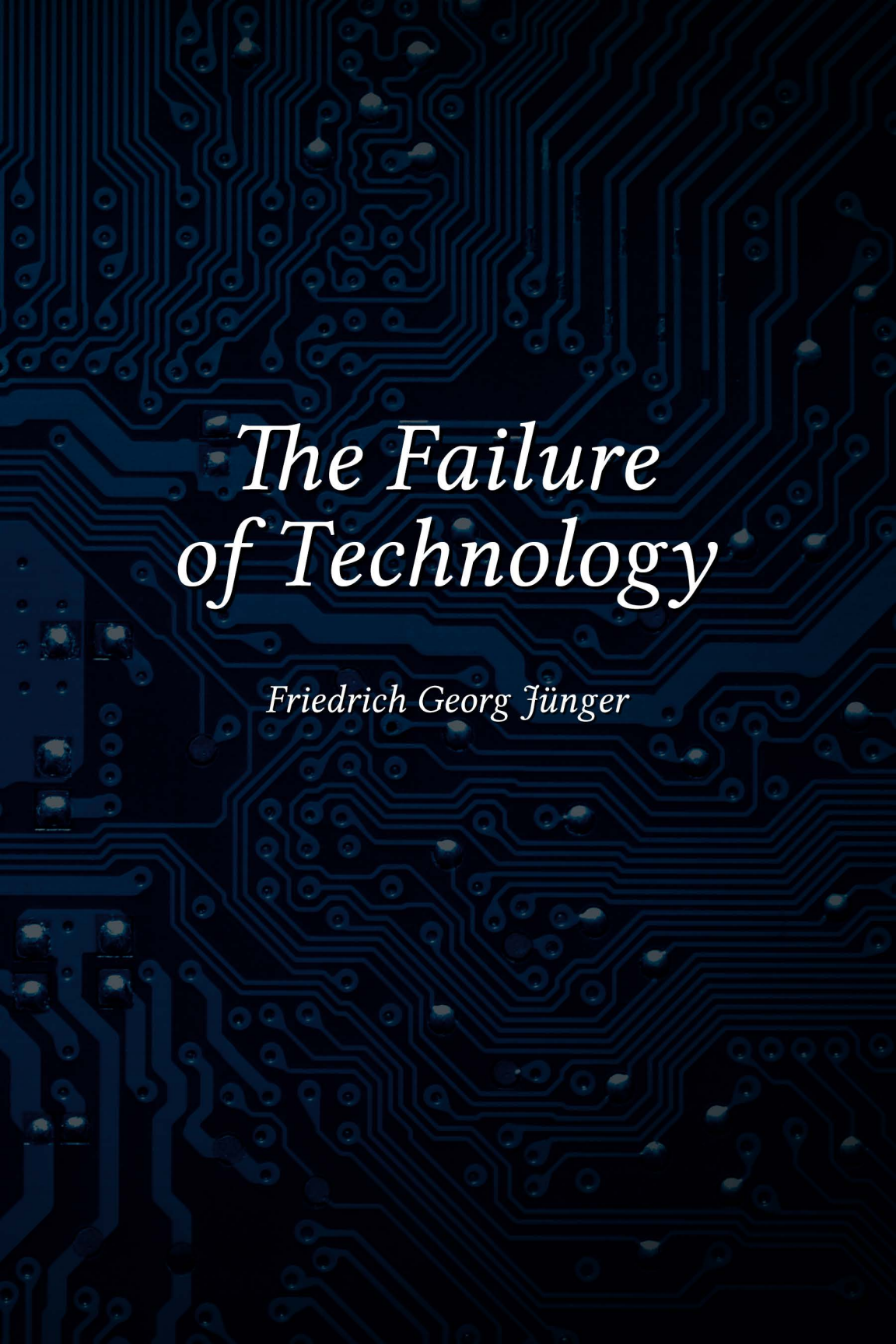

The Failure of Technology

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Introduction

Friedrich Georg Jünger's *The Failure of Technology* (*Die Perfektion der Technik*, 1946) was written under the shadow of World War II—the threat of a German sky black with enemy aircraft that splattered fire and death on the burnt-out caves of industrial man. "Lava, ashes, fumes, smoke, night-clouds lit up by fire"—the landscape of twentieth-century man erupts, in Jünger's pages, like a volcano returning man's boasted artifacts to that first wilderness that stretched back beyond the age of the gods. This book is the sombre meditation of a poet who has looked into chaos, even into hell, and who has not flinched.

But man was made for hope. Karl Jaspers and others have criticized Jünger severely for concentrating exclusively on the destructive and demonic power of technology. They have accused him of writing a one-sided document. Their very contention heightens the significance of his achievement. Jünger has not told us that the future belongs necessarily to a technocratic slave state. He has not predicted a century of mass men, faceless and without hearts—a century of robots marching over the parched desert of a mechanized west. He has not written an apocalyptic proclaiming a new iron age. He has done something else, something that badly needed doing: he has shown us the essence of technology. In so doing, he has revealed western man standing at the crossroads of history.

To know the essence of technology is to know that the control of technological power implies much more than its humanization, its direction into channels which are in accord with human dignity, much more than a hasty baptism of the machine by men eager to absorb the new world into the ethos of our Christian inheritance. All the evils of the age cannot be blamed on the bad will of men who misuse machines; some of them are intrinsic to the very nature of the machine itself. The control of technology means a severe limitation of its hitherto unchecked growth, a limitation demanding an almost savage asceticism on the part of an age drunk, not merely with the synthetic emotions and pleasures manufactured hourly by the entertainment factories, but with dreams of power and of the conquest of outer space. As Gabriel

Marcel has said, it is easy to take up technics; it is almost impossible to lay them down. Once man has assumed what is both a promise and a burden, once he has tasted the temptation of absolute power, he will never be the same again. The modem world, stamped as it is with the image of the machine, must learn to look technology in the face and read its essence, soberly and without illusion.

Jünger writes as a poet shocked by the ravages of a technology within which the elemental forces of creation, chained and directed into technological ends, have spread demonically and erupted into history to exact their revenge upon man himself. Jünger writes as a poet, but he also writes as a philosopher who understands the nature of the rationalized, the abstract thought which lies at the center of modem science. It is upon this aspect of his achievement that I would concentrate in my introduction to his work:

It is not only the scientist, however, who abstracts: everyone does. Abstraction is necessary in order that man may cooperate with nature, because unless he can do so he dies. Abstraction is a practical necessity for survival. In the non-technologized modes of production and work, abstraction is never found in a pure state; there it is a simple means to a practical end. When man abstracted the nature or a circle from the wood or the tree, he immediately reintegrated the form with the wood itself because his wheel was to be made of wood. Discrimination in the non-technologized order is but a preliminary phase of understanding which terminates in a judgement looking to things as they really exist. The materials of construction are never far from underived nature, and the form given the tool is often discovered in the very stuff from which the tool is made. Abstraction as a habit of thought in and of itself, as a deliberate, willed concentration on one segment of reality to the suppression of the whole, however, is not characteristic of artisan and peasant societies. The partial alienation from existence involved in merely technical or artistic abstraction is immediately overcome by an artistic judgement—a judgement bearing on a thing to be made. The artisan or peasant who uses abstraction in this way uses it as little more than an instrument ; it has no more value than it would were it a tool itself. Like a tool, abstraction in this order has but one crucial function: the integration of man with reality for the sake of human living.

But abstraction may be given other ends. When I abstract a reality, an object is constituted for my intelligence; a world is disengaged for the reason, a world that can be understood on its own terms only so long as it is held before the intelligence in that act alone. To abstract

the nature of circle for the sake of making a wheel is not to render full "justice" to the circle as such. "Justice" is done the circle when it is understood simply as a circle, as an intelligible form partaking of the nature of quantity, as a mathematical object.

Technological thought, as distinct from merely technical or artistic thinking, demands a steady and deliberate abstract consideration of the cosmos, of nature, and of man, in order that they might be described in purely mathematical terms. By ignoring the irreducibility of the being of things—unique and unrepeatable—modem science found it was possible to unite all things under the concept of quantity. Since measurable quantities can be predicted, they can be controlled. As Jünger points out, technological rationalism makes an act of faith in the uniformity of natural laws. This act of faith stands alone as the single non-rational postulate in the credo of scientific rationalism. The characteristics of technological rationalism are so well known that it suffices merely to list them in this place: the elimination of sense qualities; the suppressing of the organic; the mechanization of time; the patterning of the world after the dead dynamism of the machine; the suppression of the richness and idiosyncrasy of personal existence; the ideal of an horizontal and featureless cosmos; the postulate that the universe is less rich and beautiful than it looks.

In Jünger's mind, the clock stands as symbol and type of technological thought:

> Clock time is lifeless time, *tempus mortuum*, in which second follows second in monotonous repetition. Lifeless, clock-measured time flows along side by side with the life time of man, but aloof from it, utterly regardless of the high and the low tides of life where no two moments are alike.
>
> To the reflective mind, the clock summons up the thought of death. The figure of the dying Charles V, pacing among the clocks in his collection and attempting to regulate their movements, emits the frost of death. He watches and he listens to the passing of time that inevitably leads to death.
>
> . . . In an era when the public clock, visible from far off, was still looked upon as a rare masterpiece, it proclaimed an unmistakable *Memento mori.*

The rhythm of life which is one with the coming and passing of the seasons, with the flood and ebb of the tides, with the dawns and eve-

nings of all our days, with the very birth and death of man and beast and plant upon the earth—these rhythms are not caught by the fine mechanisms of clocks and watches. Thus life is forced to measure up to the relentless beat of a machine. Time as the rhythm of eternity has been shattered; hurry and speed, "the bastards of time," as Irina Gorainoff has written, have conquered everywhere. By comparison, the modes of technology are destructive of life's rhythms in all their tragedy and their joy. A technology bent on easing the tragedy of life would be a good thing indeed. But there is no real ease. On the contrary, life is invaded as by an automaton. Nature withers. The springs of piety corrupt. Man is left to shuffle along the pavements of the modem city surrounded by, and formed in the likeness of, a dream world of puppets, of flickering shadows created by minds bent on reducing the human substance to a burlesque of the machine.

There are those who believe we are living in the age of the twilight of man. Jünger is not among them. As technology, in any of its mechanisms, can come into its perfected state only by preying upon a natural order which exists independently of itself, so too technology as a habit of thought can exist only within men who, as living creatures, stand outside the world of technical organization. Technology, which is an instrument for utilizing the raw material of nature, can move toward its ultimate perfection only by impoverishing nature; the less you have to work with, the more accurate and sharp must be both the machinery used and the technological thinking employed. The zero of nature would be the zero of a technology that had reached both its apotheosis and its death. Conversely, technical thinking, as an act of the mind of man, is qualitative and living—but life is foreign to the essence of technology. Hence the full reduction of man to a set of measurable quantities would be the end of all technics. The zero of human nature would be the zero of a technics that had reached both its apotheosis and its death. Thus the complete perfection of technology is a contradiction. It follows, therefore, that as technology approaches its asymptote, it nears its own destruction.

If the thesis sounds strange to American and English ears it may be due to the ambiguity surrounding the word "perfection." It is not without significance that the original German title of Jünger's book was *The Perfection of Technology*. The German *Perfektion* does not carry the optimistic and moral overtones of its English equivalent. The German simply implies an achievement, a fullness, an actuality of something which now stands completed, finished, altogether one with its own es-

sence. *Perfektion* bespeaks a purity and thus a purification of the irrelevant, a purgation of all things other than itself. Jünger insists that as technology approaches these states, it purges nature of life and man of humanity. It perverts the state by turning politics into an order of technical problems rather than an exercise in moral judgment. It destroys the profit motive by subordinating the good of both capitalist and laborer to the good of the machine: thus the technician, writes Jünger, "drove the craftsman from his hand loom and forced him to become an operator in a mill, a proletarian. In this act his intent was not to enrich the capitalist at the expense of the factory worker, but he accepted this consequence without compunction. He was interested above all in developing the technical mechanism, and not at all in who profited by it." And we can hear Orwell's O'Brien admitting casually that the vision of constantly increasing power has its own consolations, even if they bring with them the victory of the robot. "If you want a picture of the future, imagine a boot stamping on a human face—forever."

It is precisely this characteristic of technological thinking which Jünger finds vicious. It bears for many the illusion of disinterestedness. The American tends to praise the scientist and the technician for abstracting himself from the impurities of the market place, for dedicating himself to his science. Jünger locates the danger in technological perfection in this very dedication to an abstraction from the dust and the splendour of history. The disinterested mind, the abstract mind, uproots—in the name of his science—all peasantries and it annihilates the sense of personal proprietorship. The pure technician "attacks the right to land; for landed property he feels that loathing which the dynamic mind has for all that is immobile." He subverts law in the name of the dictates of engineering: we need only think of those pitiful photographs that crop up from time to time in the daily newspapers showing some aged family evicted from a ramshackle house because it stood in the way of a road or a railway. We need only think of the five ghost towns in South Carolina, towns abandoned by their inhabitants because thermonuclear perfection demanded their destruction.

The American and the English mind bridles against the assertion that technological perfection has to do with finality of its own, rather, they still see it as a good for man or for his universe. But that mind must humble itself and come to learn that technology can only serve man provided that it remain impure, touched with the mystery beyond rational, the sense of play, the *jeu d'esprit*, the joy of contemplation.

Jünger does not tell us how to do this or even what to do. He has

confronted us with a vision of "Christmas Future." Unless we act, the tombstone of mankind will be read under the snows of other-years only by dumb eyes, those of a twisted remnant pausing amidst the dead craters of what was once the western world. Yet Jünger's was a pre-atomic vision.

No longer can we laugh at the man of the future as did Stephen Leacock in 1938, when he described him as a man "with large fluted ears, pendulous and quivering, to sort out noises with, and to scoop in aerial radio as it goes by. But very often he will have on his radio-flaps right over his ears." Leacock wrote as a man who was too civilized to take the future seriously. After all, no gentleman would care to go to the moon! But Leacock wrote this description before the last war. Today, even gentlemen can laugh no more. Today we are reminded of that grim note of warning Hilaire Belloc left with us when he wrote—like a man who had seen the angel of death and a vision of things yet to come:

> We sit by and watch the Barbarian, we tolerate him; in the long stretches of peace we are not afraid. We are tickled by his irreverence, his comic inversion of our old certitudes and our fixed creeds refreshes us; we laugh. But as we laugh we are watched by large and awful faces from beyond: and on these faces there is no smile.

An old world is dying. There are those who regret its passing. It was hardly a reality, more a memory, to those of us born soon after the First World War; but even this benediction will be denied our children. A new world is being prepared for them in the womb of history, and if we would fix its nature as by a symbol—with the resolved hope of understanding that world in order to save it—we can do no better than tum to this remarkable study by Friedrich Georg Jünger.

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Santa Clara, California.
January 17, 1956.

I

The Literature of a Danger Zone

Stories of mechanical utopias, as a glance at literature shows, are far from rare; on the contrary, there are so many of them and they find readers so readily that one is justified in assuming a general need for literature of this sort. It could be asked why it is that the machine in particular furnishes so much stuff to the mind of utopian turn. In former times, such a mind found its inspiration in the state, and the book that has given its name to the whole species, Thomas More's *De optima reipublicae statu, deque nova insula Utopia*, was a tale of the state. The changed subject matter reflects a change in the interests of the readers of such tales. Their interest is not aroused by what is accomplished, final, and completely within our grasp; it is satisfied neither with the past nor with the present—it turns to the possibilities of the future; it feeds on what might happen. The utopian tale demands an image capable of rational development and expansion, and the most serviceable image of this nature that can be found today is the machine. There is no other that could offer competition. For even a social utopia would lose its glamorous appeal if it were not based on technical progress. Without this basis, it would carry no conviction.

The utopian writer is neither prophet nor visionary, not even when his predictions have come true. No one will look for prophetic gifts in a Jules Verne or a Bellamy, for they lack almost everything that makes a prophet. Most of all, they lack the vocation, the call, and with it also the necessary wisdom, and the language in which this wisdom speaks. At best, they make a lucky guess that something will happen. They play with the imaginary, they play with the future, but it can never have for them the certainty it has for him who thinks and lives in religious terms. What they project into the future is merely a possibility emerging in the present, expanded by them in a logical and rational manner. Nor would it be fair to demand more of them. From prophecies and visions we expect infallibility; that they come true with absolute certain-

ty. But of a utopian tale we demand no more than a certain appearance of credibility: it must satisfy our intellect by a measure of probability. For what is entirely incredible and unlikely produces only boredom and discomfort; it is not worth bothering with. The fantasy, therefore, which would attract our notice and our interest will do well to appeal to our intellect. It must sway us by its coherence, by its consistency, by the intellectual detachment of its argument. He who wants to lend probability to the improbable must do it by his soberness of presentation and by the baldness of his style. And those, indeed, are generally the means by which the writers of utopias lure us, whether they carry us to the moon, or to the center of the earth, or to some other spot. In order to conceal the fantastic nature of their fantasies, they call in science.

Just what, then, makes a tale utopian? It is the blending of things that cannot blend, the going beyond limitations, the drawing of unjustified conclusions from premises that clash. The rule, *A posse ad esse non valet consequentia* ("A conclusion from the possible to the actual is not valid") is not respected here. But when we examine such a utopia, a technological novel, for instance, we find that it utopian nature does not lie, as one might think, in the technical theme which the author develops. A writer who tells us of cities with moving streets where every house is a perfect residential mechanism, every roof has an airport, every housewife receives provisions in her kitchen through an unfailing system of tubes; who assures us that these cities are built of a substance which glows gently in the dark, and that the silken garments worn there are made from refuse, or from cottage cheese—that writer is not yet truly utopian. For all this, whether it will be achieved or not, lies within the possibilities of technical organization. We are content to state that such contrivances are possible, and disregard for the time the question of what would be gained if such a state were reached. The tale becomes utopian only when the writer leaves the sphere of technical organization—when, for instance, he tries to make us believe that these cities are inhabited by better and more perfect human beings; that envy, murder, and adultery are unknown; that neither law nor a police force is needed. For in so doing he steps outside the technical scheme within which he is spinning his fantasies, and combines it in a utopian manner with something different and alien which can never be developed out of the scheme itself. This is why Bellamy is more of a utopian than Jules Verne—the latter sticks closer to the technological scheme. A social utopian like Fourier believed in all seriousness that, if only his theories

were accepted and applied, the very salt water of the sea would turn into sweet lemonade and the whales would cheerfully harness themselves to the ships. Thus he ascribed to his ideas power mightier than the song of Orpheus, and this even after his model community, La Reunion, had broken down. Such exuberance of the mind is ridiculous, unless one happens to be among those who are ruined by it.

And yet, any system rounded enough to awaken a response in our minds needs a grain of utopian salt. The theory of Comte furnishes an example. We see it more clearly today when positivism is everywhere on the retreat and even has to surrender its hereditary possessions in the various sciences. Apparently we have already passed through that third and highest stage of human evolution, the "positive" one, which Comte pretended to have achieved for himself and for his theory, and his motto, "See, in order to foresee; foresee, in order to forestall," is no more valid today than the whole natural hierarchy of sciences he erected. There is something separatistic about Comte's theory; at its bottom, there is a certainty that we have lost. When life enters into new zones of danger all things change, the observer as well as the observations. Positivism is always an occupation for settled times.

II

The Delusion of the Saving of Labor

Those who place their hopes in the machine—and hope implies an anticipation of the future—ought to be aware that the hopes themselves must be of a technical kind, for one cannot expect from the machine something which lies outside its potentialities. They must distinguish the machine from the chimeras which have become associated with it and which have nothing to do with its purpose. There is, for instance, a wide-spread belief that the machine relieves man of work, that thereby he gains leisure and time for free activity. This belief in many cases is unshakable and unexamined. Where one comes across it, one senses that it is one of the props which uphold technical progress, justify it, and secure an optimistic view of the future. Obviously, a machine which does not profit man appeals to no one—optimism is needed in this connection also. But we are here dealing with an assertion, the validity of which has not been established, and constant repetition gives it no greater conviction. Leisure and free activity are not accessible to everybody, and they are conditions in no way connected with the machine. A man who is relieved of work is not thereby capable of leisure; a man who gains time does not thereby gain the capacity to spend this time in free activity, for leisure is not a mere doing-nothing, a state that can be defined negatively. Leisure, to be fruitful, presupposes a spiritual and mental life from which it draws its meaning and its worth. An *otium sine dignitate* ("leisure without dignity") is hollow, empty loafing. Nor is leisure, as many seem to think, a mere intermission in work for a limited time—no, by definition it is unlimited and indivisible, and from it originates all meaningful work. Leisure is the prerequisite of every free thought, every free activity. And this is why only the few are capable of it, since the many, when they have gained time, only kill it. Not everyone is born for free activity, or else the world would not be what it is. Thus, even if the machine did relieve man of work, this would be no guarantee that man would profit by the time gained and use it intel-

ligently. The unemployed worker who does not have this capacity goes to pieces; because he does not know what to do with the empty time that befalls him. Not only does he have no use for it—it even harms him. He loses heart; he thinks himself degraded because he no longer fulfills his function. He has neither strength nor urge for free activity, and since he has gained nothing but empty time, he is barred from all leisure and that abundance of free activity which stems from creative thought. No connection whatsoever exists between the reduction of work and leisure and free activity; as little, in fact, as an increase in the speed of locomotion implies a rise in morality, or the invention of telegraphy an increase in clear thinking.

Still, it is not idle to ask whether the machine has raised or lowered the amount of work. This is a broad problem which can be related solely to the totality of technical and manual labor. We must also ignore the fact that work, by definition, is somehow without limit, that there is always more work than mankind can do. We must try to find the actual amount of working effort to which man is subject. Here we must not allow the legal rules and limitations of work hours to mislead us into hasty conclusions, for these legal limitations tell us nothing of the work actually accomplished, nor do they tell what further claims are made upon the worker by the technical organization outside of working hours. Many believe that in the past men used to work more, that is, longer and harder than today, and when we examine specific information on this point we shall find that this belief is often well founded in those instances where machine labor has displaced hand labor.

But if we disregard details and consider the technical organization as a whole, we realize that there can be no question of a reduction of the total amount of work. Rather, technical progress has constantly increased the total amount of work, and this is why unemployment spreads so far whenever crises and disturbances upset the organization of machine labor. But why does no one calculate this increase of work? The man who looks at a single machine is caught in a naive illusion. There can be no doubt that a bottle-blowing machine produces incomparably more bottles than did the bottle blower who used to make them laboriously by hand. A power loom does incomparably more than did the weaver with his hand loom, and one single worker in a mill can attend to several machines at once. A threshing machine does the work more quickly and more smoothly than the peasant who beats his grain with a flail. But such comparisons are childish and an insult to intelligence.

The bottle-making machine, the power loom, the threshing machine are only the end product of a vast technical process which encompasses an immense amount of work. One cannot compare the performance of a specialized machine with that of one craftsman, for the comparison is meaningless and futile. There is no machine product which does not involve the entire technical organization, no beer bottle and no suit which do not presuppose it. Consequently, there is no work process which can be treated as independent and isolated from this organization, as if it existed by itself like Robinson Crusoe upon his desert isle.

No one has any doubt that the amount of work done by machines has grown. But how could it have grown without a corresponding increase in the amount of work done by men! For the human hand is the tool of tools, the tool that has created and now maintains the whole machine-tool arsenal. Never and nowhere does machine labor reduce the amount of manual labor, however large may be the number of workers tending machines. The machine replaces the worker only where the work can be done in a mechanical fashion. But the burden of which the worker is thus relieved does not vanish at the command of the technical magician. It is merely shifted to areas where work cannot be done mechanically. And, of course, this burden grows apace with the increase in the amount of mechanical work. No complicated calculations are needed to see this. It is sufficient to observe carefully the relation of the individual work process to the whole technical organization. This observation shows that every advance in mechanization brings with it an increase in manual labor. Those who are not convinced need only consider that our working methods are not restricted to one nation, or one continent. They strive to master all the nations of the earth, and the biggest share of hard and dirty work is piled upon the shoulders of people who have no part in the invention of the technical organization.

III
The Delusion of Wealth

Mostly deeply rooted of all the illusions which technical progress creates is probably that of the riches produced by it. At bottom, no one doubts that industry increases our riches, and that it does so all the more, the further industrialization is spread by technical progress. It appears that there are historical and economic situations encouraging such a conviction—there are periods of prosperity which seem to strengthen and support it, the most fruitful being those brought about by the head start in mechanization which a few European nations had secured. It was an advantage resulting from a position of monopoly which could not be maintained, which dwindled away as technical thinking spread around the earth. It would be as interesting to study the causes of these advantages created by technical progress, as it would be to determine the events which put an end to them. The common feature of every advantage of this sort is the exploitation of a propitious situation.

But what are riches? If we want to get to the bottom of the thing, this question must be asked. The notions on this point are full of confusion, owing to jumbled concepts. Riches, by definition, are either a being or a having. If I conceive of them as a being, it is obvious that I am rich not because I have much—rather, all having is dependent upon the riches of my nature. So conceived, riches are not something which alight upon man or fly away from him; they are an endowment of nature, subject to neither will nor effort. They are original wealth, an added measure of freedom which blossoms forth in certain human beings. For riches and freedom are inseparably joined together, so intimately that riches of any kind can be appraised by the measure of freedom they contain. Riches in this sense may even be identical with poverty; a rich being is consistent with a not-having, with a lack of material possessions. Homer means just this when he calls the beggar a king. Only such riches as are mine by nature can I fully command and enjoy. Where riches consist in having, the capacity for enjoying them does not

necessarily go with them. It may be lacking—a frequent case.

Where riches are one with rank, they also have that strength that is subject neither to change nor chance. They are as lasting and stable as are those treasures that cannot be spent nor consumed by time. But riches that are a mere having may be taken from me at any moment. Most men, it is true, believe that riches are created by one's enriching himself—a delusion they have in common with all the rabble on earth. Only poverty can enrich itself. Poverty, by analogy with riches, is either a not-being or a not-having. Where it is not-being, it cannot be conceived as identical with riches which are being. Where it is not-having, it may be identical with riches: when a material not-having coincides with a rich being.

In all Indo-Germanic languages, riches are conceived as a being. In German, "rich" (*reich*) and "realm" (*Reich*) are of the same root. For "rich" here means no less than *mighty*, *noble*, *regal*, as one finds it in the Latin *regius*, And *Reich* is the same as the Latin *rex*, and the Sanskrit *rajan*, meaning king. Thus, riches in the original meaning are nothing else than the ruling, regal power and force in man. This original significance has been buried, particularly by the jargon of the economists who equate riches with economic having. But no one sensing the truth of the deeper meaning would want to accept so vulgar a conception. Possession of money, the sheer having of money, is contemptible, and it always becomes contemptible if it falls into the hands of that poverty which denotes a not-being. Unfailingly, the mark of riches is that they lavish abundance like the Nile. Riches are the regal nature in man which goes through him like veins of gold. Riches can never be created by him who is born only to eat up—the mere consumer.

Can I become rich at all, by work or any other means? I can if I conceive riches as a having. What I do not have, I may have at some future time. What I do not have, I may have had in the past. The most ingenious definition of riches as a having is that of Aristotle. He defines riches as an abundance of tools. It is worth noting that he gives a technical definition and not an economic one. But to get back to our subject: Is technology identical with an abundance of tools? True, there is no lack of tools, although not of the kind Aristotle means in his definition, for he has neither mechanisms nor machinery in mind. By definition, technology is really nothing but a rationalization of the work process.[1] But when have riches ever been created by rationalization? Is rationalization a sign of riches at all? Does it stem from abundance? Is its aim abundance? Or is it not rather a method which is used wherever a lack

is felt, wherever want is suffered?

At what moment does it occur to the working human being to rationalize his work process? At the moment when he wants to save labor, when he becomes aware that he can get the fruits of his work in a quicker, easier, cheaper way. But how can the endeavour to cheapen things create riches? By raising the work performance and producing more goods, it will be answered. Indeed, just such an answer can be expected from the shallow mentality of the economist. If the result could be achieved as cheaply as that, we who are heirs to the pioneering work of generations should literally be swimming in riches of every kind. If we could get riches by raising production, by increasing the output of labor, we should have got them long ago, for the amount of mechanical and manual labor we are performing has been on the increase for a long time. If it were so, the signs of wealth would be apparent everywhere: greater freedom, greater happiness, greater abundance. But there is no trace of this. The fact that technical progress has enriched a small and not always pleasant group of industrialists, entrepreneurs, and inventors must not mislead us to the conclusion that it has created riches. It would be just as wrong for us to harbour the foolish notion that some exceptionally noble race of men had created our technology, or that scientists, scholars, and inventors were charitable by nature, for they are not. Their knowledge has nothing to do with riches, and therein lies the difference between all merely erudite knowledge and the knowledge of the wise. In the words of Pindar, wise is he who knows by nature much, in contrast to him who has accumulated much learning on the surface.

Where increased production and increased work are the consequences of a scarcity that had to be relieved, where they are due to an increase in consumption, they obviously cannot create riches. Every rationalization is the consequence of scarcity. The expansion and constant perfection of the technical apparatus are not merely the result of the technician's urge for power; they are just as much the result of want. This is why the human situation characteristic of our machine world is poverty. And this poverty cannot be overcome by any technological efforts; it is inherent in technology itself; it has marched in step with the industrial age and it will do so to the end. It marches on in the shape of the proletarian, brings the man who has no homestead and grows no ear of corn, who has nothing but his bare working capacity, and who is tied to technical progress for better or worse. Therefore, it makes no difference whether the technical apparatus is controlled by

the capitalist, or by the proletarian, or run directly by the state. Poverty remains because it is in the nature of the thing, because it is the infallible by-product of technical thinking, which is completely rationalist. True, there has always been and always will be poverty, because the poverty which by definition is a not-being cannot be resolved and by its very nature will always be with us.

But the poverty produced by technological progress has something specific about it which sets it apart. It can never be conquered by an unfolding of rational thought, nor by attaining the ultimate in rational work organization.

IV
The Distribution of Poverty

The belief that technical organization can create something beyond its technical objectives needs re-examination. We must discover the role which illusion plays in this context. Today, faith in the magic power of technical organization is more widely held than ever, and there is no lack of eulogists who extol it as a cure-all. But every process of organization has two sides, and if we want to count its cost, we must first understand its double-edged nature.

There is no need to deny the advantages of technical organization, or the extension of power it brings, but it will be well to recognize clearly the limits of its effectiveness. We are using here the concept "organization" in the definite and limited sense it has in the vocabulary of technical progress. It comprises all the influences which the development of the machine exerts upon man. If we look at a large automaton such as a 30,000-ton liner powered with Diesel engines, we find that the ship's crew is subordinate to an organization which is a functioning of the ship's mechanism and is determined by that mechanism's size, structure, and technical equipment. This relationship between the technical apparatus and the organization of human labor is a ubiquitous feature; we shall come back to it shortly.

To find the limits of technical organization, the question must be asked: What is its object? It will not do to answer: Man, and all the resources at his disposal. A distinction needs to be made between what is organized already and those things which have not been organized because, so far, the technical organization has not absorbed them fully, or not at all. Obviously, the object of the organization cannot be what is already organized; the organization must necessarily seize upon the things as yet unorganized, for only they offer the means to keep the organization alive. If I manufacture nuts and bolts, the material I am using will not be finished nuts and bolts but iron melted from crude ore. But here a peculiar and compelling law governs. Where there is plenty of unorganized material, organization is slight. Where material

dwindles, organization begins to extend and intensify itself. Clearly one cannot forbid ocean fishing, because the ocean is so big and full of fish that an organization placing ocean fishing under definite regulations would make poor sense. Wherever such regulations exist, as in the international agreements on whaling and sealing, they are due to an anticipation of scarcity, the fear that ruthless and excessive hunting might reduce or wipe out the stock of game.

The purpose of such organization is obvious. Its salient feature is not that it increases riches, but that it distributes poverty. But when poverty is distributed something occurs that cannot be prevented: it spreads. Thus it has to be distributed constantly anew; it has to be distributed continually, and so it spreads ever wider. Unorganized material decreases in proportion until the point is reached where the organization collapses, because nothing is left to be distributed, for when the number of whales has been reduced by ruthless whaling to the point where the hunt no longer makes sense, whaling stops. It is not at all certain that whales will become extinct in just this fashion—but if they do not, it will not be due to any merit of the whaling organization, whose technical equipment approaches perfection in the same ratio as the number of whales dwindles. This exact proportion applies to all organizations which are based on exploitation, whether they are concerned with whales, ore, oil, guano, or what-have-you. We have chosen the example of whaling simply because it is a singularly revolting case, for it is revolting that man chases these great sea mammals, embodiments of the might, the abundance, the loveliness of their element, thinking only of turning them into train-oil and soap.

No one would consider rationing wealth and plenty, but scarcity and want immediately call forth regulation. The mark of these scarcity organizations is that they neither produce nor increase anything. They only mine the wealth already existing, and they do it all the better, the more rationally they are contrived. There is no clearer, no more infallible sign of poverty than the progressive rationalization of organization, the comprehensive administration and management of man by a bureaucracy of experts especially trained for the task. Speaking in the technician's terms, the best organization is that which is most rationalized—that is, the one which exploits to the fullest extent. For the more rational it is, the more inexorably it mines available resources. In an economy based upon the exhaustion of resources, the organization alone survives intact and unimpaired—its power grows as poverty spreads. The relation is reciprocal—unorganized materials vanish as the

organization extends. And as poverty spreads, the pressure of the organization upon man increases, for it becomes more urgent to squeeze the last drop from him too. This mercilessness is characteristic of all moments of human distress. Beleaguered towns, blockaded countries, ships whose food and water are running low show like conditions.

Technical progress—and we shall have occasion to return to this point—is coupled with a growth of organization, with a mushrooming bureaucracy.

It requires an enormous personnel, a personnel which is wholly unproductive, yet increasing in number all the faster, the less there is of the things produced.

V
The Pillage of The Earth

Industry is the daughter of poverty. –Rivarol.

I love machines; they are like creatures of a higher order. Intelligence has freed them of all the woes and joys which are the lot of the human body in its activity and its exhaustion. Machines on their concrete bases act like serenely meditating Buddhas, squatting on their timeless lotus. They vanish when more beautiful, more perfect ones are born. –Henry van de Velde.

Why does the contemplation of machines give us such pleasure? Because they manifest the fundamental form of man's intelligence, because before our very eyes this constructive and combining intelligence masters and amasses power, because they win a ceaseless triumph over the elements which they beat down, squeeze, and forge. Let us enter the workshop, then, to see what goes on.

The impression we gain as we observe technical processes of any sort is not at all one of abundance. The sight of abundance and plenty give us joy: they are the signs of a fruitfulness which we revere as a life-giving force. Rooting, sprouting, budding, blooming, ripening, and fruition—the exuberance of the motions and forms of life—strengthen and refresh us. The human body and the human mind possess this power of bestowing strength. Both man and woman have it. But the machine organization gives nothing—it organizes need. The prospect of vineyard, orchard, or a blossoming landscape cheers us, not because these things yield profits, but because of the sensation of fertility, abundance, and gratuitous riches. The industrial scene, however, has lost its fruitfulness; it has become the scene of mechanical production. It conveys, above all, a sense of hungriness, particularly in the industrial cities which, in the metaphorical language of technological progress, are the homes of a flourishing industry. The machine gives a hungry impression. And this sensation of a growing, gnawing hunger, a hunger that becomes unbearable, emanates from everything in our entire tech-

nical arsenal.

When we enter a factory, be it a cotton mill, a foundry, a saw mill, or a powerhouse, everywhere we get the same impression. The consuming, devouring, gluttonous motion racing through time restlessly and insatiably, reveals the never stilled and never to be stilled hunger of the machine. So obvious is this hunger that even the impression of concentrated power which we receive in the centers of heavy industry cannot overcome it. In fact, it is strongest in these centers, because precisely here we find the greatest greed for power. And the rational mind which stands behind the machine and keeps watch over its automatic, mechanical motion—it too is hungry, and hunger follows it everywhere. It cannot shake off hunger; it cannot free itself from it; it cannot be stilled, however hard it may try. And how, indeed, could that be possible! This mind itself is consuming, gluttonous, and it has no access to riches; it cannot conjure up abundance. No effort of ingenuity, not all the inventive power that is brought to bear here can do it. For rationalization only sharpens hunger and actually increases consumption. This growing consumption is a sign not of abundance but of poverty; it is bound up with worry, want, and toil.

It is precisely the methodical, disciplined effort leading to the perfection of the technical processes which destroys the basis for the hopes that certain groups place in this perfection. Progress in its present rapid advance creates an optical illusion, deceiving the observer into seeing things which are not there. Technology can be expected to solve all problems which can be mastered by technical means, but we must expect nothing from it which lies beyond technical possibilities. Since even the smallest mechanical process consumes more energy than it produces, how could the sum of all these processes create abundance?[2] There can be no talk of riches produced by technology. What really happens is rather a steady, forever growing consumption. It is a ruthless destruction, the like of which the earth has never before seen. A more and more ruthless destruction of resources is the characteristic of our technology. Only by this destruction can it exist and spread. All theories which overlook this fact are lopsided because they disregard the basic conditions which in the modem world govern production and economics.

In every healthy economy the substance with which it works is preserved and used sparingly, so that consumption and destruction do not overstep the limit beyond which the substance itself would be endangered or destroyed. Since technology presupposes destruction, since its

development depends upon destruction, it cannot be fitted into any healthy economic system; one cannot look at it from an economic point of view. The radical consumption of oil, coal, and ore cannot be called economy, however rational the methods of drilling and mining. Underlying strict rationality of technical working methods, we find a way of thinking which cares nothing for the preservation and saving of the substance.

What is euphemistically called production is really consumption. The gigantic technical apparatus, that masterpiece of human ingenuity, could not reach perfection if technological thought were to be contained within an economic scheme, if the destructive power of technical progress were to be arrested. But this progress becomes all the more impetuous, the larger the resources at its disposal, and the more energetically it devours them. This is shown by the concentration of men and machines in the great mining centers where the mechanization of work and the organization of man are most advanced. The rationality of technology, so impressively displayed here, becomes intelligible only when one has understood the conditions on which it depends. Its concomitant is waste and contempt for all rationality in the exploitation of the resources on whose existence technology depends, as the lungs depend on air.

Where wastage begins, there begins desolation, and scenes of such desolation can be found even in the early days of our technology, in the era of the steam engine. These scenes are startling by the extraordinary ugliness and the Cyclopean power which are characteristic of them. The machine invades the landscape with destruction and transformation; it grows factories and whole manufacturing cities overnight, cities grotesquely hideous, where human misery is glaringly revealed; cities which, like Manchester, represent an entire stage of technology and which have become synonymous with hopeless dreariness. Technology darkens the air with smoke, poisons the water, destroys the plants and animals. It brings about a state in which nature has to be "preserved" from rationalized thinking, in which large tracts of land have to be set apart, fenced off, and placed under a taboo, like museum pieces. What all museum-like institutions make evident is that preservation is needed. The extension of protected areas, therefore, is an indication that destructive processes are at work.

Mining centers, in particular, are the focal points of organized pillage, where the riches in the earth are exploited and consumed. Human pauperization begins with the proletariat of the masses who are indoc-

trinated to factory work and kept on a low level of existence. The exploitation of the factory worker (about which socialism is indignant only so long as it is in the opposition) is an inevitable symptom of the universal exploitation to which technology subjects the whole earth from end to end. Man no less than ore deposits belongs to the resources subject to consumption by technology. The ways in which the worker tries to evade this exploitation—associations, labor unions, political parties—are the very methods which tie him forever closer to the progress of technology, mechanical work, and technical organization.

The obverse side of technology is a pillage which becomes constantly better organized; this must not be overlooked when one speaks of technical progress. True, we have made a technical advance if by means of artificial fertilizers we succeed in squeezing uninterrupted crops out of our overburdened plough and pasture land. But this advance itself is at the same time the consequence of a calamitous deficiency, for if we did not have the fertilizer we should no longer be able to feed ourselves at all. Technical progress has deprived us of the free choice of nutriment which our ancestors possessed. A machine which trebles the output of a previous model constitutes a technical advance, for it is the result of a more rational design. But for this very reason it also possesses a more intense consuming and devouring power. Its hunger is sharper, and it consumes correspondingly more. In this way, the whole realm of the machine is full of a restless, devouring power that cannot be satisfied.

Closely linked to this is the rapid wear and tear the machine suffers. That most of our machines become junk so soon results from their design and purpose. Their durability, strength, and usability are lessened, restricted in the very degree to which technology approaches perfection. The consumption brought about by technology extends even to its own apparatus. The repairs and replacements these mechanisms constantly demand represent an immense amount of human labor. And the machine falls quickly into that state of disrepair in which we see it around us everywhere. Technical progress covers the earth, not alone with its machines and workshops, but also with junk and scrap. All this rusty tin, the twisted girders, these bent and broken machine parts and castaway tools—they remind the thoughtful observer of the fleeting impermanence of the process he witnesses. Perhaps they keep him from overestimating all this progress and help him to improve an understanding of what really goes on. Wear and tear is a form of consumption; it manifests itself pre-eminently where plundering goes on and so

we find it in particular wherever technology is at work.

If two thousand years hence there should still be archaeologists—which is rather unlikely—who were to undertake excavations, say, in Manchester, Essen, or Pittsburgh, they would find but little. They would discover nothing as enduring as Egyptian burial chambers and classical temples. For the stuff with which the factory system works is not *aere perennius* ("more lasting than bronze"—Horace). These archaeologists might even be surprised at the paltriness of their discoveries. The earth-spanning power of technology is of an ephemeral kind—a fact easily overlooked by those engrossed in it. Everywhere it is threatened by decay, given over to decay, and decay follows upon its heels all the more insistently and closely, the faster it marches on towards new triumphs.

The machine does not create new riches. It consumes existing riches through pillage, that is, in a manner which lacks all rationality even though it quickly employs rational methods of work. As technology progresses, it devours the resources on which it depends. It contributes to a constant drain, and thereby again and again comes to a point where it is forced to improve its inventory and to rationalize anew its methods of work. Those who deny this, claiming that it is the wealth of new inventions which made the existing apparatus obsolete, are confusing cause and effect. Inventions presuppose a need for improvement; their purpose is the rationalization of work. Nor can the technician legitimately blame the steadily growing deficits of the technical work process and the recurrent crises and disturbances it causes upon the political organization, charging that the competing political powers of this earth are burdening the industrial production with unjustifiable costs. Such is indeed the case: for the principle of competition is a political and economic rather than a technical one. However, even if the world were one single state, even then the machine would push the process of rationalization to the extreme. The process of rationalization would manifest itself in a free economy no less than in the kind of planned economy that goes hand in hand with technology. When the engineer destroys free economy—that is, the economy in which the businessman rules autonomously—then he forces the economy to adopt a plan designed by the engineer. To any such planned economy there applies what we have said before about the end effects of organization.

When economic crises can no longer be overcome by economic means, human hopes turn towards stricter rationalization of technology: the idea of technocracy arises. But first we should examine whether

it is not technology itself which brings about such crises. We should examine whether technology is capable of putting our economy in order and whether such an ordering falls within the scope of its tasks at all. What does "technocracy" mean? If the word has any meaning, it can only be that the technician rules, that he takes over government. But the technician is no statesman; he has no talent for politics. His knowledge is one of technical, functional effects. All technical knowledge is marked by an impersonalism that necessarily results from the purely material facts that it deals with. This impersonalism is reason enough to doubt whether the technician is capable of taking over and running the affairs of state.

VI
Technology vs the Profit Motive

It cannot be denied that technical thinking is rational, and that technical methods of work are shaped and ruled by rational considerations. Rationalization is a demand made on every single technical work process, a demand it cannot escape. The incessant effort to improve the apparatus of technology through rational thinking expresses the drive for the perfection of the work process. The process has to be freed from its imperfections in order to fulfil its given task in a perfect manner. But it is imperfect, not so much because of the factors which render it expensive and costly—such imperfection is economic; it is imperfect rather because it does not fully achieve its purpose in technical terms, because it is not yet purely technological. To make it so is the goal. A machine that converts heat into work is imperfect not because it is expensive to build, but because its efficiency stays below the possible maximum as determined by Carnot's law of thermodynamics.

So far, hardly any attention has been paid to the fact that technical and economic rationalism do not coincide, that they differ in purpose and in aim. The aim and purpose of all intelligent economy—whether of an individual or of a community—is that it yield a profit. But the aim of the technician is technical perfection. What concerns the economic man is whether a work process is profitable. But to the technician, economics, like any other activity, is something which must be subject to rationalized, technical thinking. Such difference in their desires for power creates the current rivalry between technical and economic thinking. Economic thinking, which demands autonomy, cannot be a matter of indifference to the technician. He will not accept the fact that technical progress is made subservient to, and remains dependent on, the purposes of business.

This battle breaks out everywhere, and the superior power of the

technician is evident in his fighting, not by means of ideologies, but by inventions. The economic man who buys up a technical patent to keep it locked in his safe is already on the retreat. His use of delaying tactics shows his inferiority. He is even forced to furnish the technician with new weapons for his attack. The fact that an installation is profitable is no reason for the technician to give up his striving for technical perfection. He will ruin even a profitable enterprise if it refuses to give in to his demands for technical rationalization. He ruins the manufacturer by unpredictable inventions. It is he who overnight creates new industries and new technical equipment. He cares no more for the welfare of the capitalist than for that of the proletarian. He is not concerned with incomes, or interest rates, or the standards of living they afford. This indifference to prosperity, to economic profit, may well be called "ideal" inasmuch as it is an expression of his superiority over the economic man, whose doctrines he overthrows without qualms. It was he who, by his invention of the power loom, drove the craftsman from his hand loom and forced him to become an operator in a mill, a proletarian. In this act his intent was not to enrich the capitalist at the expense of the factory worker, but he accepted this consequence without compunction. He was interested above all in developing the technical mechanism, and not at all in who profited by it. An idealist of science for science's sake like Roentgen, for example, refused categorically to draw any kind of economic profit from his invention of the X-ray machine. This refusal was not without an understanding of power relationships, for the scientist or engineer who thinks of profits first becomes a captive of economic thinking.

However, the dependence of technical thinking upon economic thinking dissolves to the degree to which economy becomes subservient to technical rationalization and has to give in to the compulsion exercised by the technician. Economic man can no longer escape the technician's drive for perfection. Wherever he tries to, he is choked by technology's firm leash. The technician determines the form of the working process and thereby gains influence upon the actual work itself. The superiority he maintains is well founded. He is superior because he thinks in terms of absolute rationality, whereas the economic man thinks only on the inferior level of functional rationality. Religious, political, social, and economic considerations are excluded from technological thought processes to which they have no necessary relationship. We see here a striving for power that is successful and terrifying precisely because it keeps aloof from monetary rewards.

Technology does not work according to economic laws. It is economic life that becomes ever more subservient to technology. We are approaching a point—here and there we have already reached it—where technological rationalism in production is more important than the profit produced. In other words, technological improvement must go on even if it spells financial loss. This symptom of economic distress is also the sign of growing technical perfection. Technology as a whole has absolutely no interest in dividends and can never develop any. It grows at the expense of economy; it increases economic emergency; it leads to an economy of deficit which grows the more strikingly obvious, the more triumphantly the perfection of technology progresses.

VII
The Invasion of Life by Automatons

By what sign can we distinguish most clearly the striving for perfection, that leitmotiv of technology? By what phenomena can we best measure technical progress as it has developed from crude and uncertain beginnings? No doubt the change from the steam engine to electricity presents such a landmark. Another would be the close cooperation that is being established between technology and biology and is leading to biotechnics, within which the laws of mechanics are applied to life.

But when we observe the work processes of technology, the striking feature is the growing automatism to which they become subjected. Technological progress is synonymous with an increase of all kinds of automations. The entire work process, up to the finished product, is performed by automatic machinery and with repetitious mechanical uniformity; the entire factory becomes one single automaton. The worker no longer manually interferes with the automaton. All he does is to control mechanically some automatic operation. And just as the work processes which result in the end product are performed by an automaton, so the end product itself is very often an automaton designed for repetitious mechanical work processes.

Here lies the difference between the automaton and all tools requiring continuous handling; its purpose is automatic and uninterrupted mechanical functioning. We are surrounded by an automatism towards which all branches of technology are developing. The greater part of our production tools work automatically. Our transport is automatized in the form of the ubiquitous railways, motor ships, motor cars, airplanes, elevators, and so on. Our light, water, and heating systems function automatically. With our automatic weapons it is the same. There are vending and food-serving automatons, radio and movie automatons, all of them designed for the task of repetitious performance with mechanical uniformity, just as a phonograph record repeats the same piece

over and over. It is exactly this automatism which gives its peculiar stamp to our civilization and sets it apart from the techniques of other eras. It is automatism by which our technology achieves its growing perfection. Its signature is the independent and unchanging repetitious operation of its apparatus.

Mechanical work processes have grown immensely, both in number and in scope, and it is obvious that their automatism, controlled and watched as it is by man, in turn has its effect on man. The power that man gains by his automatic tools gains power over him. He is compelled to give them his thought and his attention. Inasmuch as he works with automatic tools, his work becomes mechanical and repetitious with machinelike uniformity. Automatism clutches the operator and never relinquishes its grip on him. To the consequences of this we shall return again and again.

The invention of the automaton dates from antiquity, as is shown by the dove of Archytas and the robot of Ptolemy Philadelphos. These much admired mechanisms, like the automatons of Albertus Magnus, Bacon, and Regiomantus, were ingenious toys; nothing more serious. They evoked not only wonder, but also fear. The robot of Albertus Magnus, which could open the door and greet the visitor (the fruit of decades of effort), was smashed by the startled Thomas Aquinas with a blow of his stick. The intellectual fascination which machines have held for man from the earliest times is coupled with a presentiment of the uncanny, an almost unaccountable feeling of horror. We sense this in Goethe's remark on the advance of mechanical factory work, and in the shudder with which E. T. A. Hoffmann and Edgar Allan Poe viewed the automatons and mechanical figures of the early nineteenth century, among which the mechanical flute player, the drummer, and Vaucanson's mechanical duck are the most important.

This is the same horror that has of old seized man in the presence of clocks, water mills, wheels—in the presence of any work or contrivance which acts and moves although it has no life of its own. The beholder is not satisfied to study the mechanics; he is not satisfied with the understanding of their operation; he is disquieted by their mechanical action. This motion produces the illusion of life, and this illusion, once he has looked through it, is precisely what is so disturbing. Myths, sagas, and fairy tales recognize no distinction between animate and inanimate nature; they give life even to the lifeless by various personifications. That such a distinction is not recognized is the basis of poetry which voices itself by metaphor, analogy, and image; it is the basis, too, of all epic

song. Orpheus, for example, to whom was ascribed the gift of enlivening the very stones, is the arch poet and arch singer. The machine, however, gives the impression that something lifeless penetrates into, and permeates life. This is what the observer senses and what evokes in him ideas of age, coldness, death, akin to the awareness of a lifeless, mechanically self-repeating time such as clockwork measures. It is no accident that the clock was the first automaton to achieve signal success among men. In the philosophical system of Descartes, animals, which are treated as automatons, are nothing but clocks whose movements operate under mechanical laws. Here, then, we touch upon the problem of time, a problem which is inseparable from the automatism of motion. At this point, therefore, we shall have to deal with those theories about time which have had an influence upon technology and, next to that, with the role which the various methods of measuring time have exercised.

VIII
The Invasion of Life by Dead Time

Tempus absolutum quod aequabiliter fluit –Newton

According to Galilean and Newtonian mechanics, time is an absolute. The time that Newton describes is a general and universal time–*tempus absolutum quod aequabiliter fluit* ("absolute time which flows at an even pace"). According to Kant, time has no absolute reality, neither subsistent nor inherent. As a subsistent reality, time exists only in the myth, where Kronos unsexes his father with a diamond scythe, or in the heads of people who make time, the non-thing, into a thing. Nor does time have a reality inherent in things. Since time is an a priori concept, the connection between time and things is cut; experience cannot gain admittance. Kant uses his premise that the concept of time is given a priori to deny it absolute reality, either subsistent or inherent.

This time, which neither represents anything in itself when I subtract objects from it, nor is inherent in things, is therefore an ideological concept, a form without content, an intellectual pattern. This pattern is not like an empty box or, as has been said, an empty apartment house. It can be likened to the emptiness of a box—without the box. If, then, time is not inherent in things one must conclude that all the dying, wilting, withering has in reality nothing to do with time, and that the language of all peoples, as it expresses the inherence of time in things through countless words, idioms, phrases and proverbs, is on the wrong track. According to Kant, holidays are contained in time, but time is not contained in holidays. Rhythm is in time, but time is not in rhythm. It follows that all this being born and dying, all this movement remains outside of time, time is merely an idea, an intellectual pattern which has nothing to do with things. For what have life and death, what has all this movement to do with time in that case? Even though Kant denies the absolute reality of time which Newton asserted, he does agree with Newton on other properties of time. He, too, has the notion

of a single, universal, infinite, and infinitely divisible time that is irreversible and cannot be measured by itself but only by the time-space movements of bodies. Here, time always equals time. The relation of time particles is quantitatively measurable, but all these particles are alike in quality and form. And these time particles, if they are not simultaneous, flow along in a steady stream like channeled molecules, but without being molecular by their nature. Or one could liken them to a reel which rolls off from infinity to infinity with unchanging, uniform speed. Kant's concept of time betrays that it was influenced and shaped by Galilean and Newtonian mechanics. Thereby it has become somewhat mechanical itself. For obviously, time is here understood as something lifeless, something rigid. And indeed, he who reads Newton's fundamental dicta on the nature of time receives an impression of death's majesty and of eternity's awe.

Newton accords absolute reality to this linear, uninterrupted motion by which time rolls on inexorably. According to Kant, it is merely an intellectual construction, in which alone it has existence. Time, Kant states, determines "the relation of ideas in our inner state. And just because this inner vision takes no physical shape, we try to make up for this lack through analogies, and represent the sequence of time as a line going into the infinite, a line which reduces all things in a row to one dimension only. From the properties of this line we then conclude all the properties of time, with the sole exception that the parts of the line exist simultaneously, whereas the parts of time always follow one after the other."

However, there is still another reason for this linear concept of time. The concept is due to the fact that space and time are here understood as completely unrelated to each other. Neither space-times nor time-spaces are considered as existing. Linear time passes through space, without touching it; space stretches in a like manner through time. If this strict separation of time and space is accepted, then the linear concept of time remains, indeed, the one most intelligible and most convincing, since a uniform and undisturbed flow of time can only be imagined as a line. We mention this in view of those modern theories of physics in which this separation is replaced by an indissoluble union between time and space—a concept that leads to quite a different interpretation of the universe.

To most people it is immediately convincing that there should be a single, infinite, and infinitely divisible time. Perhaps this is because it is analogous to a single, infinite, and infinitely divisible space: perhaps,

too, because this concept reduces everything to the simplest formula. Could it be that there are two, several, or an infinite number of times? If time is inherent in things in such a manner that the nature of the thing affects time, or the nature of time affects the thing, does it not follow that there must be an infinite number of times? Apart from the relations between things, must not there also be relations between times which are distinguished not only quantitatively by measurement, but qualitatively, according to their structure?

Only so long as our theoretical perceptions remain limited to the field of the mathematical and physical sciences can we content ourselves with a mechanical definition of time. But if we break through these limitations, can such mechanical definitions continue to satisfy us? Can we then content ourselves with such statements as, for instance, that time exists a priori and is to be imagined as a line? Or that speed, within the same space, is in the inverse ratio of time? Here arises the question of the role which is played by our measuring methods, for we not only regulate time by means of clocks; these clocks in turn regulate our time. These two processes of measuring differ. When we study the relationship between them, it becomes clear that the measuring of time and its particles by means of timepieces that record the mechanical flow of time does not exist for its own sake. Rather, it is tied closely to the second measuring process whereby our timepieces regulate our time. This deadlock is by no means broken if we assume that a recurrent event in nature requires always the same amount of time. Instruments based upon recurrent natural events have been designed, such as the quartz clock. By such instruments time measurements can indeed be made independent from the rotation of the earth, the uniformity of which is doubtful. But the question still remains whether there are any uniform repetitions at all, whether in all nature there could be found two events which are exactly alike and different only in the moment of their occurrence.

We shall not dwell upon this question which is only of theoretical interest here. We have pointed to it merely to show what counts in the measuring of time by instruments, namely, the mechanically precise phase duplication of whatever the physics are upon which the method is based. The supposition remains that time equals time. If it is accepted, then the determination of the relation between the particles of time depends on the refinement of the methods that can yield constantly more exact measurements. In this measuring process the relation between absolute and empirical time is for the moment of no importance.

From the assumption of an absolute time in the sense of Galilean and Newtonian mechanics, and especially from Newton's definition of time, the conclusion is that time, while it is being moved, does not move itself or change itself. It moves like a machine, that is, it works like an automaton.

For if time moved and changed itself, then it could not "flow at an even pace," as Newton states. Without this assumption there could be no timepieces, for they all depend on the existence of uniform repetition. For the practical purposes of time measurement, it does not make the slightest difference whether we ascribe to time an absolute reality, or whether we consider it a transcendental ideal and an empirical reality. All these definitions, no matter how conflicting in ideology, remain without influence upon time-measuring methods. Improvement of those methods goes on regardless of theoretical disputes.

IX

The Tyranny of Causalism Over Man

Natural science is not conceivable without a recognition of the mechanical element in nature. When natural science goes to work it must discover and determine "that principle of the mechanism of nature without which no natural science could in any case exist" (Kant). Why can there be no natural science without this mechanism? The answer is, that without mechanics there can be no standards which are constantly valid and calculable. Without mechanical laws, that exactitude could not be achieved which in itself is nothing but the mechanical certainty that identical causes always produce identical effects. Thus we are justified in calling the natural scientist a mechanic who deserves scientific respect only in so far as in his thinking he retraces the mechanism of nature. This applies no matter whether the scientist works experimentally or theoretically. Anything beyond is not a part of natural science—for instance, all those disciplines that cannot neatly be reduced to mechanisms. Thus, there can be no scientific aesthetics or physiognomy, and any attempt to establish them as sciences is justly met with distrust and rejection. Lichtenberg's objections to Lavater's physiognomy are irrefutable. There are excellent physiognomists, but there is no way of making physiognomy an exact science. The natural scientist will always exhibit a tendency to delimit his science as sharply and as narrowly as possible, to make it completely methodical, to systematize it. Natural science thus limits itself to what can be proved mathematically, or to that to which the law of causality applies, or to the purely functional. These efforts which, like every heavy fortification of national borders, often give an impression of fear, originate psychologically from a desire for security.

A mechanical concept of time is a precondition to the discoveries and inventions of the exact natural sciences. Without it no natural sciences could exist The scientific concept of exactness and the mechanical concept of time are so inseparably joined that they cannot be di-

vorced from each other in any respect. Without timepieces, there would be no automatons, no science, for without the time-measuring methods on which science is based, science would get nowhere. Scientific methods are not possible without constant control through time-keeping devices. And only when these achieve reliability and exactness can engineering, industrialism, our whole technology exist. Without such time-measuring exactitude it would have been impossible, for example, to construct railroads. For the operation and maintenance of a railroad require clocklike exactness; they presuppose the precise calculation of a schedule that recurs with mechanical uniformity. Is not the railroad itself a clockwork of which we demand that it be "on time," that is, punctual to the minute?

When we study the apparatus and the human organization that have been created by our technology in step with its evolution, it becomes clear that they too depend on the mechanical concept of time, the only concept which can guarantee technical progress. How clockwork-like is not the whole order of modem civilization, how relentlessly does not technical progress strive to subject everything to this clocklike precision: man's sleep, his work, his rest, and his pleasures!

Causalism—a point to which we shall return—can become a tyrant only where its cycle through time becomes mechanically calculable and repeatable, where it can be broken up into a line-up of functions. Where causalism becomes dominant, it produces a mechanical order akin to it; it brings to the fore a watchmaker mentality. Where are the limits of this mentality? If the universe were to be conceived as a big clock and every movement in it as mechanically measurable and predictable, then the high goal of scientific-technical thinking would be the comprehension of this central mechanism. And the application of that knowledge would mean the complete mechanization of man.

X

The Victory of Dead Time Over Life Time

Clock time is lifeless time, *tempus mortuum*, in which second follows second in monotonous repetition. Lifeless, clock-measured time flows along side by side with the life time of man, but aloof from it, utterly regardless of the high and the low tides of life where no two moments are alike.

To the reflective mind, the clock summons up the thought of death. The figure of the dying Charles V, pacing among the clocks in his collection and attempting to regulate their movements, emits the frost of death. He watches, and he listens to, the passing of time that inevitably leads to death. The constant sight of clocks all around us has accustomed us to seeing in them mere time-keeping devices. But in an era when the public clock, visible from far off, was still looked upon as a rare masterpiece, it proclaimed an unmistakable *Memento mori*, "Remember you will die." A study of the artist's use of the clock as a symbol of death would yield abundant material in this respect. One need think only of Holbein's "Dance of Death," with death holding the hourglass in its bony fingers.

The beholder of a clock becomes conscious of time only in its emptiness; all time that enters our consciousness in this fashion is dead time. An automaton gives us the same feeling of lifeless, mechanically repetitious time; it is nothing essentially but a timepiece, which performs smoothly within the dead clock time. Without clocks there are no automatons.

Thus, a connection, indeed, exists between the triumph of Calvinism in Geneva and the establishment of the watchmaking industry of that city in 1587. Calvin had developed the idea of predestination with an inexorable logic, with a consistency never matched in the Catholic church, neither by Augustine nor by Gottschalk, nor by Wycliff, nor by the Jansenists. The doctrine of God's decree of reprobation, placed prior to man's fall by the stricter school of Calvinism, reaches in its more ar-

dent advocates a mechanical severity. In reading Calvinist theologians, one cannot escape the impression that they conceived God as the Great Watchmaker, and that Calvinism even more than Lutheranism constitutes a starting place for causalist thought. Even Luther's strict doctrine of predestination, side-stepped and weakened by the formula of the concordat, still lacks the clocklike exactness of Calvinist theology. We may recall here that Rousseau was both a Calvinist and a watchmaker's son. He became a Catholic, returned to Calvinism, and dedicated the second of his prize essays, *Discours sur l'inegalite*, to the Great Council of Geneva.

The history of the origin and gradual development of clocks tells us how the measuring devices that control the flow of time have become progressively more refined and more exact. The precision of chronometers and chronometric methods shows the increasing importance accorded to them. Let us remember the almost simultaneous invention of the pendulum clock by both Ruyghens and Hevelius, an invention based on Galileo's studies of falling bodies. Such simultaneity gives a fine illustration of the determined thought at work for this development.

Today, the minutest particles of time are measured with precision. Technical centers furnish and equip man with the exact time. More and more clocklike traits invade man's life and man's work. The question must be asked now what all this is driving at. Time-measuring methods are not ends in themselves. They serve to organize time, to rationalize time, to measure out more and more sharply the consumption of time.

Only measurable, exactly repeatable time is of interest to the epistemologist, the scientist, the technician. For such time, and into such time, he builds his chronometers, his automatons. And with this lifeless time one can do a lot of things. Measuring methods can subdivide it at will. It can be patched together, as pieces of leather are combined to form a belt, or links to form a chain running over a toothed wheel.[3] It can be split and chopped up at will, something that cannot be done with life time or with the organisms living in it: seeds, blossoms, plants, animals, men, organic thoughts. This is why technology works with fragments of time, and just as it has special designers for every single machine part, so it employs time-study experts—men who watch over the rational exploitation of lifeless time. The intent and the purpose of their methods are exactly like those biologists apply when they split the egg of the sea urchin, or v1v1sect axolotls and lizards to find out how small a part is still capable of living, and what kinds of mutilations their

butchery will produce. For all these are methods which subject live organisms, partaking of vital time, to a mechanical, lifeless time.

As mechanisms gain ground, springing up wherever lifeless time is waiting for them, we can observe how lifeless time has invaded life time. Just as technology has changed our idea of space by making us believe that space has become scarcer, that the earth has shrunk, just so has it has changed our idea of time. It has brought about a situation where man no longer has time, where he is destitute of time, where he is hungry for time. I have time when I am not conscious of time which presses in on me in its empty quality, as lifeless time. He who has leisure thereby disposes of boundless time; he lives in the fullness of time, be he active or at rest. This is what distinguishes him from the man who is merely on leave or on vacation and who, therefore, can dispose of a limited time only. The technological organization of work no longer permits leisure; it grants to the tired laborer only the meager measure of vacation and spare time that is absolutely necessary to maintain his efficiency.

To the extent to which lifeless time can be exploited mechanically, it begins to encroach upon man's life time and to hem it in from all sides. Lifeless time can be measured with the greatest precision; it can be cut up and determined by precise methods, and by these same methods life time is now mechanically regulated, and forced into a new time organization. Man, who rules the machine, has become its slave and has to obey its laws. The automaton forces man to automatic labor. This is most evident in street traffic, where automatism is particularly far advanced. Traffic assumes an automatic nature, and man has to obey it. This is shown in the fact that man is divested of all his qualities except one—he is still recognized as a pedestrian, an object of traffic. As a pedestrian he either obeys the traffic rules, and traffic pays no attention to him, or else he is a violator, a traffic hazard. In the latter case he attracts an attention which must be called humane by comparison with the icy indifference with which well-behaved pedestrians give way to one another.

XI
The Myth of Exact Science

The ultimate hope of classical mechanistic physics was to reach a point from which all causalism could be deduced and explained. The methods of classical physics, in other words, were aimed at the discovery of some universal law. This mechanistic determinism reveals itself most clearly in the theory of La Place, which describes the world as a system of material points having fixed relations to one another. If these relations are known, if the positions and motions of the material points are known for any specific movement, then it is possible, by integrating the differential equations backward or forward, to determine the state of the world at any past or future moment. For example, if we meet the conditions of La Place's theory, we should be able to rediscover the lost works of Praxiteles or of the Greek painters. We should be able to anticipate at will any moment of the future, or to reconstruct any past. Noteworthy in this connection is the fact that, to make these calculations, the material points themselves have to be assumed to be completely rigid and unalterable. It is also obvious that this fiction would allow us only to approach both the beginning and the end of the world, but not to reach them, since the determinations recede into infinity in both directions. The problem of the limits within which physical laws can be applied is never mentioned, nor the question whether the laws of nature may not be changing in the course of time.

This strict determinism is at present disappearing because the laws of physics, in theory, appear to be no more than the results of statistics. The hypothesis that light consists of quanta, and Heisenberg's presentation of quantum mechanics, can no longer be reconciled with the older concepts. Heisenberg's quantum mechanics, in particular, demonstrates that no measuring methods can obtain absolutely exact data of minute events. Every measurement changes the measured object itself. At the end of a physical science which accords only statistical probability to the laws of nature, there stands nothing but the law of large numbers. The strict causality of the course of nature now dissolves into arithmet-

ical probabilities. Since the exactness of the results calculated on probability depends upon the frequency of repetition, exactness vanishes as we move toward the border-lines of diminishing repetitions. But if the laws of nature apply only with that measure of precision which comes from the minuteness of the quanta, then the determination of a state which is far removed from the present becomes the more uncertain the farther removed it is, and the more time separates it from the present.

These hypotheses of theoretical physics reflect an act of resignation in the minds of the physicists, namely, a renunciation of the attempt to pass beyond certain limitations. They restrict the validity of physical laws to a narrower area. In the world of history where nothing recurs, nothing can be predicted. History reaches beyond the realm of physical laws. In the world of physics, the concept of causality as a chain or as a continuous flow is replaced by the concept of a sequence of probabilities. The concept of the universe itself becomes more elastic.

Just as the exactness of calculable determinations is confined to the realm of the infinitely small, so is it also limited in another direction. As we proceed from inorganic to organic chemistry, it becomes evident that the molecular structure of substances grows less and less "stable." When we are dealing with the so-called macromolecules, it is no longer possible to determine the exact number of single molecules that compose them; only the order of magnitude, the degree of polymerization can be determined. Finally, the structure of albumin compounds becomes increasingly more complex to the same degree to which their similarity, and with similarity the frequency of repetition, decreases. Here everything tends toward the individual case that cannot be predicted because it does not admit repetition. In the realm of the infinitely small, the limits are set by Heisenberg's formulation. However, a relation of this sort which substitutes probability for exact causal sequence can obviously not be established in other direction—the direction in which the frequency of identical molecules decreases more and more. For here the limits are set, not by the quantitative minuteness of the event under observation, but by the uniqueness of the molecule.

The methods of physics offer no help to an understanding of processes that cannot be exhausted by measurement. The same applies to the methods of a biology or a chemistry that studies life processes by physico-chemical methods. Nothing much could be gained here if we were to conceive physics as a branch-discipline of biology. In fact, it seems probable that physics would not fare any too well if it were to adopt biological terminology and biological methods, for it would lose

that precision and incisiveness which are among its best qualities.

Proposals to that effect, however, demonstrate the growing desire of the various sciences to become philosophically legitimate. This is most evident in physics, a science which is turning again to philosophy, particularly in its occupation with the concept of time. Moreover, physics is unmistakably turning toward theology, and this is not surprising. For an exact scientist who believes that he has freed himself of theological problems, that he is concerned with a truth and a reality that know no dogma, is indulging in self-deception. He may make such assertions and pretend that he is concerned solely with the knowledge of the laws that govern the processes of nature. That much can be conceded. But this knowledge cannot be isolated, and he who tries to do so does not achieve an independent platform whereon to stand; he merely loses sight of the interrelations of all things. The theory of evolution, the problem of factors, the theory of selection—all converge upon the idea of creation. Among other things, these theories depend on whether we assume a single act of creation, or a continuous creation.

The problem of causality cannot be treated without considering the question of free will or determination, and this question is inextricably tied to the religious doctrines of predestination. The same holds true of the problem of pre-established forms, and of the entire theory of heredity. Connections of this sort can be traced right into the foundations of mechanics. And those who believe that the law of energy in physics, or that wave or quantum mechanics, or the kinetic theory of heat has been "cleansed" of these philosophical connections, simply fail to understand that these connectors are integral and are formative to perception itself. To neutralize them does not mean to liquidate them. The exact scientist merely shuts his eyes to them. Moreover, he likes to believe that only mechanics possesses exactitude. The mathematician, too, assumes that mathematics is the sole source of exactitude. What he overlooks is that the concept of exactitude, like that of purpose, is a relative concept that receives meaning only if the premises are granted. For example, we cannot achieve absolute exactitude of measurement, but we can make our measurement as exact as possible under certain conditions. There is no absolute, universal concept of perfection, only a specific one resulting from the fulfillment of specific conditions. Likewise, there is only a specific concept of exactitude, and only this concept and nothing more is expressed in mathematical and causal exactitude.

Kant believed that there was a science only in so far as there was

mathematics. The same error can be encountered among many mathematicians and physicists who believe that they alone possess exactness. However, they possess it only within their field. There is exactness also in the movements of animals and in the emotions and passions of man. Homeric hexameter or a Pindaric ode has as much exactness as any causal relation or mathematical formula. But this rhythmic, metrical exactness is of another, higher order. That it cannot be calculated is no reason to call it less exact than the results of this or that quantitative measurement.

XII
The Perversion of Freedom

What is the difference between the mechanical causality assumed by today's scientists and technicians and the denials of free will as they have been expressed in the religious dogmas of predestination and in the philosophical doctrines of predetermination?

Free will exists in neither case. Neither is it possible. For he who assumes that man possesses free will is forced to assert indeterminate determination. But this presupposes the existence of an indifference or equality of intention, which leaves unexplained how any decision is ever reached. Such complete equality must lead to a paralysis of the will, by which all decision ceases, because the two sides of the scale on which decision is weighed are in perfect equilibrium. This would be the equilibrium achieved by Buridan's donkey, who starved to death between two stacks of hay. This donkey, however, is a phantasm.

Leibniz observes that the two halves of the world that would result if we drew a vertical line through the center of this donkey are just as little equal to each other as the two halves of the donkey itself. He makes it clear that there cannot be a perfect equality of balance because equilibrium does not exist. But even though the will is not free, the determination to which it is subject is not the same as blind necessity. For where blind necessity rules, there is no need at all for will, free or unfree; in that case, mechanical compulsion would suffice.

The will is not free, but the necessity under which it acts is conditional; it presupposes and needs the will; it cannot act without it. The doctrine of pre-determination is not identical with a doctrine that subjects all things to mechanical functions and makes the causal function the solution of all problems, the *deus ex machina*. If one tried to imagine such a god one would visualize him as a mere functionary and technician, a builder and an operator of machines. His creation would be an automatic factory which aims to transform man also into an automaton. For this is the ultimate goal if the doctrine of predetermination is transformed into a doctrine of mechanical functions including even man's

will. Subordination of the human will is thus perverted to empty functioning.

Quidquid fit necessario fit ("What is done, is done of necessity"). We do not act from free will, but neither do we act under compulsion; otherwise, man could not have, as the saying goes, his own sweet will. We are not forced to act against our will like a convict who is forced by constraint and pressure to act against his will, whose will is bent and broken and who is subjected to an alien will, against his own. The choice of will is forever also a choice of conscience, in the true meaning of the word; we act consciously and not from blind necessity. Although our will is not free, our actions are willed, performed in the consciousness of freedom and of free choice. And this consciousness is justified; it prevails because the choice presupposes our will, because without our will it would not be made. The consciousness of free choice might be weaker in an inactive man, or a man weak in will power. It might be stronger in an active, forceful personality. But it is always there. It is so pronounced that the naive mind is deceived by it into the belief in free will.

Since our will is determined, our freedom is determined also. Thus when we speak of freedom we must understand what kind of freedom we are talking about. We can choose neither the time nor the place of our birth, we can select neither our parents nor our relatives. And just as neither our body nor any of our organs is of our making, but issues from a preformation and pre-ordination that are beyond our influence, so also are our relations to the world predetermined, and every one of our thoughts. Since everything is prearranged, our freedom can lie nowhere else than in the arrangement itself. Freedom is given to man together with his disposition, a disposition which is different in every single individual. As there are eagles and larks, lions and hares, just so man carries within him the marks of greatness, or of loneliness. He has an indelible character, and this character determines the kind of freedom he has. Whether his thought is noble and daring, or diffident, timid, and cowardly; whether he lives a spirited and resolute life, or simply vegetat—these traits determine the degree of his freedom.

If all things were governed by mechanical necessity, there would be no need for free will; in fact, the problem of free will could not arise at all. All would be impact, pressure, driving force. But since there is a *necessitas consequentiae*, a necessity that presupposes and requires the will, our will, although not free, constantly enters our actions and acts by virtue of the freedom accorded us. This freedom is what sets man

apart from the automaton, what separates the free and reasonable creature from the machine. The machine has neither free nor unfree will; it has no will at all.

Therefore, it is a false and misleading comparison which likens the preformation and preordination of the world and all that happens in it to a mechanism, where everything happens mechanically. For a mechanism which repeats the same motions rigidly and uniformly can in no way be compared to the universe, where no two things could be found that are alike, no two causes that could produce the same effect. Since there are no two things that are completely alike, there are no two causes that are completely alike. Hence, the world is not a mill inhabited only by millers; to grind com is not its only purpose. But mills there have always been in it, among them treadmills of the worst sort. There is no doubt that the advance of technology has constantly increased the number of these treadmills, especially by its insistence on the division of labor, for this increases the functionalism of labor while achieving greater mechanical efficiency. Inescapably, such mechanization impairs human freedom. For mechanization brings to the fore the doctrine of mechanical functions and with that a growing conviction that man, too, is subjected to mechanical necessities.

Marx has likened the Hindu weaver to a spider, and this comparison expresses his scorn for manual labor, just as he attributed a certain dullness and stupidity to the life of the peasants whose work, at the time, was predominantly done by hand. But is the factory weaver any less a spider?

Judged by its basic assumptions, Marxism is a modified Spinozism, and it suffers from the errors of Spinoza's system.

The notion that manual labor is monotonous and that this so-called tedious monotony is eliminated by technical progress—this notion is false. The opposite is true. Nor does the heavy, dirty work that man has to do grow less, for there is no decrease in the number of rubbish piles and sewers in the world. Manual labor does not at all decrease with the advance of the machine; rather it increases and, so far as it is in the service of the machine, it changes in its nature.[4]

From the human hand all things originate and into it they all return. All mechanisms have evolved from, and are controlled by, us. Even the most ingenious and accomplished automaton is far from allowing our hands to rest, much less replacing them, for it is not a separate mechanism working by itself, but a part of a vast technical apparatus whose constant development entails an increase in the amount of work. No

one who postulates that all work that can be done mechanically must be done mechanically should support his claim with the assertion that mechanization gives relief to the worker. For mechanization not only increases the amount of mechanical motion and the wear produced by this motion; it also increases the amount of labor. The technician is forever intent upon extending the dominion of the machine, and this is the cause for the demand that all that can be mechanized must be mechanized. But, to take an extreme example, should pedestrians be abolished because we have mechanical conveyances that relieve us of walking?

XIII

Socialism as Surrender to Technology

In the early days of the machine age, the days when the amount of work done mechanically was small, it was not recognized that mechanization must lead to a new organization of work, a planning to which man himself would be forcibly subjected. But with the advance of technology, the consequences of increasing mechanization of work become more and more apparent. Not only are more and more men employed mechanically, but their work also becomes more and more specialized. To scientific specialization is added technical specialization. The growing specialization of the sciences, which creates artificial isolation and departmental walls, has its counterpart in technology as it breaks down and cuts up human work.

It is one of the characteristics of mechanized production that every one of its parts is replaceable and interchangeable. The apparatus can be taken apart, and it can be put back together. Parts that are worn or damaged can be repaired; old parts can be removed and new parts substituted. And it marks a step forward in the organization of technology that these replaceable, interchangeable parts themselves are subject to rationalization, standardization; that they can be typed and standardized in a fashion that extends into every branch of technology. The advantages of standardization are so obvious that they need not be discussed. Standardization is one of the methods which adds to the simplicity, the flexibility, and the perfection of the technological apparatus.

But just as the machine itself can be divided and taken to pieces, so that its parts become replaceable and even interchangeable, so also the work that is done with and by this machine can be divided and taken to pieces. Work can be broken up into functions, forming a chronological chain of mechanical operations, and this in turn leads to the functional employment of the laborer. Mechanized work loses that physical coordination which characterizes all purely manual work.

When we study the typical hand tools, we find that they are adapted

to the human body. Shovel and spade are basically nothing but extensions of the digging hand and the digging arm. The hammer is essentially the fist; the rake has fingers. The handles of these tools, their size, their shape express their close connection with man's body. A good scythe, for instance, and the mower who wields it are perfectly fitted to one another. The meticulous care with which a billiard player selects his cue remains a mystery unless we understand that the one particular cue he chooses from among scores of others is the one which is exactly fitted to his body by virtue of its weight, its length, its taper, and other qualities. Only if we understand this relationship can we understand why all play, why all work is beneficial, provided that it is appropriate for our body. This congeniality, however, is eliminated to the extent to which the machine penetrates and becomes mechanically autonomous. Work is split up mechanically and dissected into minute segments. An immediate impression of this specialization of the work process can be gained by looking at the specifications of the "Help Wanted" ads of industry, and the terminology used to describe the type of work. There are market researchers, calculators, supervisors, time-study experts, part designers, filing clerks, tolerance checkers, efficiency experts, production-layout specialists, group-work organizers, model makers, blueprint translators time-study clerks, and production cost calculators of all kinds.

What is the meaning of all these preparatory work activities? They break up the total job into fragments, into the smallest possible units of work. Often it is just one single motion, one single uniform twist of the hand which the worker repeats day-in, day-out, year after year. Such a worker is no longer a hand-worker, no "handy man," a term that denotes one capable of doing more than one job and doing it completely. He retains a function only, a functional task prescribed by the mechanism. The more technology advances, the more it specializes, and the larger becomes the amount of purely functional labor. To the extent to which this happens, the work becomes detached from the workman, separated from his person—it becomes autonomous. There is no longer a vital relation between the worker and his work, as in the case of the artisan; this relation is purely functional. The machine operator is as interchangeable as are the parts of his machine.

The worker can be switched to any other function, with ever greater ease as the functional character of the work becomes more general; that is, the more specialized the work becomes. As the standardization of machine parts brings greater usefulness, just so does the operator be-

come usable for any other machine operation.

But it would be a mistake to think that this greater usability means a higher degree of freedom. The opposite is true. Functionalism of work, which means that the work becomes autonomous, leads to the dependence of the worker upon the apparatus and the work organization. For now he loses the right and the power to determine himself what work he is to perform. He is more mobile, but precisely for this reason he is more easily harnessed to the organization. Since his work is no longer in any manner related to his person, the work can be more highly organized. The worker, being interchangeable, can be put anywhere. He must now expect also to be put to work against his will, that is, to do forced labor. For the more widespread and complex the apparatus, the more inescapable becomes the compulsion it exerts upon man. He cannot escape this compulsion. He is not even able to investigate it; all his efforts to do so are in vain. They are as futile as the efforts of the prisoner who has been put into a treadmill which turns faster, the faster he tries to run away.

Still, there is a difference between the prisoner and the laborer. The laborer, in his own thoughts, favors the progress of technology and organization. He only endeavors to gain control of them himself, for he cherishes the false hope that in this way he can improve his lot. In other words, his thought is social, more so than that of others. But his socialism, which advances in step with technology, is nothing but an adjustment of his intellect and behavior to the technical work organization.

The labor organizations spring up wherever laborers reach an awareness and an understanding of the fact that they have become dependent and that they must organize to offer joint resistance. All such organizations are marked by the hatred with which they look upon the unorganized worker, the worker who has not yet grasped the compulsion of mechanical labor and the necessity of surrendering his independence to organization. As the workers unite, however, they unwillingly fulfill a condition of technical progress, the condition that everything must be organized. Workers, thinking they are acting on their own volition, work with enthusiasm, but their organization into unions is only an expression of the mechanical compulsion to which they are subjected. These organizations which try to make certain types of work a preserve for their group, disintegrate as soon as the perfection of technology mechanizes all work, when the organization of work becomes universal, when everybody becomes a worker.

XIV

Technology Serves Not Mankind, But Itself

The mechanists refuse to consider the causal and the teleological viewpoints as equally valid. Where they are forced to employ concepts of final purpose, they do so only with the reservation that all purpose is based on prior hypotheses, that it will have to be reduced to causal relationships. As they are nominalists, universal concepts to them are something that rank behind facts—*universalia post rem*—and they do not accept any purpose they cannot lay their fingers on. They deny that any such purposes could have reality, *in re or ante rem* ("in the object" or "prior to the object"). They fear that if they were to abandon the inductive method they would at the same time lose that exactness which classical-mechanistic physics possessed (or thought it possessed), the exactness of calculable determinations.

The vitalists, on the other hand, are just as wrong in contesting every position of the mechanists. They have to pay for that temerity again and again. Physico-chemical processes are present not only in the structure of molecules and cells; they can be observed also in the performance of an opera, or in a garden fiesta at the court of Montezuma. Whether they are important in such a context is another question. More precisely, the question is whether such opera performances and such fiestas are the results of physico-chemical processes, the existence of which cannot be denied; or whether the music and the merriment direct to their own purposes the sum of mechanical processes that take place. If the question is formulated in this way, it becomes evident that here the old battle between nominalists and realists is being waged once more. It will serve us to stay out of the fight and refrain from bringing up the question of which was first, the chicken or the egg.

For the realm of technology this dispute is not of very great importance. Both causal and teleological thought participate in the development of technical processes. To separate them or to play one way of thought against the other would hardly do. If we consider any kind of

apparatus—an automobile, for example—we realize immediately that causal and purposeful functions are inseparably united in it. They constitute two aspects of one and the same thing and this close union is one of the most outstanding features of technology. That is why we would do well to make a somewhat closer examination of this highly successful co-operation between causal and teleological thought.

When speaking of purpose, we are unconsciously using a metaphorical expression. For purpose or goal, in the true sense of the Germanic word, is nothing else than the bull's-eye in the center of the target—the spot at which the marksman draws his bead and which he hopes to hit. Something seems to serve a purpose when the means we employ for the achievement of a certain goal are appropriate to the goal. The statement, then, that something "serves the purpose" expresses a relation. When we say that something serves a purpose, we express a judgment derived from our reason, and such judgment presupposes the knowledge and the understanding of the means and the end.

It follows that we can only apply the concept of purpose with regard to men, animals, plants, or any other created thing that is not our creation in a very limited sense. For we do not know, and cannot determine by reason, the final purpose which men, animals, and plants serve. Whatever may appear purposeful to us in their behavior, we cannot draw valid conclusions about their final and basic purposes from mere adaptations of their organisms for certain functions. Whenever we draw conclusions about final purpose from the effects we see before us, we are in danger of deceiving ourselves, particularly when we misunderstand the relation that is inherent in the concept of purpose.

The concept of technological purpose makes good sense, in so far as we can plainly survey the means which our machine tools combine to serve a given end. Their efficiency can be understood and tested. But we must never forget that this efficiency always and everywhere concerns the means only, and not the end that is achieved. Only when the end that has been achieved constitutes in its tum a means to a further end does the mechanism become a means itself, and assume a purpose. This relation can also be expressed by saying that within the realm of technology there exist solely technical purposes.

Much has been gained when we have recognized that the increasing efficiency of mechanical means stands in an exact relation to the advance of causal thinking. Perfection of the machine would be impossible if this type of thinking were not incessantly at work. For its field and testing ground is preeminently our technology. The relation of

means to ends corresponds to the relation of causes to effects. They are not identical, but they work together like chain drive and sprocket wheel. Every extension of the law of causality must have its effect on the relation of means to ends. Thus, the concept of technical purpose is directly influenced by causality. Since this is the case, the machine and the social organization are linked together, and one cannot be conceived without the other. They work like the blades of a scissors or the jaws of pliers. These similes are not chosen at random: they describe the process, and they also allude to the incisive pains and pressures that man here undergoes.

It may seem strange that this titanic modem industrial system with its human organization that tries to engulf everything, and whose power we encounter at every step, should have grown from seemingly unconnected trials and errors, from widely scattered inventions, from decidedly humble beginnings. But the convergence of these inventions is only an expression of the convergence of a way of thinking which is absolutely uniform no matter what its point of origin. Wherever this thought goes to work, its every manifestation contributes to the mechanical arts all over the world.

XV
The Fallacy of Specialist Thought

It goes without saying that the technician rejects everything that does not correspond to his ideas of efficiency and purpose. He will not doubt that what is technically purposeful is also desirable and advantageous. An inefficiently constructed machine gives him discomfort and disgust. In this it may be said that he is motivated, not only by mechanical rules, but by professional honor and self-esteem as well. For a piece of slipshod engineering is not only inefficient; it also shows its designer in a bad light; it exposes him as a bungler.

But this concept of efficiency needs examination. We must find the limits within which it makes sense. An example will make this clear. A well-constructed automobile is efficient because it fulfills the purpose it is meant to serve. Let us suppose that five million cars had been built according to such a well-constructed model, and that they were all in use. Nothing is changed thereby in the efficiency of the model; rather, it could be said that such extensive use is sufficient proof of its efficiency. We could go further and suppose that this automobile, manufactured in some large plant, had been so successful that every adult in a large country makes use of it. Its efficiency is demonstrated by this even more clearly.

But we must not forget that this efficiency is a matter purely of design and of production; that is, that it is a specific efficiency. Whether it serves a purpose that every adult in the country owns and operates an automobile is, however, quite a different question. It is obviously of a more general nature, and as we go into it, we shall find that it takes us beyond the realm of technology. This is why technicians have never asked it. The technician derives a direct benefit from the fact that a maximum number of automobiles are in operation, for the mechanization of traffic answers his needs and his desires. He thus brings the automobile to technical perfection without a thought of the nontechnical consequences which an incessant increase in the number of automo-

biles must have. He will even demand that everybody should own at least one automobile, and we all have heard the jubilations with which this demand has been greeted.

But whoever approves of anything like the "two cars in every garage" idea, by implication grants to every person an additional use and consumption of metals, oil, gasoline, coal, rubber, and other materials, which, applied to the whole earth, would lead to an extreme squandering of resources. To the direct consumption produced by such mechanization there must be added that other consumption which is a by-product of mechanization. Production and processing plants for all the raw materials, such as mines, steel mills, rubber plantations, are only part of this additional consumption. Enormous expansion of road networks, traffic organization, services of all kinds are other immediate necessities. Motorization may be considered as a result of the technical organization of work or, vice versa, the technical work organization, a result of motorization. Both are like the jaws of a pair of tongs, pressing down with equal force. All technical organization extends the technical apparatus; all mechanization in turn increases the rationalization of the social order. As long as the technical organization grows, its apparatus must grow, and visa versa. If we consider, on the one side, the technical organization as a whole and, on the other, the whole apparatus with which it works, we gain a complete picture of the giant tongs and of the tremendous pressures which they exert.

It would be a grave mistake, however, to think that we are dealing here with an orderly process, a process which produces or performs anything beyond its own expansion. Appearances to this effect are deceptive. He who makes such an assertion will have to bear the burden of proof. The fact that some apparatus furthers the organization of certain work, or vice versa, is inconclusive in this context. For this is a mere tautology. Nor can any ultimate profits for mankind be proved by the rational production methods of technology. For these methods produce equal results in quite a different direction: they promote the squandering of resources.

According to Plato, the difference between science and applied mechanics lies in the fact that mechanics is devoid of insight into the means it employs, is ignorant of their nature, and therefore is an ignorant pursuit and not a science. The reason for this limping behind in perception lies in the goals which the mechanical arts pursue. Because technology pursues its own ends, it fails to produce a bigness of mind capable of visualizing as a whole the evolutionary trends which evolve

from the mechanization and organization of human labor. This would require a freedom of spirit that cannot be expected of any specialist. For the specialist, whatever his field, is in the service of technical organizations. Specialization of work is nothing else than one of the principles on which the entire present-day organization of work is based, a much-praised method which, we are assured, is particularly efficient and profitable. Moreover, specialization perfectly suits the type of mind that focuses only on functions, regardless of how unhealthy this "watchmaker" mentality may be for mankind. Thus we find any number of so-called "leading men" who will prove and extol the high efficiency of the technological apparatus and organization—and are quite satisfied with such a proof because they do not think about the relationships inherent in any concept of purpose. Such proofs however do not prove a thing. For no matter how efficient mechanization and organization of work may be, even if the ultimate limits of efficiency of full automatism would be reached, this does not even touch the question we have put; it evades it. That question was: Where does all this efficiency lead to? Where does it leave man? That question cannot be answered by means of functional thinking, which focuses forever upon the wild confusion of phenomena only, and which pursues forever the sequence of phenomena in order to dissect them.

A true answer can only be found in an examination of the effects which the technological order produces in the human being. For this we must critically analyze technology's universal working plan.

XVI
Technology Creates Bureaucracy

Organization seizes man wherever he enters the field of technical progress. Technology not only supplies the demand; it also organizes it. How does it do it? The method is compelling, and utterly simple. To use a familiar technical term that describes it well: "It plugs man in." It does so with the same ease with which we push a button or throw a little switch to turn on a light. The process is all-embracing; it includes not only the laborer but everyone living within the technical organization. When I get gas, water, heat, or electricity from a public utility, I become at the same time subjected to an organization which expands like a series of widening circles and which is managed from a technical center. When a telephone or a radio is installed in my home, I not only get an object for my use, 1 am also hooked up to a circuit of power lines or a radio network. I become part of a large organization which is managed from a central office. This centralism is characteristic of everything technical. However, there is nothing hierarchical about it—it only expresses the lawful regularity of causes and effects, such as we perceive in any mechanical apparatus. If words like "direction" or "guidance" are used in such contexts, they never denote anything like a scale of values. Such expressions have a merely technical meaning. They are used like concepts of matter in physics which, wherever they apply, tell us only of the physical properties of matter.

If we visualize a house that has reached a high degree of technical perfection, that has become a "machine for living," in which all mechanical tasks are performed automatically, we find not only a large number of switches and terminal connections; we also find that the inhabitants live in complete dependence upon technical organization, that they are subject to technical functions, and that they must suffer the ill effects of each single disturbance which may occur in its functioning. That is not all. The residents of such a house live, perhaps, in the pleasant feeling of being equipped with all "modem conveniences." They

may cherish the illusion that the machine is a comfort to them, that it serves the purpose of increasing their comfort. When they tum the dial of their radio, they expect to be supplied from the ether with music to dispel the boredom of their leisure hours, to rout that empty feeling which, according to Cassian, attacks the desert monk especially around the sixth hour of the day. Such music will not be lacking. But it may also happen that their receiver reproduces quite different voices, much less pleasant, which might tell them to get up and get to work and do things they don't like at all. We leave to the reader's imagination the possibilities that open up here.

The organizing force of technology grows apace with the advancement of technology, for mechanization of work and mechanization of human organization are inseparably bound together. The automatism that produces the technical product can work unhampered only if the workman also is subjected by a parallel organization to a like automatism, an automatism in which every one of his motions is repeated monotonously. That does not mean to say that the worker becomes a robot like the machine he operates. But he is tied to his machine as to a rigid prosthesis which hampers all his impulsive movements. He is expected to work soberly, meticulously, punctually, with mechanical precision, and to permit without protest the regulation of his work by lifeless time. There are clever devices that force him to work and that control his work at the same time. Among those devices are the assembly line, which was first introduced in the slaughter houses of Chicago, and control devices of various kinds. The physician who taps an automobile driver for blood in order to learn whether the driver had taken alcohol is an official of the work organization; he watches over its undisturbed functioning, like a traffic policeman, or a judge who metes out a fine in a case of traffic violation. Ability and aptitude tests do not test the capacity for independent thought, but the capacity to react mechanically to some mechanical stimulus.

Such technical procedures are gaining ground everywhere. Wherever they appear, they introduce that sequence of mechanical motions, that chain of predetermined reactions which create dependence. It cannot here be our task to enumerate these procedures; it will be sufficient to point out the manner wherein they manifest themselves. If our approach to this problem is of any value, it will permit the thoughtful reader to make independent discoveries of his own.

But we must not fail to call attention to another phenomenon which has the closest connection with technical progress. This is the growing

influence of statistical thinking, and the forever more detailed analysis of the material which statistics supply to the technical organization. The precision of statistical methods, in which concepts like volume, index, representation, substitution, inclusion, and generalization are among the most important, increases as the technical organization extends its causal mechanism. This restless counting over and over of the available resources, down to the minutest details, and the importance attached to statistical findings—all this speaks a clear language. A Bismarck, a Mark Twain, felt a distrust for statistics, the distrust of the statesman or the artist for the mechanical determinations on which this science is based to the exclusion of all else. It was the distrust for the quantitative results supplied by statisticians working with quantitative units. This distrust is not unfounded, for statistics have ever had a close relation to rational humbug. Therefore, it is wise to receive statistical findings with some grain of salt, never to forget the question cui bona?—who profits? Who is asking the question, and what interests are served by the answer?

It can be observed everywhere that mechanization enforces the organization of work. Technical thinking, imbued with an unlimited drive for power, acts imperiously and recklessly. Full of unshakable faith in organization, it promotes and expands organization in all directions, and engulfs unorganized life wherever it finds it. That is why technical progress is accompanied by an ever more mushrooming growth of bureaucracy, for the extension of the organization necessarily requires a parallel extension of bureaus. One of the inevitable consequences of this is the swarming of the "pay-rollers."

XVII
The Ravages of Functionalism

The exact scientist is exact only in one respect—his causalism. Only in this respect can he be called exact. Every other form of exactness is beyond him. His activity is primarily descriptive measuring and its results are expressed in terms of numbers. Hence the Kantian statement that "in every investigation of nature there is only as much real science as there is mathematics."

But when we consider this extraordinary importance of numbers, what else does it signify but that the endeavors of science are imitative, that the task of science is exact imitation, and that only by imitation does it succeed in wresting the secrets from God and nature? An experiment, for example, must produce the exact conditions which make possible the exact imitation. Such intuition as the scientist possesses is of an uncovering and imitating kind. In the realm of technology where application and exploitation of mechanical laws and their reconstruction are the task, scientific activity consists in copying nature's inventions. The machine is an imitative invention. Obviously, what appears to be mechanical in nature is most open to imitation. The mechanical aspect of nature thus becomes the opening wedge for successful causal thinking. Only a mind which interprets the universe as a machine can succeed in constructing smaller machines that capture imitatively the workings of mechanical forces. And only after experiences have been accumulated and power has been harnessed, is it possible to apply what was learned to other fields, as is done by the biologist who subjects even animated nature to the mechanical frame of reference.

In the realm of life, however, the category of causality, such as it was used in classical physics, is no longer sufficient. Causes and effects retain something independent, some elusive quality, a semblance of personality. But this vital quality disappears as the law of causality is transmuted into an all-embracing functionalism that is applied to, and observed in every work process. Where everything has been turned into function, everything can be explained by function. Nobody knows

as yet what a function really is, or how it is brought about, nor what the reduction of all life to functions is leading to. But the implications of such thinking are quite easily seen.

We have alluded already to the role of functionalism in work, and to the change it effects upon the worker. We have pointed out that the functional relation of the worker to his work actually separates him from it as a person. An invention like the assembly line shows functional thinking to a high degree, for here all the functions of work are lined up within the sequence of lifeless time, and the workmen are stationed along the line as functionaries of a work process that has been cut into pieces. What is the consequence? The worker loses his identity; as a person he loses individuality; he is still noticeable only as the performer of a function. As a human figure he fades out, and from the viewpoint of technical progress it would be desirable if he disappeared altogether, if the production process were fully automatic and operable without aid of the human hand, like a transmission, a chain drive, an escalator, or the cartridge belt of a machine gun. Nothing is so significant in functional thinking as its completely impersonal character. This manner of thinking is as far removed from physiognomy as is humanly possible. It is the mark of a world wherein all things lose face and form, a world where everything turns relative and relativity becomes autonomous. For functions are nothing but the relations of movements occurring in lifeless time. Thus the functional thinking of the scientist and the technician is the prime mover which pushes automatism and successfully expands it.

This whole chain drive of causalism, this whole interpretation of all things as functions of interacting forces, where does it lead to? Where do we finally get with this concept that can never give us more than a description of movement relations?

This concept of functionalism leads to a violation, the utter ruthlessness of which few people have as yet fully grasped. It is one of the coldest discoveries of rational thinking that guides technical progress and that attempts to make all concepts of knowledge subservient to technology. All functionalism is instrumentalism, a thinking in terms of tools applied to man. For functional thinking means nothing else than subjecting the individual man to a system of functions. Such thinking is perfectly adapted to technical progress; it is even identical with it. For, as technology drives towards the organization of the masses and the mechanization of work, as it aims at complete automatism, it is moving along the same road as functional thinking, which pursues the same

goal. The more perfect the technical organization, the more it has to become a mere sequence of functions. And the closer the mechanization of work approaches automatism, the clearer becomes the role of functionalism—for what else is an automaton than a machine functioning by itself?

In the end, then, this thinking leads to the human robot, the functionary without a will of his own. Within the framework of functional thought there is no theologian concerned with the problem of predestination, no philosopher concerned with determination. Within this framework the technician alone thinks and bethinks himself of the perfection of the great machinery which he constructs. And in so far as he is a technician, the question of whether and to what extent man is gifted with a free will does not concern him. He can be concerned only with mechanics.

If we imagine this machinery developed to its full potential—a state it has not yet reached—covering the whole earth, a powerful and vast mechanism to which all mankind is harnessed mechanically, organized through and through down to the last cell, fully trained to operate along the assembly line of functions; if we imagine this, we can well understand the forebodings with which others have viewed such a scene. But this vision, mindful of the tower of Babel, has little likelihood of coming true. Nor is it likely that we are moving toward conditions similar to those of the insect communities—that a great ant or termite state will be the reward of our present efforts. Such parallels obviously force themselves on the observer of machine civilization, since it indeed shows traits, such as a deification of, and gluttony for work, that seem to justify such an association of ideas. But though collectivism of that sort may be attempted, it cannot be realized. That kind of collectivism carries within itself the seeds of its own destruction. For reasons to which we shall refer, it must collapse under its own weight before reaching its final realization.

The pillage of the earth in which technology engages has its counterpart in the thinking of the technician himself. Functional thinking is a consequence of an already very widespread mental devastation and desolation, which corresponds to the blighted areas of industry. It is an unimaginative way of thought, thought denuded of all images, a pauperized mentality which stands behind all mechanics. Its very language betrays its loss of vitality. Just what are the means and the ends of this functionalism spawned by casual thinking? The lust for power, the enslavement of nature, the harnessing of its laws.

Functionalism is nothing other than a means to squeeze the last drop from the old and dwindling resources through new working methods, more rational and more ruthless than before. What does it achieve but more rapid consumption? And what does it give in return for what it devours? What does it actually yield? Nothing except the principles through which such consumption can be extended further. Such a mode of thinking cannot last. It must go to extremes, and must collapse the moment it has outlived its usefulness.

XVIII
Technology's Attack on Law and Property

We must learn to distinguish the technical organization from the other organizations. The characteristic of technical organization is the exclusive rule of causal determinations and deductions, a strict mechanism to which even man is subjected. By the same token, its rationality, too, is mechanical. This sets it apart from other organizations, particularly from the state. The state ought to be viewed as the human organization par excellence, as the status which determines and orders every other status, the whole that assigns their tasks to all the parts. The relationship of the technical organization to the state is misunderstood to the same extent that we are ignorant of the goals of technology. The technician's lust for power aims also at the domination of the state. He wants to replace statist organization by technical organization. The fact of this ambition is established beyond doubt; the advocates and pioneers of technocracy quite patently pursue this goal.

The methods that technology employs in this contest can be studied by observing its attitude toward other organizations. We have already observed how technology has proceeded to subject all economic reason to its own. It proceeds in the same manner with the organization of law. It changes the nature and the purpose of law. The technician, of necessity, is a defender of the natural law; he must oppose the historical school because technical thinking can harmonize only with the concepts of natural law. Here again, he tries to define natural law in technical terms, by substituting a technical norm for the juridical norm, by attacking the specifically judicial quality of natural law, and by transforming both the *lexfer enda*, that is, the law in the making, and the *lex lata*, or the established law, according to his technical normative frame of reference.

He destroys mechanically the *opinio necessitatis*, the feeling of rightness; the superseding power of common law grown from the customs of the people; the vital force of the law. He cannot understand "that

laws are not only abolished by vote of the law-making body, but also through disuse with the tacit consensus of all", ["*ut leges non solum suffragio legislatoris, sed etiam tacito consensus omnium per desuetudinem abrogentur*," L 32 Sect. I D de leg. (I, 3), Julian].

This tacit consensus is beyond his understanding. But even the formal statutory law, valid by the authority of the state, goes against his grain. The technician pushes the subject matter of the law into the foreground everywhere, and in the place of statutory law he puts technical regulations. This is the explanation for the boundless flood of legislative matter, for the machinelike production of laws and regulations that are characterized by their technical, normative nature. The technician fights the specific, concept-forming force of jurisprudence, the force that masters the wildly sprouting legal matter by logical procedure. The technician is the first to attack "conceptual jurisprudence. " And these attacks are all the more effective in so far as they find support in those trends of thought that assert the existence of a basic opposition between the formal statutory law and the *opinio necessitatis*. Such trends aim at the dissolution of all law and consequently of justice generally, and at the subordination of law and justice to the dynamic will of the people which is supposedly in eternal opposition to formal statutory law. And so we witness, for instance, that the so-called "directives," executive orders, the departmental decrees of bureaucracy, the practices of business empires, begin to exert a destructive influence, begin to void and absorb formal statutory law.

The rights of the individual are turned into the rights of the technically organized person. Property, for example, defined by jurists as the exclusive right of a person over a thing, completely loses its meaning when it falls victim to technical organization. Now property is no longer independent, no longer exclusively subject to the will of the proprietor. It becomes technically organized property over which disposition can be made from outside, that is, from a sphere not defined by the right of the owner. To the technician, law is that which serves a technical purpose. Wherever he intrudes into the legal organization, be it in its legislative, its juridical, or its administrative branches, he either supplants the law by technical rules and regulations, or adapts it to his end by means of interpretation.[5]

Where the technician appears as the opponent of the letter of the law, where he makes himself the popular "champion of equity," he does so, not because he is more concerned over equity than the jurist, but because equity serves him as a back door through which he can sneak

into the legal organization. He opposes everywhere the strict formalism of the *jus cogens*, the law that "cannot be modified by private agreement" (*privatorum pactis mutari non potest*), in favor of the *jus dispositivum*, or flexible law, for the technical regulation is flexible and causal at the same time. By his manipulations he attempts to change and transform the entire legal status of persons and of objects.

The state's right of confiscation, which the old style jurists of the state had designed for considerate, sparing, and severely restricted use, is being extended, on the insistence of the technician, in a direction where every collision between the individual and the technical organization provides a precedent for confiscation. The technician fights property, not on theoretical grounds as does the social agitator; he actually transforms it by subiecting it to his all-powerful organization which disposes of it freely from rational points of view. Foremost he attacks the right to land; for landed property he feels that loathing which the dynamic mind has for all that is immobile.

It may be said in general of the transgressions into the realm of the law, as of the transgressions into other realms, that technical progress attacks everything that is at rest, everything that possesses permanence and stability, everything that does not lend itself to technical progress or withdraw from it. Technical progress attacks everything that denies it the resources, whether human beings or dead things, which it craves to devour. The quiescent reserves which, as the resources of our children and children's children, we must preserve and use sparingly like conscientious guardians, are a thorn in the technician's side.

By the same token the technician attacks the independent life of all nontechnical organizations: these he tries to force into dependence upon the mechanical apparatus he has created.

XIX
The Subjugation of Science

As technology progresses, the relation between science and technology undergoes a change. Science becomes the servant of technology. It is a symptom of this shift of power that the scientist becomes increasingly an employee in the institutes and laboratories of industry, where his knowledge is exploited for technical uses. The disciplines of science become auxiliary disciplines of technology, and they fare the better the more willingly they submit to this role. "Pure science" declines because the important thing is no longer an understanding of the laws of nature, but, first of all, the application, the uses, the exploitation, of those laws. Discovery and invention are today the handmaids of this exploitation. Therefore, if today inventors are called upon and exhorted to give new proofs of their genius, to forge ahead, to deliver more quickly, the purpose is to increase the pillage of the earth through a rationalization of the methods of plunder.

A science now making rapid progress is biology, for biology has identified itself completely with technical progress. The present methods of biology would have no sense otherwise, nor would its results be of this high practical use and value; for the yardstick is precisely the immediate technical and industrial usefulness of every biological research, usefulness to some corporation manufacturing pills, or to some other technical organization.

Obviously, the discovery of ferments, hormones, and vitamins is not only a scientific but also a technical advance. The effects which we ascribe to these substances are of a mechanical and functional nature. The uses to which we put them betray that concept: either they are introduced into the body in the form of technical preparations, supposed to produce specific mechanical effects, as are all drugs manufactured by the technicians; or else they are consumed in vitamin-enriched food. This whole pharmaceutical arsenal is the product of technical specialists who think of the human body as a machine. However, those are the methods of our day.

It is not difficult to understand the shortcomings of such methods—but it is exceedingly difficult to evade them. We can reasonably assume, for example, that an apple contains a number of substances that so far have eluded the chemist and the biologist. It is likewise quite certain that even if all these substances could be synthetically reproduced in a pill, they could not replace the apple. For the apple embodies a principle that is higher than the sum of its parts. It is not a lifeless preparation, like the substances that have been, or could be, extracted from it, but an expression of life that grows and smells and ripens and has fragrance. No doubt the wise thing to do is to eat the apple itself rather than swallow the vitamins which may be extracted from it. And I shall also show wisdom by eating the apple not for the sake of all the vitamins it contains, but because it is an apple. The difference is fundamental, for in the first instance I am acting like a sick person, in the second like a healthy one. In matters of food we act wisely if we avoid the technician wherever we can.

But if I cannot get the real apple—then not even common sense can help me over this deficiency. And this apple which I cannot get is just one symptom of the constantly growing difficulty in feeding the masses that live within the technical organization. It is clear beyond a doubt that all the biological theories of nutrition and nutritional practices spring up precisely where nutrition is most difficult, that is, in the large cities where technical progress in biochemistry has made the greatest headway. The biochemical industry typically claims its products will cure prevailing disturbances and blights, not by offering fresh, healthy, strength-giving food—that it cannot give—but by supplying substitutes.

A conscientious, humane physician is in a difficult position today. If he abandons his mission of healing the sick, he is no longer a physician. But how problematic is the task of a physician who finds himself the employee of an organization whose interests are often diametrically opposed to those of the patient! What strange notions about the nature of health must not of necessity prevail in a technical setup which defines as "healthy" only that which works for its own benefit! And the technical organization controls with growing strictness the whole field of medicine; it dominates the physician as well as the patient; it also controls the methods of the cure. Modem medical theorists, with the exception of a few outsiders, favor and further this mechanization of medicine and collaborate with it.

The understanding of the true causes of diseases is sadly neglected today. There can be no doubt that such eminent physicians as Virchow,

Koch, and Ehrlich, who were cellular pathologists and bacteriologists, have their share of responsibility for this decline. But the specific malaises of an era cannot be explained solely by physiology. The specialists moreover loses the capacity of curing them, because he cannot assign them their proper position in the scheme of things. We live no longer in the age of great, thriving, voracious plagues, but in the age of cancer, diabetes, and neuroses, where parts of the human body make themselves autonomous to grow, to spread abundantly, and to destroy the human form. Thus, the question becomes legitimate, whether the cancer institutes that can be found in every country do not tend to spread cancer, rather than cure it. For the type of mind at work in those institutes is akin to the physical phenomena that are observed in cancer. Let those who deny this be reminded that it is this mental activity that produces cancer artificially, as for instance, with the aid of aromatic carbohydrates obtained from coal tar.

XX
The Destruction of Money

When we study the financial and currency system of today, we enter an area where there reigns profound confusion. There can be no doubt that we are living in an era of general deterioration of currencies. This is shown by the withdrawal of precious metals from circulation and by the constant migration of gold in its flight from danger zones to zones of greater financial safety. Inflationary and deflationary movements, devaluations, and withdrawals from circulation affect all currencies, which have to be protected artificially by the most intricate regulations. Possession of precious metals or foreign banknotes, export of holdings by the owner or his agents, re-importation of currency into the country of its origin—all are put under the strictest control. Eventually, under pressure of exchange difficulties, we see the state reverting to a kind of primitive barter economy, an economy of peculiar financial and economic consequences.

All these mysterious and often contradictory phenomena become clear once we perceive that progressive technology can have no interest in stable currencies, that, on the contrary, it interferes with the organization of finance in order to undermine the stability of currencies. It is childish to imagine that events like inflations, which deprive whole classes of the population of their savings and abandon them to impoverishment, are the work of a band of clever speculators. For even if we harbor exaggerated notions of the power of those behind what is popularly termed "high finance," or Wall Street, events like inflations are not thereby explained.

The fictions on which the money system rests are highly artificial, and this analysis is not the place to treat them in detail. There is no completely satisfactory theory of money, but the following may be said in this connection. The point of view from which technology looks upon money is a technical one. It looks at money from the viewpoint of circulation, for circulation is the most important technical function of money. Thus, technical progress is identified with an accelerated circu-

lation of money—money is made to work more rapidly. Where treasures and possessions are by nature stable, unchangeable, and out of circulation—features which the technician abhors, because to him they signify sterility[6]—the supporting of the currency by precious metals provides an element of financial stability. From a state of stability where paper money is redeemable in gold, instability begins as the obligation of the state to redeem its currency is suspended. Money is then still backed up by gold reserves, but as the gold reserves melt away, the state is increasingly compelled to try by every means in its power to obtain gold and gold values. The circulation of sheer paper money is rapid, and the more rapidly money circulates, the better does it fulfill its technical function, which is, first of all, to circulate. The deposit of all liquid funds in banks is now recommended and encouraged with the argument that money which is banked best discharges its function of circulation.

The more money is devaluated the faster it circulates. If there is gold, money runs to gold. If there is no gold, it runs to goods. It may be said that bad money runs away from itself. But precisely by doing this it fulfills splendidly its technical purpose. It takes on perpetual motion, circulating with sweeping speed, changing hands and so creating the illusion among the naive that there is a lot of good money, or even that all of us have become richer. The decay of currency is neither local nor transitory. It is a symptom of a certain phase of technical progress. It occurs at the precise moment when the financial needs of the technical organization go beyond those limits within which an orderly financial economy can be conducted.

XXI
Technical Training vs Education

Let us study the relation of technology to quite another field, the organization of schools and universities. As the technician enters this field, he converts all institutions of learning to his interest; that is, he promotes technical training, which as he claims, is the only up-to-date, useful, practical knowledge.

The significance of reforms in this direction must not be underestimated. They constitute a direct attack against the idea of a "rounded education" (*encyclios disciplina*) that prevailed in classical and medieval times. The consequences of this attack do not, obviously, consist alone in the decline of the role of grammar in education, in the retreat of astronomy and music, in the disappearance of dialects and rhetoric. This slashing, whereby of the seven classical "free arts" only arithmetic and geometry have survived, is by no means all. The technical science which comes to a position of supremacy is both empirical and causal. Its inroads into education mean the victory of factual knowledge over integrated knowledge. The study of ancient languages is pushed into the background, but with them there vanish also the means to understand a culture in its entirety. The logical capacity of the student, his capacity to master the form of knowledge is weakened. Factual knowledge is empirical and thereby as infinite as are the endless rows of causes and effects whereby it is described. We often meet with a pride in the boundless accumulation of factual knowledge, which has been likened to an ocean on which the ship of civilization proudly sails. But this ocean is a *mare tenebrosum* ("a dark sea"); for a knowledge that has become boundless has become also formless. If to the human mind all things are equally worth knowing, then knowledge loses all value. Therefore, it may be concluded that this factual knowledge will eventually drown itself in the ocean of its facts. Today the most valiant human efforts are swamped by the rising tide of facts. It would not be surprising if we were to become as weary from this vastness of knowledge as

from a crushing weight which burdens our back.

Where emphasis is placed on facts, education strives for a handbook knowledge, imparted to the student through surveys, profiles, graphs, and statistics of the subject matter. True education is incompatible with this kind of knowledge and with this method of instruction, for the crude empiricism into which such training has fallen is a purely mechanical piling up of facts. This training lays no foundation. It contains no forming principle, which would be superior to, and would master, the subject matter.

That dubious adage which says: "Knowledge is power," is less valid today than it ever was, for knowledge of that sort is the very opposite of mental power; actually, it completely enervates the mind. Universities decline in the degree that technical progress spreads into them from the secondary schools. The university becomes a technical training center and servant of technical progress. Technology, in turn, does not fail to lavish endowments and new institutes upon the universities and to work strenuously for the transformation of the universities into conglomerates of specialized laboratories.

It should here be noted that the classic idea of a rounded education, confined as it was to the formation of culture and wisdom, stands in sharp opposition to the idea of an encyclopedia of sciences, that is, to a knowledge which is arrayed alphabetically like a dictionary or encyclopedia. The idea of an encyclopedia of sciences belongs to the eighteenth century. Knowledge of that description has been the forerunner of all modern technical science. It is the knowledge of a Diderot, a D'Alembert, a La Mettrie, who declared all philosophic thought to be null and void, who in works such as *Histoire nature/le de l'ame and L'homme* machine advocated an empiricism in which everything is explained in terms of causal reflexes between brain and body. The thought of Hume, their English contemporary, is stronger and finer, but his doctrine of the association of ideas, and the principles of all possible associations (he assumes similarity, contiguity in time and space, and cause or effect) lead to the same result (*Philosophical Essays Concerning Human Understanding* and *An Enquiry Concerning Human Understanding*). According to Hume, perceptions are not in need of a substance that carries them, for all substances are merely composites of simple concepts and thought. These theories of associative thinking always tend to make the associations materially independent. However, to associate is not yet to think; in fact, the special capacity for association characteristic of many a clever head appears to be rather a substitute for independent thought.

Hume may be considered the spiritual father of Joyce's *Ulysses*, a book that makes association independent, and destroys every intellectual order so radically that nothing is left but a great garbage pile of associations.

XXII
"Scientific" Nutrition —A Fraud

Wherever we turn, whatever field we survey, we find that technical progress attempts to shape it to its liking. Turning, for a last example, to the field of nutrition, we find the extraordinary organizing power hard at work even here. In medicine, technical progress aims at transforming all medications into technical preparations, and to establish mechanical theories about the human body and about the treatment of diseases. In like manner, in the realm of food, technical progress tries to transform all animal, plant, or mineral products that serve as human food into technical products, and where this is not feasible, to give them the uniform appearance ofstandardized technical products by means of sorting, packing, coloring, and labeling.

As foodstuffs tum into uniform trade brands, that is, into technical products, they become subject to technical organization. They lose their inherent quality. This inherent quality becomes accidental and, accordingly, its presence in the food has to be reaffirmed explicitly by the manufacturer's propaganda. The colossal growth of advertising and propaganda in the technical era is due to circumstances of which only very few of us have a clear idea.

Let us recall here that in the year 1939 we were celebrating the seventieth anniversary of the invention of margarine. It was in 1869 that Napoleon III commissioned the chemist Mege-Mouries to produce a butter substitute that was to be cheaper than natural butter. Since then, technical progress has smuggled into our fare an endless number of substitutes, synthetic concoctions, and artificial products.

Technical progress has practiced adulteration of foodstuffs on a grand scale. Not only has technical progress changed the qualities of our foods through mechanized farming, scientific meat production, and the fertilizer industry;[7] it has not only created the canning industries, the cold-storage and freezing methods, it also has brought to the fore theories of nutrition which parade under the labels of "biological" or

"scientific" nutrition.

However, modern biology, as both its methods and its terminology betray, is only an appendix of technical progress. Biology has become one of the disciplines of technical progress, characterized like all others by the fact that it is subservient to mechanist thinking in terms of cause and effect. A man who has lost the instinct for proper food, who, moreover, could not possibly follow the old rule of Celsus, *sanis omnia sana* ("all is healthy to the healthy"), because he has no way of knowing the contents of the substitutes that get on his table—such a man must indeed fall for "scientific" and "biological" nutrition. For even taste and appetite, the infallible counselors of old guide him no longer. And the technician, most inveterate of rationalists, has still another objective in mind. Where he succeeds in transforming foodstuffs into technical products, he regulates and standardizes them; he subjects them to the same techniques as machine parts; in short, he evolves a standard nutrition. In this endeavor he tries to determine everywhere the minimum requirements on which man can exist, as is shown in all the nutrition tables and doctrines of calories that have been put forward. This striving becomes understandable once we realize that technical progress goes hand in hand with curtailing of the food supply, that is, the difficulties of feeding the masses increase sharply as technology progresses. To the pangs of metaphysical hunger that we feel in the presence of the machine there corresponds an actual physical hunger: food gets scarce.

XXIII
Technology Usurps the State

It is an error to suppose that advancing technology merely narrows the sphere of individual freedom—a sphere that to some rigorists appears to be too large anyhow. That formulation would be too simple and too rash. It does not do justice to what is actually happening here.

Technology binds and sets free at the same time. It emancipates human thought from all transcendentals, but at the same time it confines this thought to all that is practical and mechanistic. Technological thinking is obviously collectivistic. But such collectivistic thinking presupposes an individual freed and cleansed from all conflicting considerations, an individual that will abandon itself unreservedly to the collective. Technology has no objection to the individual as such, so long as he surrenders unconditionally to the technical organization. It is as indifferent to the individual as, for instance, the mail carrier must be to the religious, political, or moral traits of the recipient of the mail. If this were not the case, the technical organization of the mails would quickly fall apart.

On the other hand, technology does not only interfere with individual freedom where it eludes technical organization. In the field of law, technology not only turns against such individual rights as are still independent of its organization, it also turns against the right of association, the right of organization wherever the groups thus formed are contrary to its interests. Neither does technology stop short of public law, constitutional law, or the state itself. On the contrary, it is precisely here that we can observe the most monstrous inroads by which technology permeates the whole life and the law of the state. These spreading infractions are made with a forceful consistency so great that it gives the impression of inherent necessity. The situations are many where it is difficult for us to determine whether we are dealing with a statist or with a technical organization.

The state is reduced to a choice of evils. For the sake of its own existence and survival, it must promote and protect the progress of tech-

nology. But while the state is doing this, technology infiltrates and usurps the governing and administrative activities of the state. It begins to transform the whole military and civil service organization. This mechanization appears to increase the powers of the state, and it does so indeed, even to an extent that seems to render negligible any disadvantages that may be involved. But precisely this colossal increase in power should warn the thoughtful that all this additional power comes to the state, not as a free gift, but as a loan from which technology expects to gain. And that is indeed the case.

With every act of mechanization, technology drives the wedge of its causal mechanism deeper into the state. Every expansion of technology brings new infiltrations of mechanistic thought that change the very essence of the state. Automatism spreads into government, the same automatism toward which all mechanization tends, and with automatism comes the rigidity which is the essence of all precision, machinery geared to high speed. Man not only becomes dependent upon the functioning of the state organization; he is also set in motion by it; he is constantly subjected to extensive mechanical compulsion. Wherever the state succumbs to this technological coercion, there triumphant technology lords it over the state with its technical organization.

Wherein lies the secret of the amazing success of technical thinking? It lies most of all in the fact that technology knows no hierarchy, that it concentrates upon the mastery of mechanical laws, which, are general and in themselves without quality. Neither are technical products imbued with genuine quality, for such qualities as are ascribed to them are merely incidental and not determining factors. The characteristic of standardized technical products is not their quality but their mechanical uniformity.

XXIV
The Disintegration of Nature by Scientific Thought

There is a type of intelligence which might be termed naked. In it reason considers itself absolute and refuses to admit any concepts not established by itself. All non-intellectual concepts are held to be unreasonable and are discarded. All our perceptions are put to this test. In this process, all that cannot be resolved and explained by reason is eliminated. It is precisely by this methodical effort that our knowledge becomes scientific. Man's knowledge of nature becomes "pure" and "exact" to the extent that his relations are limited to reason. By this effort science has grown to its present stature and has evolved the methods by which to transform the world and to supply mankind with keys that unlock the treasures of nature. However, by the very same process, science ruins itself, for, since reason implies the faculty of making distinctions, scientific progress marches straight toward disintegration. Science is compelled to split up into more and more disciplines and its claim to universality is destroyed by the growing isolation resulting from its concentration on minutiae. In place of the great concepts which stand at the beginning of scientific development in which intuition held mastery over reason, we find the mechanical, antlike industry characteristic of modern laboratories—that nakedly utilitarian cleverness which aims to trap the phenomena of nature. The scientist, now in possession of a tremendous arsenal of tools, begins to squeeze and torture nature and to compel it by the use of force to reveal its secrets.

"Pure mathematics and pure natural sciences" according to Kant, are those sciences that are based upon synthetic a priori perceptions, upon propositions, that is, which "are apodictically certain, partly by pure reason, and partly by general consensus based on experience, yet recognized as universally valid even in the absence of experience."

This *a priori* purity of science which has no need of experience may here be disregarded, since science also possesses an empirical purity. Science can also be termed "pure" only in so far as it deals with nature

exclusively by means of reason. But the very fact that science serves knowledge and makes knowledge an end in itself does not make science "pure". Pure science in this sense does not exist and cannot exist. The striving for knowledge cannot be isolated so as to achieve an independent existence separated from everything else; it is precisely the type of intellect which thinks in terms of cause, effect, and purposes which cannot achieve any such independence. This intellect does not confine itself to the sphere of pure knowledge but reaches beyond. It wants to change the world, and change it it does. That is why science is never satisfied with mere knowledge of the laws of nature and why it does not leave these laws alone. All scientific perceptions aim from the beginning to imitate such laws, to apply them, use them, exploit them. To the extent to which this aim is pursued, science fuses with technology. The existence of techniques and industries which have originated from scientific research and are entirely based upon it is proof in itself that there is no such thing as a "pure" science which strives solely for knowledge and for nothing else.

Science is "positive" when it is concerned with that which can be described and defined precisely. Scientific positivism has its own viewpoints, which require an eye that interprets the world in an artificially factual manner, an eye which dissects what is whole into its component parts. Such parts and particles kept in strictest isolation from the others then tend to develop a life of their own. Only that which can be established and proved by rational experience is considered "positive," and not what "stands to reason. "What "stands to reason" lies outside the fortress of positive knowledge, based as that knowledge is upon intellectual distinctions alone.

Now, proof, in order to be sufficiently positive, presupposes that something can be repeated. For nothing that is incapable of recurrence can be positively proved. That is why any experiment must be repeatable if it is to prove anything. It is by experience that we learn to distinguish things. The concept of experience, however, is ambiguous, for it relates first to that which we want to find out, but it also stipulates that whatever we find out must be repeatable and capable of being reproduced. The quest for experience asks first of all: what can be made the object of experience, and how can we experience that object? In other words, the quest is for the organs and the causes of experience. But in addition, the concept of experience also implies repetition, for once acquired, an experience can be reproduced and passed on more or less like a finished product. Not all experiences, however, are suitable for

the use of science. Memories, for instance, are experiences, but they are not of the kind produced by the intellect alone. Science is concerned solely with intellectual experiences because only with them can science operate. To science, experience is the finished product, is that which can be repeated, is that which is sufficiently solid to be reproduced over and over.

To the human intellect there rightly apply such descriptive adjectives as trenchant, sharp, or pointed, for these express its power of distinction. The intellect separates and divides, and the more proficient it is in these activities, the more it improves itself as a tool. It sharpens itself with the increasing sharpness of its distinctions. It points itself as it hits the exact point which splits some problem "wide open" for all to see. It gets increasingly more penetrating as it cuts through and classifies the dark jungles of phenomena. It fits itself preeminently for scientific research by becoming methodical. By definition, everything methodical is the object of abstract reason; methodology is the science of legitimate intellectual relationships. It is by method that the human intellect progresses from the field of practical pursuits into the field of theory, which becomes manageable through the patterns which the intellect invents and through classification, which is its specific capacity. The practical intelligence which is needed, for instance, in business and finance, has only an insufficient grasp of method. Since it is employed only as the opportunity arises, it lacks perspective and spirituality. Only theoretical thinking which proceeds methodically deserves to be called intellectual. The intellectual capacity of distinction is of a higher order, hence the intellect shows a certain spirituality based upon the system of distinctions which it has acquired.

The type of intellect which sticks to its specific capacity, which judges by it alone, methodically and without ever deviating from the course of its investigation, must be called cold. It proceeds from argument to argument in an uninterrupted logical chain.

This intellect is also barren because its capacity is based entirely on distinctions, of that which can by its very nature be separated or broken down. It is incapable of approaching an indivisible whole, and when it attempts to do so, it fails. This intellect can grasp what belongs together in essence only after it has been separated. Whatever is joined it can only disjoin, and it is only from what it has previously disjoined that it can put anything together again. This is the shortest formula to describe its activity.

In order to become active, however, it needs something on which to

test its faculties. The intellect does not exist for its own sake, and it lives not by its own faculties, not even in the fields of logic and transcendentalism where it makes its own rules and sets its own limits. Invariably, it needs a substratum, some object whereon to demonstrate and prove itself. Without it, the intellect would be, as it were, in a void, which offers nothing to hold on to. To the exact sciences, thus, substratum is nature, and this is why they are simply termed the natural sciences. The field which the methodically built-up intellect digs into is nature itself, and it is reason's task to introduce rationalism into nature, to make nature intelligible.

Intelligibility is not already present in nature; it must be introduced into it. In so far as nature proceeds according to laws, in so far as natural events recur, nature can become the object of repetitious rational observation and experience. That which does not repeat itself cannot become the object of science. Natural science is the understanding of the recurring events in nature; anything beyond does not concern science, lies beyond its limits. Consequently, it is the mechanics of nature, the mechanically recurring phenomena, that are ascertained by scientific investigation. Such investigation can proceed only if the laws of nature are conceived as permanent and inexorable, as rigid and unalterable. Only where the natural order is regularly repetitious and uniform can the intellect serenely proceed with its fact-finding of natural laws. That is why the intellect is irritated whenever contradiction arises, whenever contradictions and irregularities disturb and hamper its work.

What needs to be emphasized in this connection is the fact that all progress in scientific research is based on the assumption that nature will passively submit to the probing, that abiding by its own laws it will not jump.

What must we conclude from this? First, that all intellectual advance takes place only within the intellect itself, and that nature, which cannot become intelligible to itself, has no share in it. But there is a contradiction contained in the idea of a continuous intellectual advance, of a perpetual motion that is based on a rigid substratum. This contradiction is resolved only when we consider that the work of the intellect is aggressive in character, that it possesses activity, whereas nature, in the state in which it becomes the subject of science, suffers such scientific probings passively. Although all intellectual work on nature takes place solely within the intellect and not within unintelligent nature, which remains unintelligible to itself, nature nevertheless is the field wherein

the work of the intellect proceeds.

In other words, even if nature seems to submit to the probing into it without protest, it can still become affected by it. And that is actually the case. Science ascribes to nature the subservient role of acting as a forever rigid substratum for the growth of the intellect and the advance of science. But what if nature fails to stay in that subservient role? What if this substratum suffers changes by the very progress which is made on it? We must ask ourselves whether nature, as it is investigated and made subservient to the intellect, is not violated and robbed by this tyrannical intellect. We must seek purposes which that intellect pursues in nature. We must examine not only how this intellect interprets nature, but also to what extent it is a tool for the exploitation of nature. Since the intellect does not exist for its own sake, since it is not an end in itself but pursues definite purposes we must keep an eye upon that seemingly disinterested enlightenment which the intellect uses for its missionary and vanguard. For its real purpose might well be the spying out of opportunities for new rape and destruction. For an answer whether this is really the case we shall probe deeper into technology.

XXV
Functionalism Versus Vitality

We must keep in mind that the exactness which the natural sciences have achieved, or are trying to achieve, no matter how far it is carried, refers only to the mechanical exactness of both the process and the subject of perception. Such exactness does not give us certainty beyond the certainty of facts found in repeatable experiences. Exactness in this sense is in fact correctness, but it is not truth, for it is meaningless to talk of truth where merely something mechanically repeatable has been ascertained. Truth is not identical with repeat ability; on the contrary, it is what absolutely cannot be duplicated. Hence truth has no place in any kind of mechanics. The term "scientific truth" is therefore quite equivocal. It is based on experiments, and it is used where some mechanically exact phenomenon has been made intelligible, provable, and capable of being repeated.

But the fact that something can be proved, tested, and repeated is no criterion of truth. If the scientist asserts that this exactness is synonymous simply with truth, or with a higher truth, the assertion shows only that the scientist's terminology itself is inexact. What sense does it make to call the proposition, "Two times two equal four," a proposition memorized by first-year school children, a truth? Truth is not learned; one does not become more truthful by learning and by knowing much. Nor do we become truthful by exact thinking. A mathematical proposition does not become true just because it describes a fact with exactness, not even if it gets repeated a million times. The apodictical certainty of mathematical propositions lies entirely and completely within the field of exactness and correctness; but their content of truth equals zero, like that of any arithmetical proposition. Scientific truths are not "higher" truths. Where they claim to be, these claims are usurpations by the mechanical exactitude. It would be better to discard the term scientific truth altogether because its validity is merely descriptive.

The striving for exactness characteristic of the natural sciences must here be gauged in a different manner—not with those measuring in-

struments developed for the purpose, but from a point of vantage entirely beyond all science and scientism. No one will deny that it is needful and legitimate to seek such a point of vantage, unless, of course, we make science our religion, surround it with walls of dogma, and sanctify all its methods. But this would render all investigation and analysis impossible.

We will start from an observation which no one who has ever made it can forget. For to observe our modem civilization means to raise the question: Is there not a direct connection between the increase of knowledge concerning mechanically exact processes and the fact that modern man, in a strange manner, loses his individuality, loses his balance, his grip upon life, feels increasingly endangered and susceptible to attack in the security that is his due? This inner security, of course, means something different from the security which can be bought by any kind of measurable method. For it concerns man's place and role in life and is related to human freedom. No methodical science can ever give to man that kind of security, not even the most systematic kind of exactitude. The trend of our exact sciences is not toward purely intellectual knowledge. On the contrary, it has been sharply opposed to the way Parmenides strove after knowledge; it is typically analytical, inductive, dividing. Thus, causality and, in its train, functionalism push to the fore, and all individuality is lost. Thus too, all things mechanical predominate, and with them that brutal optimism and conceit of civilization which characterize the course of the technological age; until eventually the point is reached where a man is broken by his blind lust for power, is punished, and thereby forced to change his way of thinking.

As Niels Bohr once remarked, “If we call a machine 'dead,' in keeping with the common usage of language, we are saying hardly anything except that we can give a description of its functions, sufficient for our purposes, in terms of classical mechanics.”

Indeed, wherever we can adequately describe functions in terms of classical mechanics, we are dealing with something dead. If we should succeed in describing adequately by these terms the functions of a human being, that human being would be dead. He would be dead even though all his functions continued in a manner that would allow us to assume that he could continue to perform certain motions. This may sound strange, but it is not. The meaning of “dead” is a specific one in this context. The machine is dead although it performs motions. It is precisely because it performs the sort of motions we see in living things that we call it dead, as we call dead a corpse or a cadaver. Strictly

speaking, the machine does not move by itself; it is being moved.

This is a fundamental difference. All functions are processes of motion by which something is moved. Preconditional to all functioning is the capacity for passive motion, mobility. Whatever moves by itself, whatever possesses the capacity to direct its own motions without obeying any mechanically explicable compulsion—and even plants have that capacity—moves in a manner that cannot be adequately described in terms of a sequence of functions. Wherever the vitality of any living thing manifests itself, there the study of mobility is not enough, because all functionalism can be studied only in passive motions, that is, in dependent motions. Functionalism can describe only causal relationships but not identities; only determinations, but not what pre-exists or coexists. It cannot describe the simultaneous and contiguous being, nor any of the non-causal relationships. Thus, when the functions of man, animal, or plant are described, they don't tell us anything vital about that man, that animal, or that plant. This remains true no matter many functions may be discovered, for functions always refer to passive mobility only, to an interdependence, which means to say: to something dead.

In the same sense then that a machine may be called dead, a man may be called dead. This use of the term is metaphorical, because it describes as dead something that never has had life, and that therefore lacks polarity to living things. When the terms "dead" and "alive" have polarity, one is the corollary of the other; neither is independent so that it could exist without the other.

A machine is dead although it never lived. It is dead because its motions are subject to functionalism throughout. And there can be deadness of the same kind in a living man, a deadness that never had life and therefore cannot die, but can only disintegrate, vanish, or erode. Such a human being has dead spots, dead parts, dead sections in him. He shows a lifelessness that is manifest even in the midst of activity. His youth is without vigor, his age synthetic; maturity is lacking. No physiognomist can fail to notice such things. As there are mechanical motions, so there are mechanical faces. A man is dead inasmuch as his expressions and movements reveal functionalism of the type which can be observed served in machines. The mask-like quality in the face of such a man reveals that here life is merely being imitated—that its movements are imitations of a non-existing vitality. A study of this can be made in the faces of actors, but not in them alone. Many masks and larval beings are moving about among the living, and there is no lack of

those vampire-like beings, endowed with a semblance of life, who may justly be termed human automatons. Their influence increases at the same pace as functionalism gains in power. To the physiognomist this type of human often gives the impression that they do not age, and that they cannot die. True aliveness, in contrast, means the stamp of polarity and the stronger the vitality, the more pronounced is also the polarity of life and death.

XXVI

The Vengeance of the Fettered Elements

Let us now turn to that aspect of technology which touches and rests upon elemental nature. This association is unconditional and indissoluble, since all technical work requires some natural element with which to operate. Whatever power technology produces, it draws from nature's reservoir in the same fashion as one draws a pint from a barrel. This holds true regardless of how ingenious the means may be by which technology taps the sources of its power.

The technician has lost the age-old awe that restrained man from injuring the earth, from changing the shape of its surface. This awe in the past was very pronounced; its traces are found everywhere in the history of agriculture, and it reaches well into historical times. With the great masterpieces of architecture there is always associated the idea of a colossal presumption—the tower of Babel is a typical example; even Cologne Cathedral was held to be built with the devil's aid. Certain ceremonies during the building of a house that have survived until our days are acts of conciliation and consecration, implying that there has been an act of desecration. The technician, however, proceeds without awe, as his methods show. To him, the earth is an object for intelligent and artful planning, a lifeless sphere subject to mechanical motion and exploitation by him who understands its mechanics. Ruthlessly the technician conquers the earth in his quest for power; he confines the elemental forces in engines where they must obey and deliver power. Elementary nature and the man-made mechanisms controlled by human intelligence will clash and the outcome is an act of enslavement which presses elemental forces into service. Their free play is ended by force.

We gain a clear idea of this process if we imagine it as an act of tapping or bleeding. Man taps elemental nature and drains her forces. The wells and shafts driven into the earth everywhere to get at her underground treasures, those factories which extract the nitrogen from the

air, radium from pitchblende, or simply ways of transforming clay into bricks—all these are taps and drains. We find them wherever technical products are manufactured. We also find them where the finished technical product gets into consumers' hands. Thus the expansion of motorized transport goes hand in hand with the constant growth of road networks, service and repair stations which cover an ever larger portion of the earth. Mechanization vastly increases the number and size of those plants by which nature is tapped and drained.

With the progress of technology, the sum total of the contributions which it exacts from nature grows bigger and bigger. Elemental nature, through mechanical work, is being mastered; it is being conquered and exploited by man-made tools. But if we thought this to be the whole story, we would understand but half of it. We would have only a one-sided idea of the process. For all this seemingly one-sided pressure and compulsion, this engineered extortion of nature, has a reverse side, a counterpart. Because the elementary now floods with its powers all things mechanical, it permeates and expands all over the man-made world which has conquered it. In other words, mechanization and elementarization are merely two aspects of the same process; they presuppose one another. The one is unthinkable without the other. This reciprocal relation becomes increasingly clear with growing technical perfection. From this infiltration of the elementary, there stems the torrential dynamic motion typical of the progress of technology. The elementary is the source of its rolling speed, its vibrations and tremblings, its explosive impact. It is indeed strange that rational thought, poor as it is in elementary power, could have set these tremendous forces in motion. But let us not forget that this mobilization was effected by compulsion, by aggressive and violent means. As we look around today we feel that we are living in a giant mill which works day and night at a furious, feverish pace. In blast furnaces and converters the fires blaze and roar; everywhere the streams of molten metal are pouring forth and huge ingots are glowing cherry red. This is the workshop of the Titans. The industrial landscape is volcanic in its character, and thus are found, especially in the areas of heavy industry, all the companion-signs of volcanic eruptions: lava, ashes, fumaroles, smoke, gases, night clouds reddened by flames—and devastation spreading far and wide. Titanic elemental forces captured in marvellous engines are straining against pistons and cylinder walls as crankshafts are art; moving and delivering an even flow of power. All the elements are racing and raging through the jails of man-made apparatus; all those boilers, pipelines, gearboxes,

valves are steely and bristling with reinforcements, as is every jail designed to keep its inmates from escaping. But who can remain deaf to the sighing and moaning of the prisoners, to their raging and ranting, to their mad fury, as he listens to the multitude of new and strange noises which technology has created? Characteristically, all these noises originate from the meeting of the mechanical with the elemental; they are produced by the outflow of elementary force from the constraining might of the machine. If they are rhythmical, their rhythm is automatic, regulated significantly by lifeless time. And all these noises are malignant, shrills, shrieking, tearing, roaring, howling in character. And they grow more malignant as the technology approaches perfection. They are as evil as the visual impressions which technology supplies, such as the eerie cold light of mercury, sodium, and neon lamps, which invade the nights of our cities. Likewise it is a significant fact that sound and light signals are increasingly employed as warning signals against dangers. Traffic lights, rail torpedoes, stop lights, fog horns belong to that category, as do the sirens whose mighty mechanical screams announce the approach of bombers.

An automaton always presupposes man. If it were otherwise, it would not be a lifeless mechanism, but a demon endowed with independent will. The old superstitious idea, however, which held that some man-made apparatus might acquire a demoniacal life, might unfold a will of its own, a rebellious and destructive will—this idea is by no means as erroneous as we now suppose.[8] Although this idea may seem absurd, owing to its form of presentation, it still contains a measure of truth. For inertia, the passive resistance of matter, grows under the mechanical coercion inflicted upon it and, from this resistance of matter against its fetters, collisions result, followed by destructions.

At a certain stage of technological progress, the individual begins to become aware that he has entered a danger zone. Gradually the smug satisfaction which the observer derived from the sight of some marvellous piece of machinery gets mingled with a sense of impending danger; fear befalls him. Those weavers who in a burst of blind and thoughtless hatred destroyed the power looms that had deprived them of their livelihood were not yet aware of the real menace. They tried to stop technical progress by brute force a fruitless attempt to save themselves from proletarization. The realization that man has to pay a price for every increase in power the machine gives him, that he must give an equivalent in return, is a realization that had not yet dawned in the early days of technology. In those days boundless economic confidence

predominated, an unshakable optimism about the future. It is by no means accidental that the progress of the iron age was accompanied by doctrines in which progress undertook to celebrate itself, doctrines ranging all the way from praise of evolution to praise of brute force. The machine era is revolutionary not only as regards machinery. As technology approaches perfection, however, the chorus of optimistic voices grows weaker, because experience gradually teaches not only the advantages but also the disadvantages which the new tools bring. Only by experience do we learn that our technological apparatus has its own laws, and that we must be on our guard against getting in conflict with them.

The industrial accident may serve here as an illustration. As mechanization progresses, industrial and traffic accidents increase until they far exceed even the casualties of war. Since even the most ingenious inventions cannot eliminate these accidents, it is clear that they must be due to some basic discrepancy between the operator and the mechanism he operates. The operational accident occurs where man fails to function as a human machine, where he no longer acts in accord with the automatic mechanism he is operating. The operational accident, in other words, occurs precisely where we are human, where we try to assert our independence of the machine, be it by lack of attention, fatigue, sleep, or preoccupation with non-mechanical things. It is in such moments of human weakness that the suppressed elemental forces break loose, get out of control, and wreak their vengeance by destroying both the operator and his machine. The law, now in the service of the technical organization, punishes the negligent operator for failure to control his automaton with automatic regularity.

The disaster of the *Titanic*, an event whose symbolic significance is emphasized by the name, was such an operational accident. We can understand the shock it produced if we consider that this accident shattered for a moment faith in the technology which had claimed this ship to be unsinkable. The optimism based on such claims was temporarily dispelled. The deeper and more lasting impression made upon man's mind by the Lisbon earthquake is, however, related to a change in religious concepts. It undermined the faith in Divine Providence, a shake-up which favored the formation of a causalist ideology opposed to any idea of divine providence.

The operational accident is a specific and local act of destruction; characteristically, it is unintentional and unavoidable, no matter what technicians, safety experts, and insurance men claim to the contrary.

For while it is true that almost every accident can be proved as avoidable by analysis, it is also true that failure of mechanical functioning is inherent in human nature. This is because man is more than a bundle of associations. Appallingly high as are the operational casualties of a modem civilization even in peacetime, they give only a faint idea of the destruction that can be wrought by a perfected technology in war; if, that is, the destruction is planned and the apparatus of technology is pressed into its service. Technology, indeed, is willing, it is even eager to serve for destruction because it itself is brimful with destructive forces. Once we have grasped the fact that mechanization has its counterpart in the invasion of our civilization by elementary forces, the constantly closer connection between government by technology and government-organized war becomes quite clear.

By its progressive mechanization, technology not only accumulates those energies which obey rational thinking and are its faithful servant. With the aid of these energies, it does not merely create a new work organization that directs both production and consumption. In the same process of mechanization, technology also accumulates forces of destruction which, once unleashed, tum upon man with elemental impact and a fury all the greater, the closer technology advances to perfection. If we want to examine the interaction between the mechanical and the elemental, we can find no more instructive field of study than the battlefields in a modern war of material.

I confess that, in the first battle of Flanders (1917), I was shocked, not so much by the spectacle of death and destruction, as by the man-made transformations of whole landscapes. Without a doubt, the fields of earlier battles, at Cannae, for instance, were littered with more impressive heaps of dead men and horses within a smaller space. In Flanders, the battlefield was very wide; in it the armies were dispersed and were entrenched to an extent that made the field seem empty. The artillery barrages which had hailed down for weeks had turned this theater of war into a sort of moonscape covered with craters. Its volcanic character was unmistakable. It would have been hard to find a single object that had not been most violently mangled. Fantastically twisted and disemboweled machinery was scattered about in fragments—airplanes, motor vehicles, wagons, field kitchens—their skeletons in grotesque piles. This deformation of technical apparatus—and of the human bodies involved in it—was the reverse side of a level of technological development in which a vast amount of elemental energy had been fettered by mechanical apparatus. There are many to whom such destruction

seems senseless and inexplicable because they do not understand the relation which this represents. They fail to see the connection between destruction and technology, although they could see the same kind of disorder in any industrial accident. They do not grasp the fact that, together with technological progress, the violent and destructive forces of disorder also progress apace.

We now realize the existence of various danger zones which we can distinguish by the varying degrees to which they are menaced by destruction. Those zones where the interaction between manmade mechanics and natural elements is most intense, that is, where technical progress has advanced the farthest, as in big cities and highly industrialized regions; those are also the zones where destruction can have the greatest quantitative effect. The zones of greatest danger are the ones where the organization of work has produced the densest settlement, where the greatest mass of people has been brought together. For it is the masses especially who are threatened by destruction.

We can see this already in the new war weapons that have been introduced, weapons whose technical progressiveness is expressed in their mass effect. War weapons of this sort, like poison gas, have a painful similarity to the methods employed by the exterminators of pests. Significantly, these new weapons are designed for total effect within considerable space. This means that their effectiveness is greatest in those spaces where human masses are concentrated.

XXVII
The Immaturity of Technological Perfection

What do we mean by saying that technology achieves perfection? What does the statement imply? Nothing else than that the thinking which produces and expands technology comes to an end, that it reaches those limits which are set by its own methods. It means that a high degree of mechanical skill has been achieved, as can be observed in production methods, tools, and products.

When we study an engine, such as the diesel engine, from the first model built according to the inventor's calculations, to the latest model as it leaves the factory brand new, we observe the step-by-step advance of technical thought, testing itself, redesigning, improving, overcoming resistances. Such resistances, to the technician, are obstacles which must be and are being smoothed out by mechanical laws.

However, these "bugs" in any new design point at still another element. These resisting elements arise wherever forcible methods are applied, and they increase in the degree in which these methods become general. It is a mistake to think that the resistance is dissolved by its mechanical solution. Actually it remains; no matter how subdued, it is still there watching in ambush, forever ready to burst into destruction. That is why in countries with a highly developed technology we find the same state of nervous tension and uneasiness which marks empires having a large and malcontent slave population. On the surface the slaves may appear submissive enough, but one senses that their thoughts and dreams are centered on revolt, insurrection, and havoc. But in such countries we shall not find that patriarchal relationship that was still evident in the slave states of the South. Within the modern, technological order, there is neither the kind master nor the devoted slave. All this is gone, as neatly as bark stripped from a tree; patriarchal relations are replaced by mechanical relations; human relations are turned into power relations pure and simple, as are the laws of force and counterforce in physics. Apparently we cannot escape these power

relationships, this law which governs our age.

Significantly, however, the human race never has and never can resign itself to be governed by mere power relationships. Its rank is higher and its destiny transcends by far the realm of mechanics because man is more than a machine. Human resistance against the dehumanizing forces, to be sure, often errs in its ways. For the most part, it never goes beyond the kind of revolt which is easily subdued, the revolt of the masses which unfailingly finds its master. With the revolt of the masses we shall not deal in this context, because the "exploitation of the exploiters" originates from the same ruthless will for exploitation which characterizes all technology. The far-reaching devastation wreaked by technology, the gaping wounds, the festering sores it produces in the body of the earth—they have their exact counterpart in the havoc which the revolt of the masses works.

In the realm of modern technology equilibrium exists no more, neither between man's work and his leisure, nor between man and nature. What today we term "love of nature" is mostly the emotional sentiment, the pity one feels for something that has been wounded, bled white, and needs protection. Modem civilization pities nature and, in a measure, patches up the wounds that it has previously inflicted. Unspoiled nature is haloed, is fenced in, and studded with verboten signs because a man may no longer be trusted with it, because he would only act like a vandal ruining and killing all things. These measures to protect nature are somehow offensive to our human vanity, but they are also ironically comic, considering that nature is by no means a passive victim of our exploitation. For, as we have seen before, nature answers the conquest of technology by a counter-invasion of its own; as we destroy it, it destroys us with the elementary forces we think we have captured.

To think in terms of causes, effects, and purposes means to think one-sidedly. To see things in their whole context cannot be learned, no more than one can learn rhythm or the periodicity from which all rhythm stems. Correlations and contexts are noticed only by those minds which think in universal and reverent terms, minds which therefore reject all pillage and exploitation.

Is there a counterpart in life to that ripping intrusion of machinery which always results in the deformation of nature? It can best be seen where machinery tears itself apart, where it is ripped open, where, in destruction, it loses its mechanical form, just as man who is tied to it is torn apart with utter disregard of his organic form and structure, which

is to say, mechanically. He is not even cut up like an animal that is taken to the butcher, nor neatly carved and disjointed like a chicken: he is blown to pieces, crushed, tom to shreds.

This aspect, to which we must not shut our eyes, teaches us that technology may reach perfection, but never maturity. To ascribe maturity to a mechanism means using a metaphor which is quite out of place. Mechanisms may give the impression of the highest streamlined perfection, but this must not be confused with maturity. Maturity is never forced, nor can it be enforced. If we were to imagine a world based wholly on will power and the energetic efforts of that will, it would be a world without maturity and forever devoid of maturity, a world of immature things which, nevertheless, might seem to be quite perfect.

That is the kind of world towards which technology is marching. That also is why, wherever we look today, we find will power in action, sectors of new developments, spearheads of progress—but hardly ever will we find anything mature, for maturity lies outside the realm of the machine. The concept of perfection used in this context expresses only that final state of completion that can be measured by those means which here combine to be the end. The concept is useful here because it is completely rational, and thereby it fits the conditions we have described.

XXVIII
Technology Prepares for Invasion by Ideologies

What is behind that strange intoxication which befalls us as we are rushing along at unprecedented speeds, or soar up into the stratosphere? What is the meaning of that intoxication of the auto and the plane, which has taken the place of the old wanderlust and the mountain climber's exuberance? What is the real significance of the triumphant headlines which herald records of all kinds in this age of technology?

They would remain mysteries if we failed to understand that here a restless striving for power, fully aware of its own means and ends, finds satisfaction and fulfillment. A wise Chinese, imbued with Confucian ideas of harmony—assuming that there still are wise Chinese—might smile at such barbarous exhibitions. He may find ridiculous and even brutal the almost religious fervor with which the masses acclaim such achievements. But there is no doubt about what the masses applaud in the record-smashing. It is the victory of dynamics, in which they rejoice as in their own victory. It is the motorized mechanical motion, the conquest of the resisting elements, that elevate their emotions and arouse their enthusiasm. The applause accompanying every new record is applause for the breaking of resistance; it heralds the victory that the machine has won over elemental nature.

But to understand the enthusiasm which the masses feel for technology, we must recognize that the formation of masses and technical progress go hand in hand. The enthusiasm itself is already a symptom of this. Technical progress is strongest where the formation of masses is most advanced and vice versa. To ask, however, whether the formation of masses was the consequence of technical progress, that is, of the planned direction of man and his work, or whether technical progress was produced by the formation of masses, would be as futile as to query whether the hen was first, or the egg. We must guard against the oversimplification of looking everywhere for causes and effects, against

the type of reasoning which is satisfied once it has established a mechanical casual relation between things. Science especially has become guilty of these oversimplified forms of thought, forms which are insufficient to explain the relationships which here concern us. The procedure and the method we require are neither scientific nor technical. We must never forget that there are thought forms of a different order. Only by thinking in terms of correlations and reciprocities instead of causes and effects can we approach the phenomenon of simultaneity, a phenomenon which, defying all attempts at casual explanation, still deserves our attention.

Technical progress and the formation of masses are simultaneous; they are most closely coordinated. They are in fact inseparable. Far from resisting the struggle for technical perfection, the masses, on the contrary, further this drive. They welcome it; they fit themselves obediently into the automatism of technical operations. The mass is the most useful, the most pliant material of the technician. Without the mass the technician could not carry out his plans. Masses come nearest to the technician's ideal of human material, the more mechanically mobile they become and the easier they can be organized. At all times the habitat of the masses has been in the large cities. Only there do the conditions prevail which favor mass formation, even though mass thinking may reach far out into the countryside. Characteristic of the formation of masses is that it proceeds artificially, that is, by an influx from without. Another characteristic is that both the rise and the fall of masses are fomented by conditions beyond their control. Masses, in other words, can neither sustain themselves nor can they replace genetic losses by their own vitality; generally speaking their vitality-consumption increases in proportion to their numerical growth.

With "mass" we associate ideas of weight, pressure, and inertness. These associations are meaningful, but we must not overlook the fact that nevertheless it is precisely fluctuating motion which characterizes progressive mass formation. The mechanical, automatic trend of mass mobility is evident especially in our large cities. The increasing dependence of the masses upon rational organizations that administer and manage the mass man in all his functions is expressed in this mass mobility. Thus, the mechanization of traffic, controlled by the technician, compels man also to move mechanically, and to adapt himself to the automatism of traffic regulations. For "roaming through the gloaming," the city proffers neither space nor opportunity; it confines even the freedom of motion itself. We should have an excellent picture of what

is going on if we were to think of the streets as conveyor belts that transport men mechanically. But we get the idea even from existing conveyances like mechanical escalators, elevators, or any other mechanical means of transportation. If we watch the passers-by on a moderately crowded street, we recognize immediately the mechanical and compulsory manner of their movements and attitudes, illustrative of how mechanical their life has become.

The variety of conveyances also reveals the unprecedented extent to which man has become transportable. The tremendous expansion of traffic and transportation systems is a visible proof of this, but the significance of this vastly increased mobility becomes evident everywhere. For when we say that man himself has become "transportable," we indicate, first of all, passivity, an unfree movement, as opposed to movements that are active and show initiative. We may formulate the process as follows: Man becomes transportable to the extent to which the machine approaches perfection. Or, vice versa, without this increased human mobility, there could be no technical progress.

Man has become mobile, more mobile than he ever was. This mobility is a sign of progressive mass formation, which means the same as technical progress. It is one of technology's characteristics that it releases man from all non-rational bonds, only to subjugate him more closely to the framework of rational relations. The increasing mobility of man is related to the inroads of organization and apparatus into human life; as we get mobile, we also get mobilized. And in the same proportion man becomes mentally mobile—that is wide open to the invasions of ideologies.

The susceptibility of large segments of the population to ideologies and the power which the demagogues derive from this are symptomatic of mass formation. Ideologies are generalizations, vulgarizations of faith and knowledge; consequently, they are highly transferable and infectious. It is true that the technician has no need of an ideology to achieve his ends, for he has at his command powers that make an ideology superfluous. But exactly because the technician does not concern himself with anything beyond his own field, the ideology becomes a most handy tool. As the technician aspires to universal power, yet is interested only in his specialty, the ideology fills a gap, it abridges a vacuum; hence, the alliance between technology and ideology. In this association the ideology gains tremendous powers, and it begins to direct toward a goal all the vast stores of energy that organization and mechanism have accumulated.

The alliance between the technician and the demagogue does not come by accident. The technician's knowledge itself is just as transportable as any machine that can operate as well in the copper mines of Catanga as in the gold mines of Brazil. Technical knowledge is no more bound to an individual technician than functional factory operations are bound to an individual workman. Because the technician has no opinions or convictions of his own outside of his specialty, he needs the crutches of some vulgarized faith as peddled by the demagogue. Technical knowledge is accessible to anyone who wants it; it also can be pilfered, stolen, spied out, and it can be shipped to any point on the globe. Nor will it, like wine or tea, deteriorate in transport, for it lacks all quality; it is a knowledge without loftiness.[9]

The monopolistic character of technology in its earlier stages, therefore, rests exclusively on a head start in industrialization. In spite of all efforts to preserve it, this head start cannot be maintained because the knowledge on which the monopoly is based cannot protect itself. Those who hold that this knowledge should never have been surrendered, to the Asiatic peoples for instance, overlook that it never could have remained secret, because it has no inimitable quality. Thus inventions and devices for national defense have to be protected by special nontechnical methods.[10] Finally, the technician himself is not in the least interested that inventions should be secreted away or that monopolies should be founded on them. For him, to favor secrecy and monopoly would be to hamper technical progress, he would only be standing in his own way.

Since technical knowledge cannot protect itself, it needs legal protection, which is offered by the patent that protects the technical process and its exploitation for a certain period. It is significant that letters of patent, the documents in which privileges are granted, originated in England, and that England was the first to recognize a right of invention, a right alien to antiquity and to the Middle Ages. Jurists have developed a remarkable differentiation between the copyright of the author and the patent right of the inventor. A precondition of the author's copyright is that his brainchild has been given a definite form. With the patent right the inventor's idea itself is protected even without being translated into definite form, provided only that it can be exploited technically. But then the mark of all high-ranking knowledge is that it protects itself, not just potentially but actually, inasmuch as the creations of that knowledge cannot be imitated.

XXIX
The Mirage of Socialism

The technician, we said, could, if necessary, achieve his goals by power alone without the aid of ideologies. His thinking is not ideologically colored; neither is the apparatus with which he works. But this apparatus can be used at any time for the purposes of an ideology. Indeed, it is being used for such purposes because there exists a reciprocal affinity between apparatus and ideology.

Both have the same degrees of accomplished ability, thus they are bound to meet and join forces in their common aim which is to bring the individual under the yoke of mechanical organization. This alliance is highly successful because all ideology already presupposes mechanization, a machinelike uniformity in the thinking of its followers. It is not always easy to express in simple abstract language the difference between a people and a mass. For this reason we shall give now an infallible mark of identification. Wherever there is a people, wherever we are dealing with real peoples, there we shall never find a trace of ideology. And with the same certainty it may be said that, wherever there is a mass, we shall also find an ideology. The mass needs an ideology, and needs it the more urgently, the closer technology approaches perfection. An ideology becomes indispensable because apparatus and organization are not enough, because they do not satisfy the human need for moral support and spiritual comfort without which a man cannot exist. There is no doubt that the efforts of the technician have intensified the spiritual vacuum, that feeling of emptiness, to the same degree that he has constricted the scope of human life. And so the *horror vacui*, the horror of the void, is part of the technician's world; in many forms this horror enters into human consciousness: as a feeling of depression, of boredom, of futility, lack of purpose, nervousness and mechanical restlessness.

As soon as we concern ourselves with ideologies, we are touching also another related problem, that of the actor. Since this problem belongs in our analysis we must ask, whence comes the growing influ-

ence and importance of the actor in our modem world? The actor—of the cinema, for instance—is part and parcel of some huge organization which manufactures lifelike dreams with a highly technical apparatus. Since the technological impoverishment of life creates a popular craving for a dream-world and since these dreams are being mass-produced in dream factories, it follows that the influence of the actor grows in step with the progress of technology. This also becomes manifest in other realms of the make-believe, such as the growing influence of advertising and propaganda. Mass production of photographs is another correlated field. It is no accident that the actor is the most photographed man, the man whose picture meets one everywhere, so that the impression arises that to be photographed is the actor's main occupation, that he must constantly prostitute himself. For we are obviously dealing here with an act of prostitution.

As long as the comedian was a member of a caste, a class, or an order, as long, that is, as there was a hierarchy of society, the actor was always looked upon with distrust. This distrust was nowhere stronger than among the peasant class; indeed, we might say that wherever there is a peasant class, there is also an insurmountable distrust of the comedian. But masses feel very different in this respect. Today, when no idea of class is associated with the comedian; when, moreover, we find the comedian in every walk of life, including politics, distrust has been replaced by acclaim and contempt has given room to worship. Just as substitute foods sneak into our nutrition, so do feelings insinuate themselves into our thinking. In a world largely dominated by machinery and organization, happiness can no longer find a niche. There is just as little room for happiness there as in a causal chain, or in the relation of means to ends.

But to an individual, locked in his human misery, as in a tower, this is an unbearable condition. Where he has no longer any chance—and the strict organization puts an end to his chances—he must have at least the illusion of chance, some utopian dream of happiness. What makes every kind of socialism utopian is that it blueprints dream castles of happiness that cannot be realized. For since socialism aims to give to everybody his share, that is, since socialism distributes chances according to its own notions of justice, it equalizes and thereby nullifies them all. Nobody is so utterly lacking in imagination as the planner of utopias, who tries in vain to hide this lack behind his logic. If the Lord and Creator of this globe had made it so that everything were based on justice, there would be no happiness in this world. There would be neither

a happy man nor even a lucky one. The world would be as hard and as rigid as those scales held by the goddess of justice on which merit is weighed. In the same way, no happiness would exist in a completely "just" social organization, if it were ever followed to its logical conclusion. There could only be promotions according to some point system of merit, and some well-earned pension upon retirement. Precisely because such a social organization is built completely upon duty and reward, love and grace and happiness would be excluded from it; they could find room only outside of it.

That kind of life is wholly intolerable to human beings, even to those who have conformed to technical organization. Even though mechanized man is not happy, he is unwilling to give up the chance of at least a stroke of good luck, be it only in the sweepstakes. In fact, he clings to this chance the more strongly, the less his prospects of realizing it. And why not give him the chance? There is nothing in this world easier or cheaper than to hand out chances, since they are always distributed in exact proportion to the blanks. If one cannot make man happy, one can still make him a candidate for a hit of good fortune. Moreover, in a state of advanced technology, illusions can be mass-produced by industry. Thus, the movie industry holds out to the tired employee of mechanization the images of happiness in love, of wealth, and of imaginary worlds of gracious living. And is not the comedian the man of chances, the chance-dispenser, the chance-magician par excellence? And are not the spectators indebted to the comedian as he plays fortune's role for them? The spectators, moreover, identify themselves with the make-believe and the game of chances. The audience needs a symbol, an ideal, a hero, and the comedian who is none of these is at the same time the only one who can enact such roles. The idea of play-acting, which means change of role and character, implies that the comedian cannot have much character or stature of his own. Neither is the happy-go-lucky human type of any stature. But this human type, the average fan of the movies and the radio, is perfectly happy to watch his own role being played by those to whom "everything happens" on the silver screen.

As was already mentioned, the meaning of publicity and propaganda is understood by only a very few people. The public by and large sees only their business aspects and explains them by the rules of competition, the economic struggle which is conceived as part of the struggle for survival. But why is it that advertising and propaganda are marching apace with technical progress? Why is it that they are becoming the

foremost exploits of that progress and spread all over the earth? Why is it that publicity experts and professional propagandists begin to practice psychology in order to increase still more the penetrating, insinuating, enchanting power of their claims? Finally, what is the greatest obstacle which impedes the success of these endeavors? It is simply that the promises are not credible, and that it is not easy to hide the large portion of humbug they contain. Hence that pasted-on, poster-like quality of these claims; hence also their invariable appearance as fillers of bare spots and empty places. In fact, it seems that the very volume of advertising and propaganda proffers an excellent yardstick for the extent to which our lives have become emptied, have become whited sepulchers, the bare facades of which can be pasted over with anything.

How far are publicity and propaganda effective? What are their limits? As we have stated, they can capture only things which are technical products, preferably mass products, and they can influence only those who are susceptible to these things. Everything else remains outside their sphere. To mass production in manufacture there corresponds mass reproduction in the means of advertising. Advertising supplies only the picture of whatever it deals with, together with the promises and incantations it uses for a magic wand. The fact that people also are being advertised and published is by no means a contradiction to this formula. The comedian, for instance, is preeminently suitable for being published because he is playing a role, and only in so far as he plays a role has he that mass appeal which warrants mass reproduction of his future. We do not mean to say that the comedian is nothing outside his role, although the part his role plays in his life may well be so large that little else is left. But here we are not concerned with what the comedian may be outside his role. For even where publicity plays up an actor's "private life," it shows him in a role. Publicity is not concerned with anyone who does not "play a role." The role then is not only something put on, but also something that is repeatable. And being repeatable, it acquires that smoothness that life does not possess, that self-same smoothness which we find in the comedian's face, a face both mobile and rigid, agile and tense, but role-conscious always, as long as it is on the stage. If we catch it off guard, however, and alone, we see it helpless and in agony, slack and empty. Is there a creature more miserable than the actor who plays no part?

XXX
Self—Deception by Photography

In a world of pure being, that is, in a world in which there can be no change, propaganda could not exist, no more than a difference between being and appearance, truth and falsehood. No deception could enter such a world—there would be no openings, no crevices to admit it. There could not even be such shadows as Plato believed to be cast by thought, shadows which came between the things and the ideas of things. Wherever the ideas formed in the human mind begin to predominate, there a process of separation sets in: the prototypes vanish while the images we are forming of them multiply. Without this process of ideation no science could have developed. For only as we begin to form ideas of things, does our reason demand to have these things explained. Without this separation between things and ideas, there would be no explanations forthcoming from the human mind. In mythology, for instance, the myth has no need to explain itself. It is only in the later stages of antiquity that philosophers attempt to explain myths. Euhemerus of Cyrene, for one, declared the ancient myths to be apotheoses of outstanding human beings. Others explained them as symbols and allegories of events in nature or in history.

For a modern example of this separation between actual things and the images we form of them, let us consider photography. When we ask: How is this photographic picture made? any expert or technical dictionary will explain the chemical processes on which photography is based. This explanation does not interest us at all here. What interests us is quite another question, namely, how photography has come into existence. Why is it that only as late as 1802, Wedgwood and Davy invented a method of exposing paper saturated with silver nitrate to the darkening influence of light, and in that way produced pictures? What is the significance of the use of the camera obscura, heliography, or the daguerreotype that first operated with sensitized glass plates and mercury developers?

Superficially seen, all this but shows the stage-by-stage development

of photo techniques, improvements which still continue. But the significant aspect of this development which goes unobserved is this: at first, it was impossible to make the picture lightproof, to fixate it. The white outline that had been caught kept on darkening when exposed to light, until it disappeared. Next, difficulties arose in the process of mechanical copying. Only by the use of numerous exposures and elaborate processes, Daguerre finally succeeded in making a copy. The problem of mechanical reproduction from the negative was not really solved before the invention of the collodion process.

Looking at the old daguerreotypes, one has the feeling that these pictures were split off from the prototype with much greater difficulty than in modem photography and that consequently more of the prototype has entered into the picture. This is the reason why the old photographs seem to us somehow more significant, more faithful or even convincing. It is as if in those days man had been harder to photograph, and not just because the techniques had not yet been worked out.

This impression is not deceptive. For obviously, the photographic process could be invented only after man had become psychologically ready to be photographed. The new invention, in other words, signifies a change of mind. It was in the degree that the human model adapted itself to portrayal by photography that the new techniques developed. The difficulty of making a lightproof picture was not merely a technical one. In order to bring the copying process to the automatic dependability it has today, it was necessary to overcome obstacles, not only of a technical nature, but also obstacles that lay in the human model itself. And, perhaps, it was just these human obstacles which challenged the inventors and made the improvements of technique worthwhile to them. For today, one often has the impression that photography is getting to be boresome. We can no longer escape the suspicion that the rising tide of copied reality contains an element of self-deception. As they are reproduced in millions, the reality behind these pictures wears thin, turns vague and the old charm evaporates. The photographic techniques continue to function with undiminished excellence and mechanical dependability. But a man changes. It is quite conceivable that we may grow tired of the mere copies of things which alone photography is able to supply.

XXXI
The Stampeding of the Masses

Although this essay examines critically the rational efforts of technology, the methods of this study should make it plain that it is far from attacking human reason itself.

Nothing is further from my mind than the romantic rejection of technology, a rejection that under present conditions would amount to a mere horse-and-buggy reverie. We do not live in a desert island, nor in a virgin forest. We live within the constant reach of technical machinery and organization. The pedestrian on the street is not the only one who must forever watch his step lest he should get mowed down by the wheels. Such watchfulness, but more comprehensive and more penetrating, must today be practiced by every man of spirit who wants to go on feeling that he is more than a mere cog in a gigantic machine.

Likewise, there is nothing further from the purpose of this study than glorification of the irrational. The irrational can be praised only by those who are not aware of the dangers of our position. As we shall see directly, a close connection exists between technical progress and the efforts to turn our rational minds against rationalism itself. This essay is not concerned with these efforts and does not want to have anything to do with them. But the time has now come when we must ask: where does technical rationality lead us? That question is grave because, as we have shown, technical rationality implies a contempt of human reason as such.

Everything rational is subject to inescapable limitations and restrictions. The rational can never be its own end. If there were such a thing as rationalizing for the sake of rationalizing, there would be no reason why the helpless, the sick, and the aged should not be killed off. In fact, such action would then even seem advisable. It would be equally expedient to slay those who have retired from business and likewise all pensioners of the state according to the brutal principle that he who does not work shall not eat. Such examples show where a philosophy of sheer expediency leads. Raskolnikov, who slays the old usurer because

he deems her completely useless in the scheme of the world, and who sees in her nothing more than an evil-smelling bedbug or cockroach, becomes a murderer by his criminal and extreme arrogance. Had his mind not been so confused and so sick, he would have realized that the structure and scheme of the universe was beyond his ken, and that it was not for him to judge the role of an old woman in this world.

The technical official, on the other hand, who clerks in one of those numberless bureaus and lords it over some card file whose purpose—a purpose perhaps unknown to the official himself—is the rationalization of consumption: such a man might quite easily get the notion that all is well with the world because his files are in order. The scribe tends to confuse the world with a bureau, since his card file is his world, the center of his life. To conceive of the universe as a huge bureau would be an excellent idea if only nature had intended us to live on red tape.

Technical rationality has most peculiar consequences. The technician himself does not grasp these consequences and does not understand them. He claims to be a realist, that is, a man of "hard facts." But even at best he is a realist only within a restricted area; his knowledge is specialized. The appearance of "strict factualness" which he adopts is deceptive. It camouflages his unbounded ambition to gain power; it conceals the lopsided, eccentric nature of those plans and schemes that are the ultimate aim of his ambitions. True enough, the machinery he has developed is ingenious down to the last screw. But that last screw is where the technical genius ends; for what lies beyond he has no thought. The world of the technician is a mere apparatus, but an apparatus which, in a state of advanced centralization, makes it possible for its master to treat man himself as part and parcel of that apparatus. For the power that this machinery lends to its master is truly gigantic. Thus, an advanced stage of technology is accompanied by mechanical theories of the nature of man. Just as we speak of the "machinery" of the state, of political "machines, " of the legal "apparatus," of the "driving power" of the economy, just so all things step by step assume the character of machinery, of a reality understood in terms of machinelike functionings. This kind of thinking, typically, has lost all respect for freedom.

It is precisely these efforts to subject man completely to technical rationality, to a purposeful, all-embracing functionalism, which gradually undermines the resistance that man puts up as he tries to adhere to a more profound, a spiritual order of things. Far from taming or enlightening the instinctive side of man, his blind urges and his mental confu-

sions, the mechanization of life, on the contrary, intensifies these dark sides of human nature. Technical organization, totalitarian in its aims, has no means whatever to master this dark underworld. All the rationality of the technician cannot prevent the growth of a blind elementarism. In fact, this rationality is precisely the avenue along which elementarism invades and permeates our lives. These are dark and dangerous things which here raise their heads. The automatism in which man is trained and drilled day in and day out not only inures him to perform without a will of his own his mechanical operations; it also breaks down certain resistances in his personality by depriving him, under guise of a new order, of that self-reliance which alone can halt the inroads of chaos. The mechanization of life is the mill which grinds the individual down into atomized masses. Where human beings are concerned, the whole organization of technology achieves nothing but the acceleration of this grinding down of the individual into the mass.

Of late we have become accustomed to consider the successful organizer as a great man, to praise him as if he were a benefactor of mankind, as if he belonged to the same order as the great inventor or the great physician. What makes such an estimation ludicrous is its lopsidedness. Investigated by critical judgment, this overestimation merely adds to that gallery of obscure personalities who are supposed to be shining examples. It fails to see that the "merit" of these organizers often consists in nothing else than a destruction of unorganized resources. Just as the resistance of matter grows in proportion to the technical coercion of matter and results in a pile-up of explosively destructive forces, just so technical organization produces explosively destructive changes m humanity. Since modem psychologists are developing more and more into psycho-technicians, these dangerous changes remain beyond their ken. Yet the modem mass is the counterpart to the apparatus of technology, and in the same way is threatened by the elementary. The mass is the foremost material for mechanization by technology. But to the extent in which the masses become subjected to rational organization, they become supercharged with blind elemental powers and bereft of all spiritual powers to oppose them. The masses are running berserk, now in blind, furious enthusiasm, then again in a stampede of terrified panic that drives them irresistibly to hurl themselves blindly and madly into the abyss, just like cattle or lemmings. Those torrential dynamic forces which technology unleashes also sweep along the man in the streets who fancies technical progress to be his own. Technology spells the mobilization of everything which was

immobile heretofore. Man too has become mobilized. He not only follows automatic motion without resistance; he even wants to accelerate it still more.

XXXII
Masses and Imperialism

A problem of outstanding importance to modernity is the question: What are the means of survival and what are the resources of our big city populations? We are accustomed to consider ancient Rome as a model that furnishes us, by analogy, certain concepts and insights which throw some light upon our own situation. Not by accident did historians of the nineteenth century devote profound attention to Roman history. Mommsen, sworn enemy of all vestiges of feudalism, defined for us the significance of Roman history with that assurance that is the mark of a first-class historian. He fixed the point where the present establishes contact with the past. For the past can never be considered an independent dimension per se; it must be conceived as a dimension of time wherein the concrete present is a codeterminant. The path that the study of Roman history has followed since Mommsen also shows the immediate significance for us of this history. That significance does not lie in the early days, the history of the City proper, and so Mommsen rightly touched upon them only briefly and reticently. The significance is found in the later Rome, the Rome that had become the capital of the Empire. It is the Rome of Catiline, Caesar, and Pompey, the Rome of the Empire, that arouses our interest.

When we look at the human masses which thronged the city, we find that their situation was very different from that of the masses today. The religious, political, social differences are so great that we might speak of a religious, political, social differences are so great that we might speak of a different world. The technical organization of Imperial Rome cannot be compared to ours. But one fact emerges clearly as we view this promiscuous mass of freeborn, freedmen, and slaves that tumultuously swarmed the markets and streets; they flocked around the wealthy politicians and with the same enthusiasm flocked to the circus to witness the gladiators and wild beasts. On one side, we find this mass becoming ever more thoroughly parasitic, while on the other, we observe its increasing agility and mobility. The system of ex-

ploiting the provinces, a system leading to the devastation of once blooming regions; the colossal profiteering of officials and leaseholders; the mad luxuries in which the rich of that day indulged—all this presupposes the mass, the tremendous city population that wants to be fed and amused.

But obviously it would be an oversimplification to think of this mass solely as drones in a beehive, as good-for-nothing loafers. Rome was a city, not only replete with the most magnificent structural planning, but, like all great cities, also full of hardworking artisans and laborers. It was not only the scene of excesses; it was also ever a place of prodigious work. It housed not only men who were on the lists for free grain distribution, and who received numbered tokens for free circus seats; it also harbored a vast number of busy breadwinners in every walk of life. What we must conclude from this state of affairs is that a prodigious amount of hard work and industrious pursuits can easily exist within a world which—like Rome—was slowly draining its dominions.

Let us consider next the state of dependency into which this mass had fallen. Characteristically the proletarian mass is always produced by artificial means, that is, by an influx from outside. In connection with this artificiality stands the historical fact that the capacity for, and with it the right to, political self-determination was gradually lost by the Romans. As long as Rome was a rural township, its citizenry was able to sustain itself. But when the city became the capital of an empire, that capacity was lost. Now the populace had to be fed largely by imports, and providing for it became a constant, relentless burden. The city's appetite was ravenous. For its satisfaction the old empire no longer sufficed; new provinces had to be conquered.

It seems that in the formation of a world empire the destruction of the free farmer is an inevitable step. For only after the farmer—earthbound, immobile, and opposed to change—has been eliminated, do the political ideas assume that space-devouring strength that may truly be called imperial. Imperialism and formation of the masses go hand in hand. The masses not only give to imperialism the power to absorb space, they sharpen the hunger of imperialism and make it capable of digesting the fruits of its power. Rome as one town amongst other towns in Latium is one thing. Rome as the first city of Italy already is something else. And this second Rome which defeated Carthage is again quite different from Imperial Rome. We witness here the gradual self-destruction of the antique city, the polis, and its transformation into a capital and center of worldwide power. Colossal sacrifices of

Roman racial substance were necessary for this development. Time and again the old, strict Roman society tried to halt this course with passionate effort, but in vain. The constant sacrifice borne by the Roman people—they alone were the justification of Rome's imperial power, and at the same time the basis of its enduring quality. They are what distinguishes Rome from the crew of a pirate vessel, from an enterprise aimed exclusively at loot and booty.

But we have only a one-sided idea of power if we overlook the fact that power always overpowers the victor as well as the vanquished. For the conqueror invariably is conquered in turn by his very conquests. That is why, in the example of Rome, we observe the peoples of Asia, Africa, and all the parts of the Empire flocking to Rome. First they arrive as exhibits of Roman victories, chained and under the yoke. But in the end we find the scions of the conquered as praetors, consuls, and Caesars. The artificial accumulation of city masses goes along with this development and reaches its climax under the Caesars. The structure of these masses shows that the native-born Roman element now forms only a declining minority. In this Latinized and Hellenized populace, the visible traces of old Rome are completely lost. The metropolis devours its own children. It no longer regenerates itself from itself; it has to draw on the human reserves of the Empire, attracting the best minds from everywhere and absorbing always new masses of slaves. At the end of this decline, we find those catastrophes that dry up the artificial influx of new masses, which depopulate the city, and render it insignificant.

XXXIII
The Mechanical Sterility of Modern Sports

The influence of technology upon man is apparent not only in man's work; we see it also in his favorite amusements, and in his favorite sports. Sports presuppose and are, in fact, impossible without the technically organized city. The technical terms of our modem sports are largely of English origin. This is owing to the British head start in industrialization, particularly in the first half of the nineteenth century. Engineers and technicians from all over the world then traveled to England to round out their technical education. Later, when America had become the technically leading nation, sports too became Americanized. Sports receive little support from technically backward countries, and none at all from the vast regions which so far have not been industrialized.

Sports, then, may be defined as a reaction the conditions under which man lives in the large cities. This reaction is dependent upon the increasing mechanization of motion. “Savages” do not practice sports. They exercise their physical faculties; they play, dance, and sing, but there is nothing sportslike in these activities, even if they are performed with virtuosity. Our best sportsmen significantly hail from the industrial districts where mechanization is at its highest, particularly from the cities. Farmers, foresters, professional hunters, and fishermen, those whose movements are free of mechanical compulsion, rarely practice sports. The headway that sports are making in the rural districts is in fact a yardstick of advancing mechanization, particularly the mechanization of farming. For the operation of that machinery changes the muscular development and with it the operator's movements. In older generations, lifelong hard manual labor had produced that heaviness and hardness of body, that clumsiness typical of the peasant. Now these features are disappearing. He becomes nimble and more agile since the machine relieves him from direct contact with the soil. The driver of a tractor or a combine has a body different from that of the ploughman or

the mower.

It is not easy to draw a sharp line between play and sports, because there is hardly a game that cannot be practiced as a sport. The Olympic Games of the Greeks, obviously, were not sports but festivals of a religious character, combined with contests. They cannot be called sports simply because of the absence of the industrial scene, which is the background of what we moderns term sports. What we call Olympic games in memory of antiquity are highly technical sports to which flock the specialists from all countries. There is a difference between the man for whom hunting or swimming, fishing or rowing are natural pursuits, parts of his life, and the man who practices hunting, swimming, fishing, or rowing as a sport. The latter obviously is a technician who has developed to perfection the mechanical side of his activity. The equipment of the modem sportsman alone indicates this. To get an impression of the growing mechanization, we need only look at the tools used in sports, all those elaborate fishing rods and reels, all those scientific golf balls and clubs, the stop watches, time clocks, measuring devices, starting machines, and so on. In the exact timings of motions and split-second recordings of modem sports we find again that organization and control of the consumption of time that characterize technology.

And is not the sportsman's lingo a language of typically mechanical hardness?

Finally, let us consider the organization of the sports business itself: the athletic teams, their training, their scores, their lists of members, and their records. Plainly the popularity of modem sports is connected with the advance of mechanization, and the sports themselves are practiced more and more mechanically. This is evident not only in automobile races, air races, or speedboat races, where engines are used; we see the same thing in such sports as boxing, wrestling, swimming, running, jumping, throwing, weight-lifting. Even in these the individual turns himself into a machine, a fighting or record-breaking machine, whose every motion is controlled and checked by machinery until it becomes mechanical. Consequently sportsmen today are becoming professionals, who make a profitable business of their special talents.

Doubtless sports are an activity which, with increasing mechanization, is becoming more and more indispensable to man. We find, too, that the discipline to which sports subject the human body results in extraordinary performances. However, there is a peculiar sterility in the sports business of today which can be traced to the mechanization of

sports activities and to their mushrooming into huge technical organizations. Long observation makes this ever more evident. They lack completely all spontaneous movement, all free improvisation.

A man who starts to jump and run for the sheer joy of jumping and running and who stops when the mood has left him is entirely different from the man who enters an athletic event in which, under guidance of technical rules and with the use of time clocks and measuring apparatus, he jumps and runs in an attempt to break a record. The high pleasure that swimming and diving give us is due to the touch of water, its crystal freshness, its coolness, purity, transparency, and gentle yielding. This delight, obviously, is of no significance in contests where professional swimmers perform. For the purpose of such contests is to find out which swimmer has the most perfect technique and consequently reaches the goal faster than the rest. Training for record-breaking is essentially an intensification of will power aimed at complete mastery over the body which has to obey mechanically. Such an effort may be quite useful and effective. But the more the training for, and the breaking of, records become ends in themselves, the more sterile they grow.

The physique of the modem athlete betrays the one-sided training to which it is subjected. His body is trained, but it is anything but beautiful. The body-building, as effected by specialized sports, does not achieve beauty, because it lacks proportion, something a body devoted to special training no more can have than a mind narrowed down to highly specialized interests. When the sports-trained body is considered beautiful, it is due not merely to the absence of a trained eye, to insufficient study of the nude. No, an appraisal of this sort also expresses the fact that the human body is judged by mechanical criteria such as muscular dimensions and, in particular, by the specialized training it shows. These criteria, however, lack appreciation for the quiet, effortless fullness of beauty; they do not consider relaxed easiness or charm and grace. These viewpoints are deficient in spirituality as well as in sensuality. Unbalance and exaggeration of physique as bred by modem sports are most striking with women. Both their bodies and their faces acquire hardened, sterile traits. Modem sports are incompatible with any kind of artistic life and activity; they are essentially unartistic and unspiritual by nature.

A comparison suggests itself between the sportsman and the ascetic, who is also a professional, though in quite a different sense. The training of the sportsman has an ascetic trait, and through all sports we find a certain puritanism, a strict hygiene of physical habits, which controls

sleep, nutrition, and sex life from the viewpoint of efficiency. Sportsmen are not a group of people who exuberantly express their abundance of vital energy, but a tribe of strict professionals who rigidly economize their every ounce of strength, lest they waste a single motion of their money-making, fame-making physique.

XXXIV
Synthetic Emotions from Synthetic Amusements

All amusements in which the machine plays a part are somehow empty. They have no gaiety. They show that they are dominated by some compulsion which affects the freedom of human motion. Life within the technical organization means that the individual is not gay, and cannot be gay because he is overstrained and no longer has leisure. Enjoyment has departed from his work as well. It is precisely because the joy has gone out of work that work is being praised and exalted with growing ethical fanaticism. The picture proffered by our great industrial cities with their human masses streaming back and forth mechanically is grim and joyless. The great masters of the festive spirit, Apollo and Dionysus, no longer find room in this picture.

The rhythm of things mechanical is one of automatic lifelessness and rigidity. Where it dominates, it displaces man's rhythmically rounded motion. The periodicity which is basic to all rhythm and all measured motion becomes mechanical and ordered by dead time. The yearly cycle of the holidays, which used to be holy days of a higher order, decays as technology advances to perfection. Popular celebrations change their character. Where festivals or fairs are still rooted in the hearts of the people, we shall always find that the farmers flock to them, for peasants are that portion of the people who follow with the greatest assurance the cyclic sequence of the year and its feast days. But if we witness a festival as ancient and as popular as the October Fest in Munich, we can see at a glance how the inroads of technical organization have profoundly altered its old rural character. Everywhere we find mechanically operated swings, Ferris wheels, power rides and other power-driven gadgets of the amusement park, which with mechanical music invite us to buy their mechanical thrills. And just as in the field of sports we already noted the lack of free improvisation, so in amusements, too, all free improvisation and spontaneity are lost as they become mechanized. Increasingly our amusements are becoming a

business subject to technical organization. It appears that man has lost the faculty of amusing and entertaining himself, that for his enjoyment some apparatus is indispensable—and this means that even our spare time must needs be filled with automatic regulation. The modem idea of recreation is the relaxation that follows the tension of mechanical work. That is why our amusements show a kind of hectic mobility, a spasmodic tenseness for the loosening of which a long succession of gymnastic systems has been invented. When we look at an art as free as the dance, be it artistic or social, it becomes very noticeable how mechanical it appears. The music for it is furnished either by machines or by musicians who have mechanized rhythm. The radio and the films are among the great automatons whose share in popular entertainment is constantly expanding.

In studying the movies, we see the human figures on the screen moving within a mechanical theater, caught in an optical mechanism from which they cannot escape, since it is this mechanism which makes the whole performance possible. No matter how perfected, be it by technicolor or by three-dimensional effects in order to heighten the illusion created in the audience—all this perfection is mechanical and it ends where the laws of mechanics ends. Motion voices and background music are reproduced mechanically. The illusion of the audience plays an important part, for they really think that the fleeting mirages are real human beings and that the words are really spoken by them. The spectator is not disillusioned by the fact that what he sees is not people of flesh and blood, that what he hears is not live voices but mechanical sounds. He is never disturbed by the mechanical side of the spectacle, only by mechanical imperfections.

Everyone knows that one cannot see a movie as often as a stage play, that the effectiveness of a movie wears off far more quickly, and that time in particular turns a movie rapidly stale and obsolete. A stage play in contrast may be performed as often as you wish, yet each performance is different from all others, whereas all showings of a movie are mechanically identical. The stage play is constantly varied by the performance of the actors, while the screen play remains rigid and unchanged. Because the screen play is so rigid, it cannot be endured without music. The more often we see a movie, the less effective becomes its illusion, the more does its mechanical rigidity show through. Moreover, we discover the screen drama's comical side, that unintentional comedy which is the stamp of all the melodramas and horror pictures of the early days of the films, and makes them ludicrous. All screen

drama seems to become comical as time goes by.

The technician's answer to this problem is to try to assist the illusion of the audience still more vigorously by camouflaging the apparatus still better, by making the illusion so convincing and lifelike that we forget the apparatus. But since the mechanism cannot be eliminated, such efforts have their limits. As a matter of fact, such efforts go in the wrong direction, since movies can be improved technically only by improving their mechanism without attempting to conceal it. A genuine improvement, for example, is the animated cartoon which turns all living things into machines, including human figures. The cartoonist does not attempt to imitate life, but invents little automatons specifically for the technical medium of the film. This idea may to some seem paradoxical. But the Americans, from whom the world has still much to learn in this respect, have long since introduced such films and they enjoy great popularity. At present these films still lack coherence and consistency, since there are not enough cartoonists who have the necessary intelligence to master this new art. But even what has already been achieved gives an inkling of what can be expected in the future.[11]

XXXV

The Modern Longing for Vitality and Devitalization

In a mechanized civilization, every standstill of technology produces a feeling of intolerable emptiness in the technically organized peoples, a void in their lives which they cannot endure and from which they try to escape by intensified motion. The individual may bemoan the inexorable organization of time to which his day is subjected, he may curse the mechanical job to which he is tied, but at the same time he cannot be without his mechanical organization; he adheres to its pattern even in his amusements. Motion has a narcotic attraction for him, an intoxicating power, particularly where the going is fast, where the speed is record-breaking. He needs this stimulant as an addict needs his drug to feel alive. He must always feel that something is going on, that he is participating in some action. Hence, his insatiable thirst for news, a thirst that no rotary press can quench. His concept of life is dynamic. He puts the highest value on life's vitality, but this very evaluation betrays the growing hunger for life that torments the masses. Modern life is dominated by the consuming force of that hunger. The individual who forever craves new experiences, who forever desires something to happen, such a person wants to be re-enlivened.

The feeling of weakness, fatigue, exhaustion, and of the senselessness of life becomes overpowering at times when the impulses of mechanical motion are slowing down, when the individual feels that the dynamic energy from without which drives him on is beginning to fail. He gets depressed as he becomes conscious of lifeless time. Motion is one of modern man's most vital consumer goods; wherever it is restricted, the hunger for it grows. Immediately the person is seized by boredom and next by a craving for some sensational event. He fears that the lifeless time which he means to consume will devour him instead, and he attempts to get away from this gnawing sensation by speeding up the motions of his life. Mere action awakens in him the feeling of a more vigorous life; it stimulates him like a drug that creates

beautiful dreams. Modem man worships uninhibited, dynamic, throbbing life—but worships it as a weakling who cherishes an illusion of strength. Lifeless time mocks him, for he does not understand that the mechanical motion to which he abandons himself is itself empty, and that the faster it speeds, the more vacuous it becomes. Motion to him becomes a value in itself, because it increases his feeling of wellbeing. One reason why he may well consider being in motion a blessing is that it prevents him from thinking about himself. For thinking, according to Aristotle, means to suffer, since it cannot take place without reason's suffering. This suffering, then, he can avoid by abandoning himself to mechanical motion.

The effectiveness of mechanical motion as a narcotic can, indeed, be observed everywhere. The wide-awake atmosphere of our cities is permeated with a trancelike quality. That atmosphere is a blend of intense awareness and of dream-life. The consciousness of a chauffeur, a traffic cop, a subway motorman is awake, but only in a small sector that is surrounded by blackouts and dreamlike, visionary ideas. Such a mind has a functional wakefulness that is focused upon the functions of the machine under its control. But the more one-sidedly this consciousness concentrates, the narrower it becomes. It is amazing how little the pedestrians in a large city really observe, particularly in the great traffic centers where all attention has to be centered upon traffic and its rules. The pedestrian is watchful because he is constantly menaced by the automatically moving streams of traffic. But at the same time this flowing stream has a soporific effect, so that we easily become panicky if this functional flow is interrupted in some way.

In connection with this, we find that sensation of utter unreality, that absent-mindedness produced by the absolute artificiality of the surroundings, which seizes man in the large cities so often and so suddenly. There also is that sensation of being submerged, an impression which to good observers becomes increasingly manifest. Life moves deep in the chasms of our city streets as if seen through a diver's helmet, and looking through the big panes of offices and restaurants, we seem to be looking into an aquarium. This queer and not at all pleasant impression is caused by the automatism of motion, by the vision of mechanically sliding reflexes reminiscent of the reflexes of amphibians. Even to us who are their builders, our modern cities are as uncanny and as foreign as those great cities of past ages of which only a memory has come down to us. Supposing a man of some such bygone era, a man who has no idea of our technology, would come into our cities; suppos-

ing we should ask him: "What powers do you think have built all this?" Chances are that his answer would be: "Very mighty, very evil demons."

XXXVI
Technology and War

It is an axiom of the natural sciences that the laws of nature are stable, unchangeable, and of permanent mechanical validity. Faith in scientific progress strangely enough presupposes the existence of laws which are completely exempt from any kind of progress. These laws are indispensable to the natural sciences as rigid and dependable substrata. The law of causality, for instance, states that the same causes must always produce the same effects.

The scientist who voices a doubt in the validity of the law of causality is obviously attacking the foundation on which the whole Babylonian tower of scientific knowledge rests. He who raises the question whether all this knowledge is worth knowing likewise attacks these foundations. This very question is outside the scientific field, for we are breaking through the sacred precincts of science if we are not content with its obvious and wonderful results. We undermine these foundations if we ask what insights really are gained by scientific discoveries, what good they do us, and where mankind will be once science has achieved its goal.

Here we approach the ultimate illusion which attaches to scientific progress. Obviously the striving for rationalization must come to an end at some time. Obviously it attains its end once that state of perfection has been reached for which it is striving so untiringly. For the idea of unending progress is absurd and inane, because the infinite motion that it presupposes is contradictory. It is exactly the rapidity and forcefulness of technical rationalization which indicate that we are approaching a finale, an ultimate stage of technology where everything technical attains the same degree of perfection long since achieved in the tools of handicrafts. Perhaps the moment when this will come about is not far off, but it would be idle to speculate on this.

In any case, this is the great moment which is the main theme of the utopists, the moment upon which they concentrate their hopes. We often meet with the idea that all of mankind's sufferings, all the sacri-

fices that must be endured for the sake of technical progress will be compensated for at the end. Such theories of reward, however, while quite right and proper to *homo religiosus*, have nothing to do with technology. It is not the beginning but the end that has to bear the burden. It would be more fitting to see in these sacrifices and suffering, the price of man's thirst for power.

To associate notions of harmony with a state of technical perfection or to suppose a political and social idyll where it can never be found is sheer pipe-dreaming. Those dreams of leisure, freedom, and wealth created by technical progress are utopian, and so are the ideas of peace, wellbeing, and happiness in future times. They are utopian because they combine what cannot be combined. The machine is not a godhead lavishing cornucopias of happiness, and the era of the machine does not lead to a peaceful and charming idyll. At all times the power proffered by technology has exacted, and forever will exact, a high price; the price of the blood and sinew of human hecatombs who in one way or another get caught in the cogs and wheels of that vast engine. The price is being paid by the leaden monotony of factory and business life that is now reaching its peak; by mechanical work for one's living; by the operator's dependence upon the automatic tool. The price is paid by the devastation of spiritual life which grows in step with mechanization. We would do well, indeed, to say goodbye to all illusions about the blessings forthcoming from technology, but most of all to that illusion of peaceful happiness it is supposed to bring. Technology has not the wherewithal to bring back Eden.

Indeed, the shape of things to come is vastly different. Since technology is based upon the mining of resources and since its progress spells the progressive pillage of the earth, it is obvious that in a state of perfection it will practice the most complete and the most intensive exploitation on a planetary scale, a mining of all its resources in the most rational manner. This sapping and mining is bound to produce losses which must become increasingly unbearable. The devastations of this pillage are not limited to the exhaustion of mines, of oil wells and other resources. Neither this nor the reckless exhaustion of the topsoil which spreads erosion and the sinking of water tables will be decisive in themselves, although—in America, for instance—these warning signals are already looming big.

What will spell the end is rather the total character of these losses which include the human beings within the technical organizations. It becomes constantly more evident that the sum total of the technologi-

cal efforts and investments overtaxes human capacities, that the sheer weight of the mechanical burden is getting too heavy, that once technology has reached perfection, it will not be long before modem man collapses. Symptoms of this overburdening are already evident in the mental and the physical spasms of this day and age, the contortions of which betray the high pressure under which we live. Everywhere in the world we see forced, overtaxing efforts. They are bound to be followed by the re action that invariably comes after excesses of will power and nervous overstrain: exhaustion, apathy, and dull depression.

In this overstraining we also find the key to an understanding of the ideas and plans for total mobilization and total war. Whatever their opponents may object, these ideas make perfectly good sense, inasmuch as they outline with precision the situation in which we find ourselves. For this reason they deserve an attention and a respect demanded by any momentous thoughts which do not shrink from logical consequences no matter how grave they may be. The objections raised against total mobilization and total war significantly fail to hit at the crux of the matter.

What is the meaning of total mobilization and total conduct of war? How does total war differ from other wars? Clausewitz, the leading war theorist of the nineteenth century, never described such a war. True, in his definition of war he remarks that there is a tendency toward the extreme use of force and that there are no inherent limits to such use. He mentions specifically three reciprocal elements in war as conducive to extremes. But in the same breath he also speaks of the forces which modify and moderate the extreme and absolute concepts of war; the human relations, for instance, which actually continue between the belligerents even in war. His ideas of war, in other words, show plainly that they belong to a time which could have no clear concepts of the colossal growth of technical organization. The Napoleonic wars could still give no hint of this potential. What Clausewitz assumes as basic in waging war is the use of limited means for limited ends.

But total war presupposes total technical organization. By its very concept, total war rejects all limitations of means and purposes. Its corollary appears to be nothing less than total annihilation—from the writings of modem war theorists this goal emerges forever more clearly. This war is total not only in its preparation, its strategic and tactical means and ends; it is total above all in its mentality of ruthless extermination which no longer recognizes any barriers. This destructive mentality is the counterpart of technological progress. It develops in the

exact proportion in which technology itself breaks down all barriers of space and develops a destructive potential which is unlimited.

Even total war, however, has its modifications; even its inherent trend toward the extremes of violence is subjected to limitations and restraints.

One such limitation lies in the tact that a war which is waged by every means must lead also to the exhaustion of every resource, provided that a certain balance of strength exists between the opponents. By definition, total mobilization or total war abolishes all and every reserve since no reserve remains untouched. There are neither stores nor funds that remain intact or inviolate, nothing immobile even that does not get mobilized, no inalienable ownership that does not get disowned.

For proper understanding of these developments, we must consider the overall situation of modern man. What characterizes the situation in the mechanized war of the industrial worker or the soldier who is, in fact, a worker, as is everybody who lives in a state of advanced industrialization?

The situation of the worker is signalized by his dependence on machinery and organization. It is signalized by the absence of reserves on which he could fall back. He is reduced to the sale of his bare working capacity, and he must sell it unceasingly and unstintingly if he wants to live. He has no funds to guarantee him peace of mind, leisure, or even an extended vacation. This already existing pattern of so-called normal civilian life simply gets incorporated into the pattern of total war. In it all human and material resources are drafted, mobilized, and brought into action. Plainly, there is a reverse side to this process, namely, the total consumption caused by total war. Such a war is by no means a spontaneous, voluntary mass uprising where enthusiasm makes up for primitive technical equipment. It is a struggle between technically highly developed organizations which show all the mechanical, automatic features characteristic of an advanced stage of technology. That is why the most important goal of modern war is to smash the technical potential of the opponent.

Technical progress and conduct of war today are merging. We have reached a state of affairs where the technical potential of a state is the determining factor in the event of war. Superior technology means victory, inferior technology means defeat; that is the briefest possible formula to which a definite phase of technical progress can be reduced. This equation forces all modem states, with relentlessly increasing me-

chanical compulsion to support speed up, and push to the utmost the drive for technical perfection. For its own self-preservation, the modem state has to promote, and subject everything possible to, technical automatism. Since the technical potential is decisive in war, it is actually a form of armament. Technical progress now drops the economic mask it had been wearing in the early days of technical organization. Technically organized work becomes preparation for war; its connection with war becomes constantly more unmistakable.

Nothing can prevent this. It is conceivable that war can be prevented in a specific case. But it is inconceivable that, in the event of war, the state would refrain from using to the full its technical potential. The incessant pointing to this potential, the propagandist efforts to make it look formidable and terrifying, are parts of modem political tactics even in so-called peace. It also becomes clear why states depart more and more from the old law of nations which requested a formal declaration of war. The stigma of being termed "aggressor" is too far outweighed by the advantage of high preparedness coupled with surprise attack made possible by the technical potential.

Just as a technically organized economy becomes more and more a war economy, so technology develops more and more into a war technology; it reveals ever more clearly its armament character. In our dynamic age, technology steps up its pillage of world resources; but while it devours material for war preparation, it reduces at the same time our living standards. It shakes off all fetters of economic laws and finances its organization by methods which constantly increase the burdens on the workers.

The question of just what is gained by total war is not limited to specialists. That question is raised by the consideration that the total consumption demanded by a total war may well consume whatever gains result even from the winning of the war. What must be anticipated is a condition where there is neither victor nor vanquished, but only general exhaustion. Are we still in a position where we can hope for a gain? Or is the call for total war proof in itself that the fight for sheer survival has begun? In other words: Has technical progress reached a stage where its consumption has grown so tremendous that of necessity it must radically change the territorial and political organizations of all states?

XXXVII
The Self—Frustration of Social Security

We already mentioned in the beginning that every ordering process is of a twofold nature, and that it is necessary to understand this before one can determine the price paid for order. Let us illustrate this with an example. As technology progresses, the lack of protection for the worker engaged in it becomes ever more evident. The technical apparatus itself cannot give him protection, for it is precisely the growth of this apparatus that inevitably produces the feeling of helplessness and the desire for social security which trouble and disquiet the worker. To be more exact: the rational thinking, which fathered and which directs this apparatus, is confronted with the necessity of inventing a remedy for the human emergency which is of its own making. The remedy which rationalism proffers, however, is nothing else but a still more total human surrender to new technical organizations supposed to protect the worker. In the beginning, he joins these more or less voluntarily, but eventually they are made compulsory.

If we wish to understand this phenomenon we must learn to distinguish between actual security and the mere need for it. We may assume that security is present where the individual is conscious of his freedom. Without freedom there can be no question of human superiority and human dignity. The currently popular accusation that the entire nineteenth century was possessed by a false sense of security carries little conviction. A false sense of security has always existed, for nothing is more typically human than to build dream castles of wonderful security. No doubt the nineteenth century shows long periods that seem idyllic—if one chooses the time and the place—and we encounter sheltered lives in it that remind us of hothouse plants untouched by raw frosts or high winds. The nostalgia for those bygone days, the feeling of loss that overcomes many who look back to this past, are quite understandable if we think of the peace, the growing wealth, and the considerable leeway of individual liberty in those times.

Nevertheless, we find a most vivid sense of vanishing security permeating the nineteenth century. The prophets and seers of that age registered in their writings the impending catastrophes with the exactitude with which a seismograph registers a faraway earthquake. The rising popular demand and outcry for security is another infallible yardstick, because the need for security grows in proportion to the actual decline of security.

We shall never understand the irresistible force with which the "social question" came to the fore at that time unless we realize that the decline of actual security produced an increasingly sharp and often painful need for it. An uneasy feeling of being exposed to the storms of life without shelter and protection, of floating in a void, then befell and disrupted the individual. Inevitably the social question preoccupied above all the human group which felt its lack of protection most keenly. It was among the industrial workers and in the industrial districts that socialism first became a political movement. The workers' charge that the capitalist who owns the means of production is an exploiter is justified, inasmuch as the production methods of technology are based on exploitation and pillage. But the worker fails to see that he himself is equally guilty of exploitation since he works hand in hand with technological progress and advocates it.

That is why all his efforts to achieve social justice and security are doomed to failure. That is why his plight remains unrelieved even when he lives under governments which he trusts and with which he identifies himself. Even when he demonstrates his power to overthrow capitalism, he lacks the power to master the rationality of technology itself. As a result, he remains captive to the technical apparatus and its organization; his situation remains unchanged. He is bound to be subject to exploitation as long as he himself advocates and supports exploitation. Not actual security, but want of security produces those powerful organizations we see growing up around us, not only labor parties and unions but also private insurance combines and governmental social security bureaus. However, he who craves security, he who calls for protection, can in no way escape from paying the price it costs. To the same extent to which protection is granted, the individual becomes dependent upon the organization that gives the protection. The whole weakness of the human being who lives within the technical organization, his whole peculiar uprootedness, his crying need for guidance and aid, his isolation—they find expression in this striving for security that shrinks from no act of subjection, that surrenders itself into dependence

with a definite eagerness. Moreover, since the craving for security grows as fast as actual security declines, we notice a peculiar vicious circle at work: technical progress increases the craving for security, while mushrooming organizations for a sham security produce a decline of actual security.

Here we must ask how far organization can be expanded, whether it has limits, and where. In the theory in which statistical and probability calculations have a part, everything is a question of organization, which determines the amount of necessary reserves and calculates the manner of their disposition. This approach is well established; what it amounts to is nothing else but the compulsory organization of every living soul.

But then, our era of increasingly perfect technology may be likened to the mythological Saturn, for, like Saturn who devoured his own children, our age is devouring its own security. Just as total war by its over-expansion annihilates its own means and frustrates its own objectives, so we find the organizations for security invaded by destructive, elementary forces which cannot be controlled by rational thought. Why does the craving for security grow with growing technical perfection? Because, the dangers now becoming visible, the followers of technical progress begin easily to sense the regression which by their very own efforts they have produced. Modem man wakes up to the fact that the elemental forces he has enslaved in his machinery are turning against him with ever growing, viciously destructive force.

To be "socially conscious" today means nothing else than to maintain faith in machinery and organization. Social consciousness is the kowtow of man before the ideology of technical progress. The craving for security may well call forth powerful organizations, but to give man real security is entirely beyond their power. This is not just because the only real security we can ever possess depends upon ourselves, and, being our individual responsibility, cannot be relegated to others; this is not only because these organizations merely distribute or spread poverty; but because these organizations are in themselves already expressions of poverty, worry, misery, and like all scarcity organizations they mushroom just as fast as unorganized wealth declines.

XXXVIII
The Downfall of the Mechanized State

If we tum back here to compare the thought of the seventeenth century with that of the nineteenth, profound differences in the viewpoints and assumptions of their philosophical observers are immediately evident.

In all the philosophical systems of the seventeenth century we find the notion of equilibrium and balance. We find the ideas of harmony and perfectibility recurring everywhere in metaphysics, epistemology, ethics, and education. The thought of Leibniz and Wolff is filled with these ideas. That entire philosophy may be considered as a system of adjustment and compromise. Even the absolute rulers of those days and the policies of their states were formed by such ideas. In Leibniz' monadology, the law of causality is still not absolute, since it is subject to factors not determined by it. These ideas had far-reaching effects. For it may be said that the fundamental thought of a harmonious cooperation among all human powers, the idea of a pre-established harmony of human reason, still underlies Kant's philosophy, although Kant himself was inimical to the philosophy of Leibniz and Wolff. The human warmth of seventeenth-century ideas still radiated into the coldness, the strictness, and the scientific detachment of Kantian thought. Reason, intellect, judgment are Kant's starting points, and their extent and limits are the object of his epistemological inquiries.

However, from Kant on, the philosophy of the nineteenth century assumes more and more the character of a philosophy of will. In Kantian thought we find but little preoccupation with the human will, less even than in Luther's, whose essay De servo arbitrio belongs among the fundamental writings of Protestantism. But Schopenhauer declared the human will to be “the thing as such.” This identification would have been incomprehensible to Kant, for Kant declared it impossible to understand and define the nature of things, “as such.” The idea of the supremacy of the human will culminates in Nietzsche's “will to power.” That power was the foremost goal of the will was claimed by Nietzsche

as passionately as it was denied by Schopenhauer. The manner in which Nietzsche campaigns for his will-for-power idea reminds one of Callicles in Plato's *Gorgias*.

The philosophy of will has peculiar premises and consequences. It is obvious, first of all, that those older ideas of perfectibility, harmony, and balance cannot be reconciled with it. For if we start with will, everything is set in motion. Thought becomes dynamic; it is carried along by motion. But to what goal?

That sheer will has its limits must still be acknowledged. *A posse ad esse non valet consequentia* ("The conclusion from the possible to the actual is not valid"). Success, for instance, does not depend exclusively on will, even the greatest effort of will cannot force it. Rather, accomplished and perfect motion is distinguished by the fact that in it willed effort recedes. Great works of art, for example, always appear effortless; in an excellent painting, in a superb statue, the artistic effort and painstaking workmanship vanish in the perfection of the whole. Will and success are not identical, and therefore the will to power by itself does not accomplish anything. It may fail, it may come to ruin, and this does happen particularly when it is not consistent with the human nature from which it springs. It may lead to a mere caricature of power, to a distortion showing that little or nothing has resulted from all the willed effort. What such an exaggerated will for power achieves is like the work of a bad artist who wants to depict strength. In order to create the impression of extraordinary strength, he exaggerates all muscles and proportions except that basic proportion from which alone the power of a figure can become effortlessly manifest. The assertion of an all-present will to power remains lopsided unless the higher authority has been established, without which this will to power can be neither convincing nor successful.

Overvaluation of will in itself contains a destructive element. It implies an overestimation of movement, of direct action, of the human type which blindly follows its instincts, of the raw vitality of life. Likewise, movements enforced by sheer will tend to become themselves mechanical and unfree, because they push on towards their objectives where they are bound to fail anyway. But this dynamic thinking is by no means a sign of exuberant physical strength, nor is it a sign of a rich personality, overflowing with ideas. On the contrary, it is deeply significant that our idea of the highest power is one of divine calm, and that we associate the sublime, not with motion, but with a majesty which rules from rest. The will to power, in contrast, strives for power, be-

cause it doesn't have it. It is a poor will; that is why it is so greedy for power.

Philosophies which make the human will the measure of all things are always linked with periods of upheaval when the human mind is affected by destructive acts. Luther's *De servo arbitrio* and Nietzsche's *Revaluation of All Values* are typical in this respect. Their justification lies in the recognition of a destructive state in human affairs. Today, this recognition raises decisive questions. Who is the destroyer? What is being destroyed? How great is the destruction? In what order, in what direction does the destruction proceed? Where are the elements of a new order that doom the old order to destruction? Finally—and this is what concerns our subject—what is the role of technology in all this destruction?

Technology, as every observation proves, is completely integrated with our present era. It has created a new rational organization of work. It expands this organization by means of that mechanical automatism which is the sign of its growing perfection. It is a changing, a transmuting, a destructive force. It fits intact into this day and age, not because it contains the elements of a new order, but because it is the most efficient instrument for scrapping the older order of things, for the leveling of pre-existing differentiations, for a fundamental equalization. For this is the way it works, by its striving for arithmetical, that is mechanical, equality—to use a Platonic concept.

Since all things mechanical harness elemental forces, we know for certain that in a state of perfected technology the human race will dispose of a maximum of elemental powers. Here we touch upon the limits of technical progress. We perceive ultimate barriers to its advance. For nothing is more certain than that modern man, in his struggle for power, will make resolute use of those forces which he has forcibly subjected.

In other words, the surplus of elemental power that man has obtained by his destructive exploitation of nature thereby turns against him and threatens to destroy him. In terms of an older language, it is the vengeance of the elemental spirits which the modem magician has conjured up. With a hostility no longer disguised, the accumulated elemental forces harnessed in our machines are rebelling against their masters. This is the regression that proceeds in exactly the same proportion as technology progresses.

Next, as we examine the areas preeminently menaced by destruction, that is, the zones of densest population and highest industrializa-

tion, we perceive the direction of the destructive regression and its relationships. And only now the demoniacal aspects of this regression become fully manifest. The dead time which we thought we could command and could press into our service at will, this dead time now tightly fetters modem man by means of the machinery which it dominates. It mocks the worker; it locks him up behind the same bars of steel which he built for it. In theory, dead time appeared to be an infinite, immeasurable quantity. But when it entered into conflict with the biological time of human life, when our life time became enslaved by mechanical time, that spelled the end of all leisure, the end of all human time. In this way, too, the whole globe was shrinking; all of a sudden there seemed to be no living space where once it seemed to be without limit.

Mechanical thinking never shrinks from violating what is dead or what it believes dead. If the universe were really of that lifeless submissiveness which mechanical thinking presupposes, then to try to perfect technology would be quite a safe undertaking. But wherever there is something lifeless, there is also something alive. Nowhere is death to be found without the connotation of life, since the one is meaningless and inconceivable without the other. That is the reason why everything mechanical cuts deeply into life. No matter where in nature technology applies its mechanisms and its organization it simultaneously organizes the resistance against its own compulsion, and the force of this resistance hits man with hammer-like precision, with the balancing exactness of a pendulum in those clockworks that measure lifeless time. As the ancients said: Generally the demons are asleep; he who makes bold to arouse them must first enter into their sphere. If we adopt this view, there is no doubt that today the demons are wide awake.

In view of this fact, anxiety and fear of destruction darken the spirit of modem man. He feels it in his nerves for they have become more sensitive, a phenomenon which is closely related with certain perfections of technology. Living as he does with the premonition of impending catastrophe, modem man is scared by any unfamiliar noise. For when our reason becomes helpless, it circles closer and closer around the catastrophe. The catastrophe is the event that obsesses the human mind when that mind no longer sees a way out, when it surrenders to fear instead of using its wits. This is why theories of catastrophe and their spokesmen crop up everywhere today. They mask their mental despair with doctrines of impending ice ages or cataclysmic floods. They have the moon fall up on the earth; they predict the end of civili-

zation, and assert that the next war will mean the end of everything. In reality, however, nothing is at an end; only, they are at the end of their wits and therefore are plunging themselves into despair. The world catastrophe is an imaginary event projected into the future by a mind that has become helpless. Of course, it is certain that we must all die, and one does not need to be a prophet to forecast great upheavals and changes in the future. But then the power of death is manifested only in relation to life. At all times there has existed an exact relation between that actual destruction and what is ripe for destruction. And this is a state of affairs that human efforts cannot change.

As was already mentioned, progress of science and exactitude of scientific knowledge are possible only on the basic assumption that the laws of nature with which the scientist must work are unalterable. The experiment would lose all authority for him if it could not be repeated ad infinitum, if the once-established answer to a given question would not always remain the same. Scientific knowledge progresses by means of a dead and rigid medium, and science also ages along with this knowledge. It moves toward a strict mechanism, which repeats all motion uniformly. The world is a machine, man an automaton. The machine which the technician designs just imitates this universal machine, this super-engine which serves as prime mover for all those pistons, wheels, drive chains, power belts, and turnstiles with which the works of technology are built. The science which is co-ordinate to technology is causal; it stems from whatever insights we have been able to gain into the causal mechanism of nature. As this knowledge expands and produces great works, it becomes increasingly evident how this knowledge moves inescapably along the tracks which mechanical thinking has laid out for it. For technical progress, by its very nature, leads to that complete mechanization which subjects the individual to the self-same compulsion. Lifeless time comes to the fore. Life becomes subservient to a ubiquitous automatism that regulates it.

Science may be likened to a huge monastery, the innumerable cells of which are cubicles for men to work in. True, it is not a convent of devotees preparing themselves for heaven. Likewise, these men are not bound to celibacy. Yet, it cannot be denied that in the passion of science's devotees, there lies something ascetic, monkish, a certain sterility of the carnal man. The world of science is a hierarchy of those who are the fathers of its great ideas; as such it is inviolably male in character. All rational thinking, if traced to its origin, goes back to a male. Hence, not only scientific thinking but also technical thinking is essentially

paternalistic. With his great respect for ideas, the scientist wants to establish and to secure their paternity, and this is one more reason why he lives in a paternalistic hierarchy. In whatever field the rationality of science may be active, it is always a causal rationality. He who is not able to think rationally and causally cannot be an exact scientist. That is why women are largely excluded from science; they have no business there. The women who do penetrate the scientific work cell are like sexless toilers in a beehive. Of course, there are some scientifically minded bluestockings, as well as those who ride in on the coattails of man. But, contrary to the beehive, the worker here is the exception, not the rule.

The saying, *Mulier taceat in ecclesia* ("Women shall remain silent in church") applies to science also. Everything matriarchal is far removed from science and has to be kept away from it, because if female thinking were ever to gain the upper hand, it would destroy science itself; it would break the power of rational thinking. Women as a rule are not scientifically creative, neither are they inventors; our technology is not of their making.

Women are not of that gadgeteering species to which the technician belongs. Nor are they mechanics, fit servants for the machine. Technical progress, which favors the emancipation of woman in order to absorb her as a worker in its organization, not only robs her of her womanly power, it also impairs her in her deepest purpose. The sight of women employed in technical activities always has something incongruous about it. Lawrence rightly says that one leaves woman behind when one goes to the machine. And indeed, why should women be tinkering with machines? Their forte lies in quite another direction. Women pre-eminently belong to the life-giving side of existence, whereas the machines confront us with a dead world of sterile, sexless automatons. The machine is not animated matter like the golem of the Jewish saga. It is not clay enlivened by a learned rabbi's magic, nor is it a man-made spirit, a homunculus. It is a dead automaton, a robot, untiringly and uniformly repeating the self-same operation. It is as rational as a mechanism can be, and the mechanical precision with which it works presupposes a mind working with mechanical exactness, such as has been described by Baudelaire in a bitter verse well applicable to the technician:

Cette crapule invulnérable
Comme les machines de fer,

Famais, ni l'été ni l'hiver,
N'a connu l'amour veritable.

As this investigation is coming to a close, let us take one last look at the symbolic myth of Prometheus. The view which ancient myths hold of man as a gadgeteer is decidedly unfavorable. It would be even more adverse to the modern man of high explosives and the internal combustion engine.

Prometheus, we remember, the wisest of the Titans, makes himself the protector of man the maker of things, but in his revolt against the gods he fails. It is a trait of deepest significance that Prometheus has to steal the fire from the gods, and that it is precisely this theft that provokes their wrath against Titans and men.

What kind of fire is it that he brings to earth in a tinder tube, in the hollow stem of a sunflower? The myth is vague about the place where he

stole it, but the vessel he used gives us a hint that this fire did not stem from the smithy of Hephaistos but from the sun—that what Prometheus stole was part of the great sun-fire. What is the meaning of the theft? Without sun-fire life is unthinkable. The wrath of the gods, then, cannot have been provoked by the fact that Prometheus had tried to bring this fire to man as a life-giving element, for as a life-giving element the sun had always come to man; there was no need to steal it. No! the wrath of the gods was provoked by something very different, namely, by the enslavement of the sacred fire which Prometheus dared to perpetrate. This was an act of desecration, a most dangerous undertaking. The reason why this theft has fascinated the human mind so strongly and so long lies in those sacred, hallowing, purifying, atoning powers of the flame.

Our modem engines are not powered directly by solar heat. Perhaps it is significant that the many attempts made to harness the sun's energy directly for the production of steam, for instance, have so far failed. What our technology robs and exploits is the stores where solar energy slumbers in transmuted forms, like coal and oil which are saturated with solar fire. The fire of the smithy, the first fire of technology thus stems from the earth. Alchemy later symbolized the spirit of that fire in the "salamander." It is earth-fire from which and with which technology starts out. From its very beginning it makes that fire subservient by building apparatuses which in one way or another are fire-operated. Our whole technical personnel has branched out from the blacksmiths.

From them came the locksmiths and then, in the early ages of technical specialization, all those technical workers whose number today is legion.

Today lives an iron race,
They never rest in the daytime
From the work's weight and from woe,
They rest not at night.

-Hesiod.

Hephaistos himself is a patron of man, the maker. He is as sooty, sweaty, and pale as are all smiths, whose skin turns pale under the radiation of the flames.

Why does he limp, why does Wayland the Smith limp? And why is the smith's craft taught by dwarfs, deformed and crippled creatures? Because their relation to the treasures of the chasms, and caves, bowels of the mountains where the metals slumber, was of old considered unlawful and sacrilegious. Why is it that an ancient awe attaches to the art of metal working? Why have the myths so many evil deeds and disasters to report in connection with this craft, ever since the days of Daedalus?

The gods manifestly do not love man the maker; they oppose him violently at times, while at other times they suffer him as a half-burlesque figure by their side, like Hephaistos. They beat down the revolt and the presumption of the Titans. But all technology is of titanic mold, and man the maker, is always of the race of the Titans. And so we meet him first of all in volcanic landscapes. From his titanic kinship stems his love for the enormous, the gigantic, the colossal; his delight in towering works that impress by their quantity and mass, the vastness of their piled-up matter. That trait, incidentally, explains why man the technician so often lacks a sense of beauty and proportion; he is not an artist.

The myth of the Battle of the Titans and the myth of Prometheus tell us how the Greeks, the most artistic of all peoples, the familiars of beauty's golden rule, overcame the temptation to ally themselves with the Titans. And there can be no doubt that this myth once and for all described the comparatively modest role of the machine in antiquity. His restless industry, his busy activity, his eccentric thirst for power make man the gadgeteer hateful to the gods. The majesty of Zeus is fullness of being, quiescent strength. The strength of Prometheus, in

contrast, lies in rebellious upheaval, in the urge to cast Zeus from his golden throne, to drive out all gods, and to make himself master of the world.

Symbolically speaking, the technician is crippled in his mind also. He is one-eyed like all Cyclopes. His empiricism alone indicates this. He is not bothered by the question where ultimately his efforts lead. His factualness consists precisely in avoiding this question, because it lies outside the realm of his work. We can expect from him technical thoughts, the kind which specialized knowledge can produce, but we must not expect from him any wisdom outside of the technical field. His preoccupation with facts not only prevents him from thinking about himself: it also blocks his approach to that more spiritual wisdom which cannot be reduced to mechanics.

Still, his striving for power has limits that we can define, since we can delimit the zones wherein the present, near perfect, technology is effective. The pillage which is inseparable from its reckless and ruthless squandering of men and material cannot be continued for long. It ends with the exhaustion of those stores whereon this consuming technical progress rests. We often meet a tendency to represent these stores as inexhaustible, but such assertions are contradicted by the rationalism of exploitation. For this rationalization is the best yardstick for the decrease in natural wealth.[12] All calculations concerning subterranean reserves are somewhat questionable, and they remain questionable even if the figures as such are beyond a doubt. For what all these statistics disregard is the fact that among the resources consumed by technical progress are the human resources. They fail to consider the limits of technological expansion, limits which are set by destructive forces, which rise against man and his works in the same degree as these elemental forces get harnessed in our engines. They forget, finally, that human organization is closely linked to the existence of unorganized wealth, that is, we organize for the uses of such wealth. Once, however, the unorganized wealth nears exhaustion, human organization sickens, becomes an end in itself, grows cancerously and without bounds; in the end it destroys all that is not organized.

No human invention could possibly abolish the reciprocity between mechanical progression and elemental regression. With this reciprocity in mind, we hold a yardstick by which to measure those high hopes and expectations which are currently placed in new and unheard-of mechanical inventions. One of these is the claim that technical progress will, for instance, by atomic fission, supply man with energies of un-

fathomable scope, that man will succeed in tapping elemental powers far beyond anything hitherto known. Hopes for the harnessing of such powers are perhaps not utopian. What is completely utopian is the naive optimism on which such speculations are based, and the innocence with which they are proffered. Is there anything man should fear more, anything that could become more terrible than that such discoveries and inventions should achieve success? What possibilities for destruction open up where such inventions are made![13] Science fiction, for which this kind of invention is a favorite, usually presents us with some noble hero who uses the new power for the benefit of all mankind. Even if this were so, what could be more abhorrent than the idea that the use of such an invention depended upon the will of one single being? Should we not have to fear him, however noble he might be, far more than the most vicious and inhuman criminal? To place such powers in the hands of one man is a thought more inhuman than any human crime.

Technology's striving for power is unbroken. Daily we observe how its spearheads are driving farther, and how its organizations are constantly spreading out. In the course of this offensive drive, relations change between technology and the state. The state itself is now conceived by technology as an organization which must be brought to perfection, which must be controlled by a perfect automatism. The technician asserts that the state can properly fulfill its tasks only when it becomes organized on a completely technical basis, when the idea of the state and its purpose are organized into a centralized functionalism, an all-embracing machine which nothing escapes.

But precisely this definition annihilates the very essence of the state. For, indispensable to the state is that which is not state, and can never become state. This something by which alone the state can be a state is the people. The people may well be conceived as the carriers of the state; there are all kinds of relationships between the governed and their government, but never can the people be the state itself. The very idea of the state is null and void once this basis collapses whereon the state is built. The technical organization of the whole people to the point where no sector of life remains unorganized, in the end brings the downfall of that state.

Notes

1 *Rationalization* is here understood as the organization of a business or industry, or the orderly division and subdivision of a system or process, to avoid waste, to simplify procedure, and to coordinate various parts, etc., all primarily to effect a saving of time and money. In many instances in this work, the term is almost synonymous with mechanization. It was a much-used word and concept in Germany in the 1920's, when admiration for American production-line methods was widespread, and Henry Ford's autobiography sold by the hundred of thousands [Editor's note].

2 The second main theorem of thermodynamics, the law of entropy, tells us that heat can be converted into work only to a limited extent. Thus, the designer of a machine never gets beyond the degree of efficiency of Carnot's cycle.

3 The zipper is an example of a method of mechanical opening and closing. The royalties which the clever inventor derives from his invention are calculated in inches.

4 One has to make a distinction between the kind of work that is done with the help of a mechanism, and the work that is done automatically, by a mechanism. The first demands manipulation, to an extent continuous, to an extent supplementary to the work of the mechanism—much like the manipulation of a tool. The second requires only control of the mechanism by the human hand. This distinction becomes quite clear when we compare the bicyclist and the automobile driver. The bicycle is one of those almost perfect mechanisms that can hardly be improved upon, and that as a mechanical tool must be operated continuously. For this reason it is well adapted to the human body: the handlebars correspond to arms and hands, the pedals to the feet, and it is entirely controlled by the balance of the human body. The motor cycle merely uses the form of the bicycle, modifying it more and more, because it is propelled not by continuous manipulation but by a mechanism that performs controlled automatic work. The evolution of the automobile begins with the introduction of the motor into the readymade form of the

horse-drawn carriage. Later, it goes on to the construction of a body especially designed for the motor. Now there is no longer any correspondence between the human body and the mechanically accomplished work. Those adaptations of the automobile body to the human body that still exist have no longer any relation to the work performed.

5 Montesquieu' s doctrine of the separation of powers, which demands a separate bureaucracy for the legislative, the executive, and the judicial branches, and which declares the law to be binding on the executive and judicial branches (*De l'esprit des lois*, 1748), has found acceptance in the constitutions of the nineteenth century. The German "Law on the organization of Courts," of January 27, 1877 recognizes it in paragraph one: "The power of jurisdiction is exercised by independent tribunals subject only to the law." Rules of this sort, like many others, have a meaning which is forgotten sooner than the rule itself. To Montesquieu, the meaning of such rules is to limit the power of governmental authority, of the absolute monarch and his cabinet courts. But we live no longer in those days—today we are moving in quite another direction.

6 While writing these lines I happened across an article on the Philippine Islands which says about them and other lands in the Pacific: "Almost all of these lands and possessions are among those blessed portions of the earth where a truly almost unimaginable wealth of raw materials promises paradise to the modem man who know how to exploit them properly." The idea of exploitation is the first that comes to the author at the sight of paradise. This sort of homo faber fails to see that an exploited paradise is no longer paradise.

7 Liebig's famous work, *Chemistry in its Application to Agriculture and Physiology*, appeared in the year 1840. Translations of it into almost all languages appeared a few years later. This work asserts the necessity of returning to the soil those minerals that the crops draw from it.

8 The recognition and description of demoniacal traits in the machine deserves a treatment of its own. Demoniacal traits are present wherever the machine is at work, and they unfold in the machine realm with constantly growing power. The reasons are obvious. Technical thinking itself, which must be recognized as a collusion of causal and teleological thinking, throws open the doors for the invasion of the demons. They display their fullest power in the forced organization of elemental energies, that is machinery—and most of all in the consequences of this violation, consequences that turn directly against man himself. Depending

upon which aspect of the machine we are studying, the demoniacal activity can be described in various ways. The process as a whole is often understood as one of inner corrosion and emaciation, and from the Christian point of view as a deadening of the soul. The Titanic character of the machine evokes the vision of colossal animals of altogether strange and disturbing shapes. Machinery reminds one of the living creatures of the ice age, of a world filled with saurian beasts that we feel are monstrous. Technical organization is of the Titanic character of a mammoth. Its volcanic nature is disturbing in a different fashion. Again, the precise organization of labor reminds us of insects; it recalls the ant or termite states. One striking likeness is the similarity of airplanes to locusts or dragon flies. Automatism has unmistakable submarine traits; it shows a dreamlike, malignant absence of will and consciousness. E. T. A. Hoffmann more than others was frightened by the sort of automatism he saw in the mechanical figures that were popular in the 18th century. Man's relation to this mechanical world is expressed in centaur-like images—I am thinking here of pictures of his eyes, a metal beak in place of his nose. The dream life of modem man may also be mentioned, for it produces all these painful and disturbing visions.

9 It is remarkable how easily men untouched by the machine, for instance Central Africans who have left their tribal village, can be fitted into the service of a highly organized machine system and be made to tend machines and do technical labor. This phenomenon is readily understood when we consider the peculiar ahistorical and apolitical traits of the machine. If it were possible to teach a stone-age man to drive a car, no doubt he would learn quickly. Nothing in it is beyond his powers. He does not even have to understand the mechanism. As experience has shown, even a chimpanzee can be taught to ride a motorcycle.

10 A remarkable phenomenon is the concealment of scientific discoveries in anagrams that we encounter in the 16th and 17th centuries. These anagrams, first of all, secure the priority of the discovery by means that make it accessible only to him who can decipher the anagram. A well-known instance is the anagram of Galileo containing his suppositions about the shape of the planet Saturn. Its solution gives the sentence: *Altissimam planet am tergeminum observavi* ("I have seen a very high triple plant"). Obviously, anagrams of this sort are the harder to solve the more letters they contain. Huyghens cloaked his observations on the shape of Saturn in an anagram of sixty-two letters, but it was quick-

ly solved by the mathematician Wallis. The solution gives the sentence: *Annulo cingitur, tenui, plano, nusquam cohaerente, ad eclipticam inclinato* ("It is girded by a thin, fiat ring, nowhere touching, and inclined to the ecliptic"). The struggles among scientists over priority are so violent and bitter because on the recognition of priority depend the very name and scientific fame of the scientist. The flowering of our sciences falls into the era of Columbus. It is important to have been the first to see America, or the rings of Saturn. In fact, the scientific nature of a statement can be tested on the question whether or not a struggle for priority was connected with it.

11 When Jünger wrote this, such "masterpieces" as Disney's "Snow 'White" and "Fantasia" had not yet been produced, not to speak of the latest productions in 3D computer animation, such as "Toy Story" etc. These works fully warrant his prediction (Editor's note).

12 "At any particular time, it is the task of the purely natural sciences to prepare the soil on which the machine is to grow; and since tilled soil is soon exhausted, it is important that new son be added constantly" (Heisenberg). The significance of this statement lies in its recognition of the consumptive character of the machine. It may be assumed that the *terra incognita*, the uncharted land, is unlimited, its riches inexhaustible. But these riches are not at the beck and call of just anyone. For every treasure cave there must be an Ali Baba in possession of the magic word. Rational thinking has no access to uncharted lands; it always works on tilled soil.

13 Scientifically speaking, technical exploitation of atomic energy is possible today. And the possibility cannot be dismissed that, during experiments of this sort, not only the experimenting scientists but perhaps also the whole earth may fly apart. It is significant that atomic physics is based to a large extent on the investigation of disintegratory reactions.