were absolutely wrong in maintaining that man's project of life calls forth technology which in turn shapes nature so that it conforms to the human purpose. In India, he will say, by way of example, climate and soil facilitate human life to such a degree that there is hardly any need for man to move and to eat. Thus, climate and soil are conducive to the Buddhistic type of life. This, I expect, is the first time that something in my essay appeals to the scientists among my readers, if such there be.

But now I cannot help spoiling even this small satisfaction for them. No; there doubtless exists a relation between climate and soil on the one hand and man's program on the other, but it is very different from what their explanation supposes. I will not describe here what it really is. For once I should like to be excused from reasoning and be allowed simply to contrast with the fact adduced by my presumed opponent another fact that bears witness against his explanation.

If the climate and the soil of India are responsible for Buddhism in India, why then should Tibet now be the foremost land of Buddhism? Its climate and soil contrast markedly with those of the Ganges and Ceylon. The high tableland behind the Himalayas is among the most inhospitable and inclement regions of the globe. Fierce storms sweep over those immense plains and wide val-

leys. Blizzards and frosts haunt them for the best part of the year. The original inhabitants were rugged, roving hordes in continuous feud with one another. They lived in tents made of the hides of the great sheep of the tableland. No state could ever establish itself in those regions.

But one day Buddhistic missionaries climbed over the grisly Himalayan passes and converted some of these hordes to their religion. Now, Buddhism is more than any other religion a matter of meditation. It knows of no god who takes upon his own shoulders the salvation of man. Man has to see to it himself by means of meditation and prayer. But how meditate in the grim Tibetan climate? The answer was the construction of monasteries of stone and stucco, the first buildings ever seen in that part of the world. In Tibet, therefore, the house came into being for man to pray in, not to live in. But now it happened that in the customary tribal campaigns the Buddhist hordes took shelter in their houses, which thus acquired a military significance, furnishing their owners with a certain superiority over the non-Buddhists. To make a long story short: the monastery functioning as a fortress created the Tibetan State. Here Buddhism does not spring from the climate and the soil but, on the contrary, Buddhism as a "human necessity," that is to say, something life is able to do without, through the art of building, modifies the

climate and the soil with respect to their influence on social and political circumstances.

This, by the way, also furnishes a good example of the solidarity between the different technical arts. It shows how easy an artifact invented to serve one purpose may be used for others. We have already seen that the primitive bow, which most probably originated as a musical instrument, became a weapon for war and the hunt. An analogous case is presented by the story of Tyrtaeus, that ridiculous general lent by the Athenians to the Spartans in the second Messenian war. Old, lame, and the author of outmoded elegies to boot, he was the laughingstock of the *jeunesse dorée* in Attica. But lo and behold, he comes to Sparta and the demoralized Lacedaemonians begin winning all the battles. Why? For a technical reason of tactics. Tyrtaeus's elegies, composed in a clearly accentuated archaic rhythm, lend themselves beautifully to marching songs and make for a stricter unity of movement in the Spartan phalanx. Thus a technical item of the art of poetry turned out to be important in the art of warfare.

But enough of digressions. We were bent on contrasting the two situations of man that ensue from his aspiration to be a gentleman or a *bodhisattva*. The difference is radical. It will become quite clear when we point out some

characteristics of the gentleman. Concerning the gentleman we must first state that he is not the same as an aristocrat. No doubt, English aristocrats were the first to invent this mode of being, but they were actuated by those tendencies which have always distinguished the English noblemen from all other types of noblemen. While the others were hermetic as a class and likewise hermetic regarding the type of occupations they deigned to devote themselves to—war, politics, diplomacy, sport, agriculture on a large scale—since the sixteenth century the English aristocrat held his own in commerce, industry, and the liberal professions. As history from that time on has mainly consisted in activities of this sort he has been the only aristocrat to survive in full social efficiency. This made it possible for England to create in the beginning of the nineteenth century a prototype of existence which was to become exemplary throughout the world. Members of the middle class and the working class can, to a certain degree, be gentlemen. Nay more, whatever happens in a future which, alas, may be imminent there will remain as one of the miracles of history the fact that today even the humblest English workman is in his sphere a gentleman. Gentlemanliness does not imply nobility. The continental aristocrat of the last four centuries is, primarily, an heir—a man who has

large means of living at his command without having had to earn them. The gentleman as such is not an heir. On the contrary, the supposition is that a man has to earn his living and to have an occupation, preferably a practical one—the gentleman is no intellectual—and it is precisely in his profession that he has to behave as a gentleman. Antipodes of the gentleman are the *gentil-homme* of Versailles and the Prussian *Junker*.

VII THE GENTLEMAN TYPE—ITS TECHNICAL
REQUIREMENTS—THE GENTLEMAN
AND THE *HIDALGO*

But what does it mean to be a gentleman? Let us take a short cut and, exaggerating things, put it this way: a gentleman is a man who displays throughout his life, i. e., in every situation however serious or unpleasant, a type of behavior which customarily remains restricted to those brief moments when the pressures and responsibilities of life are shuffled off and man indulges in the diversion of a game. This again shows strikingly to what degree the human program of life can be extra-natural. For games and their rules are sheer invention in comparison with life as it comes from nature's own hands. The gentleman ideal inverts the terms within human life itself, proposing that a man should behave in

his enforced existence of struggle with his environment as though he moved in the unreal and purely imaginative orbit of his games and sports.

When people are in the mood to play we may assume that they feel comparatively safe regarding the elemental needs of life. Games are a luxury not to be indulged in before the lower zones of existence are well taken care of, and an abundance of means guarantees a life within an ample margin of serene tranquillity, unharassed by the stress and strain of penury which converts everything into a frightening problem. In this state of mind man delights in his own magnanimity and gratifies himself with playing fair. He will defend his cause but without ceasing to respect the other fellow's rights. He will not cheat, for cheating means to give up the attitude of play: it is "not cricket." The game, it is true, is an effort, but an effort which is at rest in itself, free from the uneasiness that hovers about every kind of compulsory work because such work must be accomplished at all costs.

This explains the manners of the gentleman, his sense of justice, his veracity, his perfect self-control based on previous control of his surroundings, his clear awareness of his personal claims on others and theirs on him, viz., his duties. He would not think of using trickery. What is done must be done well, and that is all there is to it. English industrial products are known to be good

and solid both in raw material and in workmanship. They are not made to be sold at any price. They are the opposite of trash. The English manufacturer has never condescended to conform to the taste and caprices of his customer as has the German. On the contrary, he calmly expects his customer to conform to his products. He does but little advertising which is always deceit, rhetoric, foul play. And the same in politics. No phrases, no farces, no demagogic inveiglement, no intolerance, but few laws; for the law, once it is written, turns into a reign of pure words which, since words cannot be fulfilled to the letter, necessarily results in falsification of the law and governmental dishonesty. A nation of gentlemen needs no constitution. Therefore England has fared very well without it. And so forth.

The gentleman, in contrast to the *bodhisattva*, wants to live intensely in this world and to be as much of an individual as he possibly can, centered in himself and filled with a sense of independence of everything else. In Paradise, where existence itself is a delightful game, the gentleman would be incongruous, the gentleman's concern being precisely to remain a good sport in the thick of rude reality. The principal element, the atmosphere, as it were, of the gentlemanly existence is a basic feeling of leisure derived from an ample control over the world. In stifling surroundings one cannot hope

to breed gentlemen. This type of man, bent on converting existence into a game and a sport, is therefore very far from being an illusionist. He acts as he does just because he knows life to be hard, serious, and difficult. And just because he knows this he is anxious to secure control over circumstance—matter and man. That is how the British grew to be great engineers and great politicians.

The desire of the gentleman to be an individual and to give to his mundane destiny the grace of a game made it necessary for him to live remote from people and things, even physically, and to ennoble the humblest functions of his body by attending to them with elaborate care. The details of personal cleanliness, the ceremony of dressing for dinner, the daily bath—after Roman times there were hardly any private baths in the Western world—are punctiliously observed. I apologize for mentioning that England gave us the w.c. A dyed-in-the-wool intellectual would never have thought of inventing it, for he despises his body. But the gentleman, as we have said, is no intellectual; and so he is concerned about decorum: clean body, clean soul.

All this, of course, is based on wealth. The gentleman ideal both presupposed and produced large fortunes. Its virtues cannot unfold without an ample margin of economic power. As a matter of fact, the gentleman type reached its perfection only in the middle of the last

century when England had become fabulously rich. The English worker can, in his way, be a gentleman because he earns more than the average member of the middle class in other countries.

It would be of no small interest if someone with a good mind and a long intimate knowledge of the English situation were to study the present state of the system of vital norms which we have called the gentleman ideal. During the last twenty years economic circumstances in England have changed. She is much less rich than in the beginning of this century. Can one be poor and still be English? Can the characteristic English virtues survive in an atmosphere of scarcity?

Be that as it may, it is not unfitting to think of an exemplary type of life that preserves the best qualities of the gentleman and yet is compatible with the impoverishment that inexorably threatens our planet. If we try to visualize this new figure, there will inevitably rise before our mind's eye as a term of comparison another human profile evolved in history, which in some of its features bears close resemblance to the portrait of the gentleman while differing from it in one respect: it thrives on the soil of poverty. I mean the Spanish *hidalgo*. In contrast to the gentleman the *hidalgo* does not work. He reduces his material necessities to a minimum and consequently has no use for technology. He

lives in poverty, it is true, like those plants of the desert which have learned to grow without moisture. But it is also beyond question that he knows how to lend dignity to his wretched conditions. Dignity makes him the equal of his more fortunate brother, the gentleman.

VIII THINGS AND THEIR "BEING"—THE PRE-THING
—MAN, ANIMALS, TOOLS—EVOLUTION
OF TECHNOLOGY

After this digression into a few concrete examples, we now take up again the main trend of our investigation. I have been anxious to stress those assumptions and implications of the phenomenon of technology which, though they really are its essence, usually remain unobserved. For a thing is above all the series of conditions which make it possible. Kant would have called them "conditions of possibility" and Leibnitz in his clearer and soberer way "ingredients" or "requisites."

But now I am certain there will be objections from my readers. Among them, I fear, are quite a few who listen only because they hope to hear what they know already in more or less distinct details and not because they have decided to open their minds to what I have to say—the more unexpected the better. These, I fear, will have thought to themselves: now, what can all this have

to do with technology, I mean real technology, the way it works?

They are unaware that if we want to answer the question, what is this thing, we must break up the form in which it exists and functions here before our eyes and try to isolate it and to describe its ingredients. None of these, it is evident, is the thing; the thing is their result. If we want to restore the thing, its ingredients as such and in their isolation must disappear for us. We can see water only after we have ceased to see oxygen and hydrogen. A thing is defined through an enumeration of its ingredients; and its ingredients, its presuppositions, its implications, become therefore something like a pre-thing. It is this essence of the thing, this pre-thing, which must be brought to light; for the thing is there already and need not be discovered. In return, the pre-thing shows the thing in *statu nascendi*; and we do not really know a thing unless we have, in one sense or another, been present at its birth.

The “requisites” or “ingredients” of technology we have thus far pointed out are certainly not all, but they are the deepest and therefore the most easily overlooked, whereas we may be sure no one will fail to see that man would never have invented tools to satisfy his necessities had not his intelligence enabled him to dis-

cover new relations between the things about him. This seems obvious; and yet it is not conclusive. Being able to do something is no sufficient reason for doing it. The fact that man possesses technical intelligence does not necessarily entail the existence of technology; for technical intelligence is an ability, but technology is actual performance which may or may not take place. And we are interested here not in finding out whether man is endowed with technical ability, but in understanding why such a thing as technology exists. This, however, will become intelligible only after the discovery that man has to be an engineer, no matter whether he is gifted for it or not.

It may seem obvious to hold intelligence responsible for both the existence of technology and the difference between man and animals. But we should by this time have lost the calm belief with which, two centuries ago, Benjamin Franklin could still define man as the "tool-making animal." Mr. Koehler's famous experiments with chimpanzees as well as observations in other fields of animal psychology have revealed that animals possess a certain ability for manufacturing tools. If they are not able of taking full advantage of tools, it is owing not to lack of intelligence, strictly speaking, but to other peculiarities of their constitution. Mr. Koehler shows that the essential deficiency of the chimpanzee is its

memory. Because it will forget what has happened to it only a minute ago, its intelligence finds but scanty material for creative combinations.

What distinguishes man from animals is not so much the difference of their psychic mechanisms in themselves as the consequences which arise from this difference and give completely dissimilar structures to their respective existences. The animal has not enough imagination to draw up a project of life other than the mere monotonous repetition of its previous actions. And this is enough to bring about an absolutely different reality of life in the two cases. If life is not realization of a program, intelligence becomes a purely mechanical function without discipline and orientation. One forgets too easily that intelligence, however keen, cannot furnish its own direction and therefore is unable to attain to actual technical discoveries. It does not know by itself what to prefer among the countless "inventable" things and is lost in their unlimited possibilities. Technical capacity can arise only in an entity whose intelligence functions in the service of an imagination pregnant not with technical, but with vital projects.

One of the purposes of the foregoing argument has been to warn against the spontaneous but injudicious tendency of our time to believe that, at bottom, no more than one technology exists, the present Americo-European

technology, and that all others are but awkward stammerings, rudimentary attempts. I have opposed this tendency and embedded our present technology, as one among many others, in the vast and multiform panorama of human technology in its entirety, thereby relativizing its meaning and showing that every way and project of life has its corresponding specific form of technology.

But now that this is done, I must proceed to describe the characteristics of modern technology and to point out in particular why it has appeared to us, with some semblance of truth after all, as the technology par excellence. In fact, technology has for many reasons attained today among the integral components of human life a position which it has never held before. True, it has been in all times important enough; witness the historian who, when he tries to find a common denominator for vast periods of prehistoric time, resorts to the peculiarities of their technologies, calling the primeval age of humanity—which we faintly discern as though by the light of early dawn—the eolithic or auroral stone age and going on with the paleolithic or early stone age, the bronze age, and so forth. Yet on this list our own time would have to figure not as the age of this or that technology, but simply as the age of technology. How could the evolution of man's technical capacity bring forth an epoch in which we can adequately characterize

man, who, after all, has always been an engineer, by defining him merely as such? It is evident that this could occur only because the relation between man and technology had been raised to an extraordinarily high power; and this rise must in its turn have been produced by a radical modification in the technical function itself.

Insight into the specific character of modern technology itself will best be gained by deliberately setting off its peculiar silhouette against the background of the whole of man's technical past. This means that we must give a sketch, if only the briefest, of the great changes undergone by the technical function itself; in other words, that we must define various stages in the evolution of technology. In this way, drawing some border lines and underlining others, we shall see the hazy past take on relief and perspective, revealing the forms from which technology has set out and those to which it has been coming.

IX THE STAGES OF TECHNOLOGY—

TECHNOLOGY OF CHANCE

The subject is difficult. It took me some time to decide upon the principle best suited to distinguish periods of technology. I do not hesitate to reject the one readiest to hand, viz., that we should divide the evolution ac-

ording to the appearance of certain momentous and characteristic inventions. All I have said in this essay aims to correct the current error of regarding such or such a definite invention as the thing which matters in technology. What really matters and what can bring about a fundamental advance is a change in the general character of technology. No single invention is of such caliber as to bear comparison with the tremendous mass of the integral evolution. We have seen that magnificent advances have been achieved only to be lost again, whether they disappeared completely or whether they had to be rediscovered.

Nay more, an invention may be made sometime and somewhere and still fail to take on its true technical significance. Gunpowder and the printing press, unquestionably two discoveries of great pith and moment, were known in China for centuries without being of much use. It is not before the fifteenth century in Europe that gunpowder and the printing press, the former probably in Lombardy, the latter in Germany, became historical powers. With this in view, when shall we say they were invented? No doubt, they grew effective in history only when they appeared incorporated in the general body of late medieval technology, serving the purposes of the program of life operative in that age. Firearms and the printing press are contemporaries of

the compass. They all bear the same marks, so characteristic, as we shall shortly see, of that hour between Gothic and Renaissance, the scientific endeavors of which culminated in Copernicus. The reader will observe that, each in its own manner, they establish contact between man and things at a distance from him. They belong to the instruments of the *actio in distans*, which is at the root of modern technology. The cannon brings distant armies into immediate touch with each other. The compass throws a bridge between man and the cardinal points. The printing press brings the solitary writer into the presence of the infinite orbit of possible readers.

The best principle of delimiting periods in technical evolution is, to my judgment, furnished by the relation between man and technology, in other words by the conception which man in the course of history held, not of this or that particular technology but of the technical function as such. In applying this principle we shall see that it not only clarifies the past, but also throws light on the question we have asked before: how could modern technology give birth to such radical changes, and why is the part it plays in human life unparalleled in any previous age?

Taking this principle as our point of departure we come to discern three main periods in the evolution of

technology: technology of chance; technology of the craftsman; technology of the technician.

What I call technology of chance, because in it chance is the engineer responsible for the invention, is the primitive technology of pre- and protohistoric man and of the contemporary savage, viz., of the least-advanced groups of mankind—as the Vedas in Ceylon, the Semang in Borneo, the pigmies in New Guinea and Central Africa, the Australian Negroes, etc.

How does primitive man conceive technology? The answer is easy. He is not aware of his technology as such; he is unconscious of the fact that there is among his faculties one which enables him to refashion nature after his desires.

The repertory of technical acts at the command of primitive man is very small and does not form a body of sufficient volume to stand out against, and be distinguished from, that of his natural acts, which is incomparably more important. That is to say, primitive man is very little man and almost all animal. His technical acts are scattered over and merged into the totality of his natural acts and appear to him as part of his natural life. He finds himself with the ability to light a fire as he finds himself with the ability to walk, swim, use his arms . . . His natural acts are a given stock fixed once and for all; and so are his technical. It does

not occur to him that technology is a means of virtually unlimited changes and advances.

The simplicity and scantiness of these pristine technical acts account for their being executed indiscriminately by all members of the community, who all light fires, carve bows and arrows, and so forth. The one differentiation noticeable very early is that women perform certain technical functions and men certain others. But that does not help primitive man to recognize technology as an isolated phenomenon. For the repertory of natural acts is also somewhat different in men and women. That the woman should plow the field—it was she who invented agriculture—appears as natural as that she should bear the children.

Nor does technology at this stage reveal its most characteristic aspect, that of invention. Primitive man is unaware that he has the power of invention; his inventions are not the result of a premeditated and deliberate search. He does not look for them; they seem rather to look for him. In the course of his constant and fortuitous manipulation of objects he may suddenly and by mere chance come upon a new useful device. While for fun or out of sheer restlessness he rubs two sticks together a spark springs up, and a vision of new connections between things will dawn upon him. The stick, which hitherto has served as weapon or support, acquires the

new aspect of a thing producing fire. Our savage will be awed, feeling that nature has inadvertently loosed one of its secrets before him. Since fire had always seemed a godlike power, arousing religious emotions, the new fact is prone to take on a magic tinge. All primitive technology smacks of magic. In fact, magic, as we shall shortly see, is nothing but a kind of technology, albeit a frustrated and illusory one.

Primitive man does not look upon himself as the inventor of his inventions. Invention appears to him as another dimension of nature, as part of nature's power to furnish him—nature furnishing man, not man nature—with certain novel devices. He feels no more responsible for the production of his implements than for that of his hands and feet. He does not conceive of himself as *homo faber*. He is therefore very much in the same situation as Mr. Koehler's monkey when it suddenly notices that the stick in his hands may serve an unforeseen purpose. Mr. Koehler calls this the "aha-impression" after the exclamation of surprise a man utters when coming upon a startling new relation between things. It is obviously a case of the biological law of trial and error applied to the mental sphere. The infusoria "try" various movements and eventually find one with favorable effects on them which they consequently adopt as a function.

The inventions of primitive man, being, as we have

seen, products of pure chance, will obey the laws of probability. Given the number of possible independent combinations of things, a certain possibility exists of their presenting themselves some day in such an arrangement as to enable man to see preformed in them a future implement.

X TECHNOLOGY AS CRAFTSMANSHIP—TECHNOLOGY
OF THE TECHNICIAN

We come to the second stage, the technology of the artisan. This is the technology of Greece, of preimperial Rome, and of the Middle Ages. Here are in swift enumeration some of its essential features.

The repertory of technical acts has grown considerably. But—and this is important—a crisis and setback, or even the sudden disappearance of the principal industrial arts, would not yet be a fatal blow to material life in these societies. The life people lead with all these technical comforts and the life they would have to lead without them are not so radically different as to bar, in case of failures or checks, retreat to a primitive or almost primitive existence. The proportion between the technical and the nontechnical is not yet such as to make the former indispensable for the supporting of life. Man is still relying mainly on nature. At least, and that is what matters, so he himself feels. When technical

crises arise he does therefore not realize that they will hamper his life, and consequently fails to meet them in time and with sufficient energy.

Having made this reservation we may now state that technical acts have by this time enormously increased both in number and in complexity. It has become necessary for a definite group of people to take them up systematically and make a full-time job of them. These people are the artisans. Their existence is bound to help man become conscious of technology as an independent entity. He sees the craftsman at work—the cobbler, the blacksmith, the mason, the saddler—and therefore comes to think of technology in terms and in the guise of the technician, the artisan. That is to say, he does not yet know that there is technology, but he knows that there are technicians who perform a peculiar set of activities which are not natural and common to all men.

Socrates in his struggle, which is so appallingly modern, with the people of his time began by trying to convince them that technology is not the same as the technician, that it is an abstract entity of its own not to be mixed up with this or that concrete man who possesses it.

At the second stage of technology everybody knows shoemaking to be a skill peculiar to certain men. It can be greater or smaller and suffer slight variations as do

natural skills, running for instance, or swimming or, better still, the flying of a bird, the charging of a bull. That means shoemaking is now recognized as exclusively human and not natural, i. e., animal; but it is still looked upon as a gift granted and fixed once and for all. Since it is something exclusively human it is extra-natural, but since it is something fixed and limited, a definite fund not admitting of substantial amplification, it partakes of nature; and thus technology belongs to the nature of man. As man finds himself equipped with the unexchangeable system of his bodily movements, so he finds himself equipped with the fixed system of the "arts." For this is the name technology bears in nations and epochs living on the technical level in question; and this also is the original meaning of the Greek word *techné*.

The way technology progresses might disclose that it is an independent and, in principle, unlimited function. But, oddly enough, this fact becomes even less apparent in this than in the primitive period. After all, the few primitive inventions, being so fundamental, must have stood out melodramatically against the workaday routine of animal habits. But in craftsmanship there is no room whatever for a sense of invention. The artisan must learn thoroughly in long apprenticeship—it is the time of masters and apprentices—elaborate usages

handed down by long tradition. He is governed by the norm that man must bow to tradition as such. His mind is turned towards the past and closed to novel possibilities. He follows the established routine. Even such modifications and improvements as may be brought about in his craft through continuous and therefore imperceptible shifts present themselves not as fundamental novelties, but rather as differences of personal style and skill. And these styles of certain masters again will spread in the forms of schools and thus retain the outward character of tradition.

We must mention another decisive reason why the idea of technology is not at this time separated from the idea of the person who practices it. Invention has as yet produced only tools and not machines. The first machine in the strict sense of the word—and with it I anticipate the third period—was the weaving machine set up by Robert in 1825. It is the first machine because it is the first tool that works by itself, and by itself produces the object. Herewith technology ceases to be what it was before, handiwork, and becomes mechanical production. In the crafts the tool works as a complement of man; man with his natural actions continues to be the principal agent. In the machine the tool comes to the fore, and now it is no longer the machine that serves man but man who waits on the machine. Working by it-

self, emancipated from man, the machine, at this stage, finally reveals that technology is a function apart and highly independent of natural man, a function which reaches far beyond the bounds set for him. What a man can do with his fixed animal activities we know beforehand; his scope is limited. But what the machine man is capable of inventing may do, is in principle unlimited.

One more feature of craftsmanship remains to be mentioned which helps to conceal the true character of technology. I mean this: technology implies two things. First, the invention of a plan of activity, of a method or procedure—*mechane*, said the Greeks—and, secondly, the execution of this plan. The former is technology strictly speaking, the latter consists merely in handling the raw material. In short, we have the technician and the worker who between them, performing very different functions, discharge the technical job. The craftsman is both technician and worker; and what appears first is a man at work with his hands, and what appears last, if at all, is the technology behind him. The dissociation of the artisan into his two ingredients, the worker and the technician, is one of the principal symptoms of the technology of the third period.

We have anticipated some of the traits of this technology. We have called it the technology of the technician. Man becomes clearly aware that there is a capacity

in him which is totally different from the immutable activities of his natural or animal part. He realizes that technology is not a haphazard discovery, as in the primitive period; that it is not a given and limited skill of some people, the artisans, as in the second period; that it is not this or that definite and therefore fixed "art"; but that it is a source of practically unlimited human activity.

This new insight into technology as such puts man in a situation radically new in his whole history and in a way contrary to all he has experienced before. Hitherto he has been conscious mainly of all the things he is unable to do, i. e., of his deficiencies and limitations. But the conception our time holds of technology—let the reader reflect a moment on his own—places us in a really tragicomic situation. Whenever we imagine some utterly extravagant feat, we catch ourselves in a feeling almost of apprehension lest our reckless dream—say a voyage to the stars—should come true. Who knows but that tomorrow morning's paper will spring upon us the news that it has been possible to send a projectile to the moon by imparting to it a speed great enough to overcome the gravitational attraction. That is to say, present-day man is secretly frightened by his own omnipotence. And this may be another reason why he

does not know what he is. For finding himself in principle capable of being almost anything makes it all the harder for him to know what he actually is.

In this connection I want to draw attention to a point which does not properly belong here, that technology for all its being a practically unlimited capacity will ir-retrievably empty the lives of those who are resolved to stake everything on their faith in it and it alone. To be an engineer and nothing but an engineer means to be potentially everything and actually nothing. Just because of its promise of unlimited possibilities technology is an empty form like the most formalistic logic and is unable to determine the content of life. That is why our time, being the most intensely technical, is also the emptiest in all human history.

XI RELATION BETWEEN MAN AND TECHNOLOGY IN OUR TIME—THE ENGINEER IN ANTIQUITY

This third stage of technical evolution, which is our own, is characterized by the following features:

Technical acts and achievements have increased enormously. Whereas in the Middle Ages—the era of the artisan—technology and the nature of man counter-balanced each other and the conditions of life made it possible to benefit from the human gift of adapting

nature to man without denaturalizing man, in our time the technical devices outweigh the natural ones so gravely that material life would be flatly impossible without them. This is no manner of speaking, it is the literal truth. In *The Revolt of the Masses* I drew attention to the most noteworthy fact that the population of Europe between 500 and 1800 A. D., i. e., for thirteen centuries, never exceeded 180 millions; whereas by now, in little over a century, it has reached 500 millions, not counting those who have emigrated to America. In one century it has grown nearly three and a half times its size. If today 500 million people can live well in a space where 180 lived badly before, it is evident that, whatever the minor causes, the immediate cause and most necessary condition is the perfection of technology. Were technology to suffer a setback, millions of people would perish.

Such fecundity of the human animal could occur only after man had succeeded in interposing between himself and nature a zone of exclusively technical provenance, solid and thick enough to form something like a supernature. Present-day man—I refer not to the individual but to the totality of men—has no choice of whether to live in nature or to take advantage of this supernature. He is as irremediably dependent on, and lodged in, the latter as primitive man is in his natural

environment. And that entails certain dangers. Since present-day man, as soon as he opens his eyes to life, finds himself surrounded by a superabundance of technical objects and procedures forming an artificial environment of such compactness that primordial nature is hidden behind it, he will tend to believe that all these things are there in the same way as nature itself is there without further effort on his part: that aspirin and automobiles grow on trees like apples. That is to say, he may easily lose sight of technology and of the conditions—the moral conditions, for example—under which it is produced and return to the primitive attitude of taking it for the gift of nature which is simply there. We thus have the curious fact that, at first, the prodigious expansion of technology made it stand out against the sober background of man's natural activities and allowed him to gain full sight of it, whereas by now its fantastic progress threatens to obscure it again.

Another feature helping man to discover the true character of his own technology we found to be the transition from mere tools to machines, i. e., mechanically working apparatus. A modern factory is a self-sufficient establishment waited on occasionally by a few persons of very modest standing. In consequence, the technician and the worker, who were united in the

artisan, have been separated and the technician has grown to be the live expression of technology as such—in a word, the engineer.

Today technology stands before our mind's eye for what it is, apart, unmistakable, isolated, and unobscured by elements other than itself. And this enables certain persons, called engineers, to devote their lives to it. In the paleolithic age or in the Middle Ages technology, that is invention, could not have been a profession because man was ignorant of his own inventive power. Today the engineer embraces as one of the most normal and firmly established forms of activity the occupation of inventor. In contrast to the savage, he knows before he begins to invent that he is capable of doing so, which means that he has "technology" before he has "a technology." To this degree and in this concrete sense our previous assertion holds that technologies are nothing but concrete realizations of the general technical function of man. The engineer need not wait for chances and favorable odds; he is sure to make discoveries. How can he be?

The question obliges us to say a word about the technique of technology. To some people technique and nothing else is technology. They are right in so far as without technique—the intellectual method operative in technical creation—there is no technology. But with

technique alone there is none either. As we have seen before, the existence of a capacity is not enough to put that capacity into action.

I should have liked to talk at leisure and in detail about both present and past techniques of technology. It is perhaps the subject in which I myself am most interested. But it would have been a mistake to let our investigations gravitate entirely around it. Now that this essay is breathing its last I must be content to give the matter brief consideration—brief, yet, I hope, sufficiently clear.

No doubt, technology could not have expanded so gloriously in these last centuries, nor the machine have replaced the tool, nor the artisan have been split up into his components, the worker and the engineer, had not the method of technology undergone a profound transformation.

Our technical methods are radically different from those of all earlier technologies. How can we best explain the diversity? Perhaps through the following question: how would an engineer of the past, supposing he was a real engineer and his invention was not due to chance but deliberately searched for, go about his task? I will give a schematic and therefore exaggerated example which is, however, historical and not fictitious. The Egyptian architect who built the pyramid of Cheops

was confronted with the problem of lifting stone blocks to the highest parts of the monument. Starting as he needs must from the desired end, namely to lift the stones, he looked around for devices to achieve this. "This," I have said, meaning he is concerned with the result as a whole. His mind is absorbed by the final aim in its integrity. He will therefore consider as possible means only such procedures as will bring about the total result at once, in one operation that may take more or less time but which is homogeneous in itself. The unbroken unity of the end prompts him to look for a similarly uniform and undifferentiated means. This accounts for the fact that in the early days of technology the instrument through which an aim is achieved tends to resemble the aim itself. Thus in the construction of the pyramid the stones are raised to the top over another pyramid, an earthen pyramid with a wider base and a more gradual slope, which abuts against the first. Since a solution found through this principle of similitude—*similia similibus*—is not likely to be applicable in many cases, the engineer has no general rule and method to lead him from the intended aim to the adequate means. All he can do is to try out empirically such possibilities as offer more or less hope of serving his purpose. Within the circle defined by his special problem he thus falls back into the attitude of the primitive inventor.

XII MODERN TECHNICAL METHODS—THE CLOCKS
OF CHARLES V—SCIENCE AND WORKSHOP
—THE MIRACLE OF OUR TIME

The sixteenth century saw the rise of a new way of thinking manifest in technology as well as in the science of physics. Nay more, it was an essential feature of this new way of thinking that it is impossible to tell where it began, whether in the solution of practical problems or in the construction of pure ideas. In both realms Leonardo da Vinci was the harbinger of the new age. He was at home not only and not even principally in the painter's studio, but also in the workshop of the mechanician. All his life he was busy inventing "gadgets."

In the letter in which he begged for employment in Ludovico Moro's services he enclosed a long list of war machines and hydraulic apparatus of his invention. As in the Hellenistic period the battles and sieges of the great Demetrius Poliorcetes brought about the progress of mechanics which was to culminate in Archimedes, so the wars of the end of the fifteenth and the beginning of the sixteenth century stimulated the development of the new technology. Be it observed, the Diadochian wars, as well as those of the Renaissance, were sham wars, not fierce wars between hostile nations; they were wars of the military against the military, cold-blooded wars of

brains and cannons, not wars of fiery hearts: therefore, technical wars.

About 1540 "mechanics" was a fad. At that time the word did not yet signify the science we understand by it. It referred to machinery and the art of building it. This was the meaning it still held in 1600 for Galileo, the father of mechanics as a science. Everybody was eager for apparatus, large or small, useful or simply amusing. When the great Charles V, the black-armored victor of Mühlberg, retired to the monastery of Yuste in one of the most illustrious examples of life's decline recorded in history, he took with him on his sublime voyage into oblivion but two objects from the world he left behind: clocks and Juanelo Turriano. The latter was a Fleming, a real magician in mechanical inventions, the deviser not only of the aqueducts which supplied Toledo with water—part of their ruins are still to be seen—but also of the automatic bird that fluttered on metal wings through the vast emptiness of the room where Charles V rested far from the maddening crowd.

Due emphasis should be laid on the fact that the greatest miracle wrought by the human mind, the science of physics, originated in technology. The young Galileo worked not at a university, but in the arsenals of Venice among cranes and levers. It was there that his mind was shaped.

In fact, the new technology proceeds in exactly the same way as the *nuova scienza*. The engineer no longer passes directly from the image of the desired end to the search of the means which may obtain it. He stands before the envisaged aim and begins to work on it. He analyzes it. That is to say, he breaks down the total result into the components which have formed it, e. g., into its "causes."

This is the method applied to physics by Galileo, who is known to have been an eminent inventor to boot. An Aristotelian scientist would not have thought of splitting up a phenomenon into its elements. He tried to find for it in its totality a cause likewise total; for the drowsiness produced by poppy juice the *virtus dormitiva*. Galileo proceeded in the opposite way. When observing an object in motion he asked for the elementary and therefore general movements of which the concrete movement was made up. This is the new mode of thinking: analysis of nature.

The union between the new technology and the new science is one not of superficial resemblance but of identical intellectual method. Herein lies the source of the independence and self-sufficiency of modern technology. It is neither magical inspiration nor pure chance, but "method," a pre-established, systematic way of thinking, conscious of its own foundations.

What a lesson! The scholar, we learn, must long and patiently manipulate the objects of his investigation and be in close contact with them—the scientist with material, the historian with human things. Had the German historians of the nineteenth century been better politicians or even better men of the world, who knows but that history might by now be a science, and we might have at our command a really efficient method for handling the great collective phenomena before which, with shame be it said, present-day man finds himself adopting the same attitude as the paleolithic savage before lightning.

The so-called spirit is an all too ethereal agent, permanently in danger of being lost in the labyrinth of its own infinite possibilities. Thinking is too easy. The mind in its flight rarely meets with resistance. Hence the vital importance for the intellectual of touching concrete objects and of learning discipline in his intercourse with them. Bodies are the mentors of the spirit, as Chiron, the centaur, was the mentor of the Greek heroes. Without the check of visible and palpable things, the spirit in its high-flown arrogance would be sheer madness. The body is the tutor and the policeman of the spirit.

Hence the exemplary character of physical thinking among all other intellectual activities. Physics owes its unique strength to the fact that it has been the only

science in which the truth is established through the accord of two independent instances, neither of which will let itself be bribed by the other: pure mathematical thinking *a priori* and pure observation of nature with the body's eye; analysis and experiment.

The founding fathers of the *nuova scienza* were well aware that it was made of the same stuff as technology—Bacon as well as Galileo, Gilbert and Descartes, Huygens, Hooke and Newton.

Since their time, in no more than three centuries, the development of both, science and technology, has been miraculous. But human life is not only a struggle with nature; it is also the struggle of man with his soul. What has Euramerica contributed to the techniques of the soul? Can it be that in this realm it is inferior to unfathomable Asia? Let us conclude our argument with opening a vista on future investigations which would have to confront Asiatic technologies with those of Western civilization.

JOSÉ ORTEGA Y GASSET

TOWARD
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PHILOSOPHY
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