Second Part

Man and the Technical Object

Chapter 1

The Two Fundamental Modes of Relation Between Man and the Technical Object

Section I. The Social Majority and Minority of Technics

We would like to show that the technical object can be related to man in two opposite ways: either through a status of majority (i.e. in the *sui juris* sense in that it has come of age and is fully responsible as an individual) or as a status of minority (i.e. not considered as being in full control or responsible for one's actions as an individual). The status of minority is the one according to which the technical object is first and foremost an object to be used, that is necessary to everyday life and is part of the environment in which the individual human grows and develops. In this state, the first encounter between the technical object and man essentially takes place during childhood. Technical knowledge is innate, built on habit and un-thought. On the other hand, the status of majority corresponds to its conscious and considered use by a free adult, who has at his disposal the means of rational knowledge as elabourated by science—the knowledge of the apprentice is this way opposed to that of the engineer. Once the apprentice becomes an adult artisan and the engineer is introduced into his network of social relations, they sustain and cause to radiate around them a vision of the technical object which corresponds in the first case to a relation of minority and in the second to one of majority. These represent two very different sources for the representation and comparison of technical objects. The artisan and engineer don't live only for themselves—as agents and witnesses to the relation between human society as a whole and the world of technical objects as a whole, they are worthwhile exemplars: through them, the technical object incorporates itself into culture. Until today, these two modes of incorporation have been unable to provide concordant results and have resulted in two

languages and two types of thinking on technics that are not consistent with each other. This lack of consistency is partly responsible for the contradictions within culture as to how it represents to itself and thinks about the technical object in relation to man.

This conflict between majority and minority status is nothing else than another example of the inadequate relationship that has always existed between man as an individual or as a social being and the technical reality. In antiquity, a very large part of technical activity was banished outside of the domain of thought since it corresponded to servile occupations—in the same way that the slave was relegated to the outside of the city, the servile occupations and technical objects which corresponded to them were likewise banished from the universe of discourse, of reflective thought and of culture. Only the sophists, and Socrates to a certain extent, made an effort to bring into the domain of noble thought the technical activities practised by slaves and freedmen: the status of majority was only accorded to certain activities, such as agriculture, hunting, war, and the art of navigation, whereas the technical activities that use tools were kept outside of the realm of culture: Cicero draws almost all his metaphors from the noble arts, particularly from agriculture and navigation; the mechanical arts are rarely invoked by him.

Going back further into the past, one would find that a variety of civilizations would differentiate between technics that were noble and those that were not. The history of the Hebrews accords a veritable privilege to pastoral technics while regarding the earth as damned. God accepts Abel's offers but not Cain's—the shepherd is superior to the farmer. The Bible contains a multitude of paradigms and schemes of thought drawn from the methods by which herds can be made to prosper. On the other hand, the scriptures introduce modes of thought drawn from agriculture. Perhaps, in the origins of mythologies and of religions, we can find a certain predisposition towards a particular technology, consecrating the noble technics while refusing the right of expression of others, even when they are in fact used. This initial choice between a majority technics and a minority technics, between a valued technics and a devalued technics, imparts to the culture which incorporates these technical schemes thus created an aspect of partiality, of non-universality. Our research does not propose to reveal for each particular case the reasons for

the choice between fundamental technics but to show that human thought must establish a relation of equality without undue privilege between man and technics. This task remains to be accomplished since the occurrences of technical dominance, which during every historical era cause the recognition of a part of the technical world by culture while rejecting others, maintain an inadequate relation between human reality and technical reality.

The suppression of slavery in Western Europe allowed ancient servile technics to see the light of day and manifest themselves in rational thought and the Renaissance consecrated artisanal technics by bringing to them the light of rationality. Rational mechanics allowed machines to enter the domain of mathematical thought—Descartes calculated the transformations of movement within simple machines used by the slaves of antiquity. This effort towards rationalization, which signifies integration to culture, went on until the end of the 18th century. But in spite of that, the unity of technics was still not maintained. A real reversal was in operation, which repressed the ancient noble technics (those of agriculture and of husbandry) into the domain of the irrational and of the non-cultural. The relation to the natural world was lost and the technical object became an artificial object which distanced man from the world. Today, we can barely see a pathway of reconciliation between thought inspired by technics relative to living beings and artificialist thought, creator of automatons. Mechanistic technics were unable to attain a status of majority unless they were thought up by the engineer, rather than remaining technics of the artisan. At an artisanal level, the concrete relation between the world and the technical object still exists, but the object thought up by the engineer is an abstract technical object that is not linked to the natural world. In order for culture to be able to incorporate technical objects, we would have to discover a middle way between the status of majority and the status of minority of technical objects. The disjunction between culture and technics finds itself in the state of disjunction which exists within the world of technics itself. In order to find an adequate relation between man and the technical object, we would have to be able to discover a unity to the technical world, through a representation which simultaneously incorporates that of the artisan and that of the engineer. The artisan's representation is engulfed in the concrete, engaged in material manipulation and sensible existence;

it is dominated by its object. On the other hand, the engineer's representation is dominating: it makes out of the object a bundle of measured relations, a product, an ensemble of characteristics.

Thus, the first condition towards the integration of technical objects and culture would be that man ought not be inferior nor superior to technical objects; that he'd be able to interact with them and learn to know them within a relationship of equality and of reciprocal exchange—a social relation of some sort.

The compatibility or incompatibility between the different technological modes deserves being subjected to a conditional analysis. Perhaps it would be possible to discover instances of compatibility between a technology such as that of the Romans and that of another such as the civilised society of today. Or perhaps it might be possible to discover an incompatibility barely discernible between the technological conditions of the 19th century and those of the middle of the 20th century. Certain myths born from the misguided encounter of two incompatible technological paradigms could be brought back to their initial conditions and analyzed.

Section II. Technics as learnt by the child and technics as thought by the adult

One cannot study the status of the technical object within a civilization without bringing to the forefront the differences between the ways technical objects relate to adults and to children. Even though life in modern societies gives us the option to think that there is continuity between childhood and adulthood, the history of technical education quickly shows us that a difference does exist and that the way a child or an adult acquire technical knowledge is not the same. We have no intention of presenting a normative rule; we only wish to show that the character of technical education has varied significantly over time. This variation is due not only to the level of technical knowledge or the structure of society, but also to the age difference between the individuals being educated. We could likely discover a circular causality between the level of technics and the age of acquisition of knowledge that constitutes the technician's baggage.

If a barely rationalized technics requires its learning at an extremely early age, the young subject will preserve the irrational basis of his technical knowledge into adulthood. He will hold onto this knowledge by virtue of its repeated inculcation, deeply rooted because it was acquired from very early on. In the same manner, the technician will put forward his knowledge not through a clearly represented diagram, but in a manner that comes across almost as a sleight-of-hand acquired by instinct and relegated to second nature as habit. His science will manifest itself at the level of the sensorial and the qualitative, very close to the concrete character of the material. This individual will be gifted with powers of intuitive collusion with the world which will give him a remarkable ability that will manifest itself, not in his conscience or in his discourse, but exclusively through his work. The artisan will be like a magician and his knowledge will be a working knowledge more than intellectual one, and it will be a capacity more than a knowledge. It will be secret to others because it is secret even to himself and to his own conscience on account of its nature.

Even today, a technical subconscious that cannot be expressed as a function of reflexive activity can still be found in peasants or shepherds. They are able to directly understand the value of seeds, the exposure of a piece of land, the best place to plant a tree or to set up an enclosure for animals in such a way that it will be sheltered and well located. These individuals are experts in the etymological sense of the term: they are part of the living nature of the thing they know, and their knowledge is a participatory knowledge that is deep, direct, and requires an original symbiosis that includes a kinship with a valued and qualified aspect of the world.

Man behaves in this instance as an animal that can smell water or salt from afar, or that knows how to choose where to place a nest without forethought or planning. This type of participation is by nature instinctive and is only found where successive generations have adapted to the rhythms of life, the conditions of perception and the mental structures essential to the type of collectivities that emerge from on-going stability. In a tale remarkably entitled *The Mine*, Hoffman described a similar style of intuition in a real miner—he smells danger and knows how to discover the ore in the most secreted veins. He lives in nature as part of the nature of underground, and his being with this nature is so ingrained that it excludes all other sentiments or attachments. The real miner is an underground man.

Whosoever goes down into the mine without loving it, like the errant seafarer who courageously hires on to work in the mine because he loves a young woman, will never partake of this essential being with nature; the morning of his wedding, he will become a casualty of the mine. There is no moral novelty here. The young sailor is full of merit and worth, but he is a sailor and not a miner: he does not possess the intuition for the mine. The ghost of the old miner warns him of the danger he is in; the mine does not accept outsiders, intruders from other trades, from other lives, that don't partake in the gift of participation. Human nature as found in the peasant, the shepherd, the miner, the sailor, doubles up with a double second nature which is like an ancestral pact with an element or a region. It is difficult to say whether this sense of participation is acquired during the first years of life or if it is part and parcel of an innate heritage, but it is certain that a similar technical education belongs to childhood even if it is made up of intuitions and purely physical functional schemes that are very difficult to express and convey through oral or figurative symbolism. And for that same reason, it is very difficult for it to evolve or to be reformulated in adulthood. In fact, it is not of a scientific or conceptual nature and cannot be modified by any kind of intellectual symbolism, oral or written.

This technical education is rigid. It would be excessive to consider this technical education as necessarily inferior to an education based on intellectual symbolisms; the quantity of information contained in this instinctual education can be as great as that contained in symbol-based knowledge, explained by graphics, drawings or formulas. It would be too easy to pit routine against science, particularly since science usually implies progress. Primitiveness cannot be mixed up with dullness or denseness, any more than conceptualization can be confused with science, but it is important to point out that this technical knowledge is effectively fixed, since one cannot become a child once again in order to acquire a new set of basic intuitions. This type of technical knowledge also has a second character: access to it is restricted and requires initiation. In fact, it's only through being raised within a community that the child acquires these basic intuitions. The outsider is most likely deprived of this initial participation which requires the existence of living conditions because these living conditions are first and foremost educational. It would be too much to attribute

the demise of ancient technics to the closing of communal life of societies. In fact, these societies knew how to remain open, as demonstrated by the temporary or seasonal migration of peasants from Auvergne to Paris up to the end of the 19th century. In this case, it is technics itself which corresponds to a closed regime of life because a technical education is valid only for the society within which it was created and only for that society. It appears that historians have dealt with in a rather abstract fashion the initiation rites of ancient trades by considering them only from a purely sociological point of view. It needs to be pointed out that the trials that correspond to the acquisition of technical knowledge by the child are not only social rites but feats through which a young person becomes an adult by taming the world or by measuring up to a critical situation and overcoming it. There's a certain magical charge to the trial, i.e. a feat by which the child becomes a man by using all his strength pushed to its extreme limit. In this perilous face-to-face with world and matter, if he lacks resolve or is not up to the task, he will put on the line his efficacy as a man of action. If the hostile environment wins out, the man will be unable to fully become an adult because a rift has formed between nature and man—the trial becomes a hex cast by the technical being that will last a lifetime. In the same way that an animal becomes docile from the day it allows itself to be led for the first time, matter comes to obey this man who has become its master by dominating it in the trial. If the first attempts miss, the animal will rebel and will remain untamed. It will never accept him as master and he, in turn, will forever be insecure because the connection was broken right then and there. In the trial, the law of all or nothing takes hold; man and world are transformed and an asymmetrical union takes place. We're not saying that the trial is a test for the demonstration of courage or ability—it engenders these qualities since courage emerges from an immediate and confident linkage with the world which dispels all uncertainty and hesitation. Courage is not fear overcome, but fear deferred by the presence of intuition which puts the world on the side of the one who acts. The able man is the one that the world accepts, that matter is fond of and to whom it obeys with the faithful docility of the animal that recognizes his master. Ability is one of the forms of power, and power supposes a spell

that makes possible an exchange of forces, or rather a mode of participation somewhat more primitive or more natural than the already very elabourate and partially abstract spell. In this sense, ability is not the application of violent despotism but the application of a force appropriate to the being it drives. In the true power of the able man, there is a recurring relation of causality. The true technician is fond of the matter he works on and he is on its side. He is an initiate and respects that to which he has been initiated to. And once he has tamed it, he becomes a couple with the matter and does not easily give it over to the profane because he has a sense of the sacred. The artisan and the peasant, to this very day, are averse to bring to market certain products or works which demonstrate their most perfect or refined technical pursuits. An example of the prohibition of commercialism and divulgence is patent in the off-market limited edition of a book not offered for sale by a printer, editor or author. It is also manifest when the peasant, at his home in the Pyrenees, offers a visitor certain foodstuffs which he would never put up for sale or allow the visitor to take away.

The secret and non-evolving nature of such technics is therefore not only a product of social conditions; it is created by the structure of the group just as much as the structure of the group conditions the technics. It is quite possible that technics must in some way or other carry within themselves a coefficient of intuition and instinct necessary for the establishment of mutually acceptable communication between man and technical beings. But next to this first aspect of technical education, there is a second one which is its inverse and which essentially addresses itself to adult man. Like in the preceding case, there is a dynamic action on the individual and on the group by bringing it to take on an adult mentality.

The second type of technical knowledge is rational, theoretical, scientific, universal knowledge. Its best example is Diderot and D'Alembert's Encyclopaedia. If the Encyclopaedia appeared as a powerful and dangerous work, it wasn't because of veiled or direct attacks against abuse or privilege, nor because of the philosophical nature of various articles—at that time there existed pamphlets and libelous tracts much more violent than the Encyclopaedia. The most alarming aspect of the Encyclopaedia was that it was moved by an enormous force, that of technical encyclopaedism —a force that had been granted by powerful and enlightened protectors. This force existed on its own, because it

responded to need even more than to political or financial reforms. It was a positive and creative force that managed to bring about a remarkable grouping of researchers, writers and correspondents, while giving faith to this team of men who would come together to collabourate even though they were not associated to each other by means of a social or religious community: a great task was to be accomplished. The greatness and novelty of the Encyclopaedia resides in the fundamental character of the plates of diagrams and machine models which pay homage to the trades and to the irrational knowledge of technical operations. These plates don't play the role of purely disinterested documentation for a public desirous to satisfy its curiosity. Rather, information is presented in a rather complete way in order to present the documentation in a practical and useful way so that an individual who owns the work would be capable of constructing a depicted machine or to advance through invention the state-of-the-art in a particular domain and to pursue research at the point where other researchers left off.

The method and structure of these new teachings are opposite to those which came before: they are rational and doubly universal, and in that respect they are adult. They are rational because they use measurement, calculation, and the processes of geometrical figuration and descriptive analysis. They are also rational because they call upon objective explanations, and invoke the results of experience, taking care to precisely present the conditions, treating the hypothetical as that which is conjectural, and established fact as that which must be considered as such. Not only is scientific explanation required, it is required with a distinct taste for the scientific spirit. On the other hand, this style of teaching is doubly universal because of the public to whom it is addressed and the information it provides. Even though it is higher-level knowledge that is being taught, it is meant for everyone; only the purchase price limits the number of possible buyers. This knowledge is provided in the spirit of the highest possible universality according to a circular schema that is based on a technical process that can never be closed in upon itself within the secret of its specialty, but which is related to others using a variety of analogous tools which rely on a small number of principles. For the first time, we see a technical universe coming into existence, a cosmos where everything is linked to everything else instead of being jealously guarded by a corporation. This consistent and objective universality which presupposes an internal resonance with this

technical world, requires that the work be open to everyone in order to constitute a material and intellectual universality, a block of technical knowledge that is available and open. This style of education takes for granted an adult subject capable of self direction and able to establish his own norms without someone to direct him: the autodidact is by necessity an adult. A society of autodidacts cannot accept tutelage or to be taken for a minor in spirit because this kind of society aspires to drive and manage itself. It is principally in this sense and through its technological power that the Encyclopaedia brings forth a new force and a new social dynamic; it's the causal circularity of encyclopaedic knowledge that rejects the moral and political heteronomy of Ancien Regime society. The technical world becomes aware of its independence when it realizes its unity; the Encyclopaedia is like a celebration of the Federation of Technics that discovers for the first time a solidarity amongst themselves.

Section III. Common Nature of the Minor and Major Technics. Meaning of Encyclopaedism.

We will attempt to analyze the relation between the encyclopaedic spirit and the technical object because it appears to be one of the poles of any technological conscience. On top of its historical meaning it also possesses a valid sense towards the knowing of technicity. We have always opposed the implicit spiritual and magical nature of technical education aimed at the child. It runs counter to the spirit of the Encyclopaedia but this opposition risks hiding a deep analogy within the existent dynamisms in the structurations of technical knowledge. Encyclopaedism brings out and propagates an inversion of the fundamental dynamisms of technics; nevertheless, this inversion is only possible because these operations are not shattered but displaced or turned back in some way. The Encyclopaedia manipulates and transfers forces and powers; it also casts a spell and traces a circle like a magical circle, only it doesn't do it in the same way as the trial associated with instinctual knowledge and it is not the same reality that it places within the circle of knowledge. It is human society with its forces and its dark powers which is placed within the circle which has now become immense and all-inclusive. The circle is the objective reality of

the book that represents and constitutes it. Everything that appears in the encyclopaedic book is within the power of the individual who possesses this representational symbol of all human activities in their most secret detail. The Encyclopaedia creates a universality of initiation and thus shatters the meaning of initiation itself. The secret of the universal rendered objective keeps a positive sense of the notion of secret (perfection of knowledge, familiarity with the sacred), and annihilates its negative character (obscurity, a means of exclusion through mystery, knowledge reserved for a small number of men). Technics becomes an exoteric mystery. (1) The Encyclopaedia is a vault, but a more efficient one on account of its being constructed from a more precise, more exact, more objective representation of its model. All the active springs, all the living forces of human operations are assembled here in this object-symbol. Every individual capable of reading and of understanding possesses the vault of the world and of society. As if by magic, everyone becomes the master of everything because they possess the vault of everything. The cosmos (that once upon a time enveloped everything and was superior to the individual) and the constraining social circle (that was always eccentric with regards to individual power) are now in the hands of the individual like the orb representing the world that emperors carried as a sign of sovereignty. Power, the safety of the reader of the Encyclopaedia is the same as that of the man that attacks an effigy of an animal prior to taking it on in nature, or of the primitive farmer who entrusts seeds to the earth after having accomplished propitiatory rites, or of the traveler who does not venture abroad to a new land except only after having rendered favourable his journey through some kind of rite establishing a communion and a pre-possession of memory which is preserved in the Odyssey (2). This rite of initiation is the union to a still hostile reality which remains so until it has been dominated and possessed. It's for this reason that all initiations render one more virile and more adult.

Every manifestation of the encyclopaedic spirit can therefore appear, within a psycho-sociological scope, as a background movement within a society

that expresses the need to attain a state of adulthood and freedom because the regime or habits of thought perpetuate an artificial state of tutelage and minority in individuals. The will towards the passage from a state of minority to that of adulthood by widening the circle of knowledge and the liberation of the power of knowing has taken place three times in the history of thought since the Middle Ages. The first manifestation of the encyclopaedic spirit constitutes the Renaissance and is contemporary with the ethical and religious revolution of the Reformation. The desire to go from the Vulgate to actual Biblical texts, to seek out the Greek texts instead of a complacency with bad Latin translations, or to find Plato once again beyond the scholastic tradition crystallized as fixed dogma is to refuse the arbitrary limitation of thought and knowledge. Erudition represents not the return to the past as the past, but the will to widen the circle of knowledge, to recover once again the entirety of human thought in order to free oneself from the limitations of knowledge.

The humanism of the Renaissance was never the will towards finding a fixed image of man in order to restrain and normalize knowledge as the decadence in classical studies would have us believe nowadays. Humanism responds first and foremost to the encyclopaedic drive, but this drive turned towards an already formalized knowledge because the level of development of technics was not high enough to allow the intervention of a rapid formalization in this domain. The sciences in particular were not developed enough and the intellectual means towards the technics of universalization were not ready so it is only with the 17th century that the means for the universalization of the technics come about which the Encyclopaedia set afoot. However, we must underline that, since the Renaissance, a great deal of goodwill towards technics has been manifested—already it is valued as a paradigm and as a means of expression (1), if anything for the human value in opening new pathways. Rabelais's magnificent praise of the Pantagruel tales summarizes the hope of Renaissance man—their complete belief in the virtue of technics—thanks to which humanity will perhaps be able to go one day to the “celestial signs” in the same way that it figured out how to go from the Old World to the New.

The second encyclopaedic stage is that of the Enlightenment. Scientific thought had found its freedom but technical thought was still not free;

scientific thought liberated technical thought. In the same way that technics touches commerce, agriculture, and industry as aspects of society, technological encyclopaedism could not but be a correlate of social and administrative reforms. Institutions such as the Grandes Écoles merge as a result of the encyclopaedic spirit. Encyclopaedism is by definition polytechnical, under the auspices of industry, in the same way that it is physiocratic in accordance with its agricultural nature. The industrial aspect developed much more than its physiocratic aspect. This is because encyclopaedic rationalization permitted more sensible transformations within the industrial domain that had benefited from the recent scientific discoveries of the end of the 18th century. Meanwhile, this asymmetrical development cannot allow us to forget one of the more important components of the spirit of technical encyclopaedism, i.e. the direct relation of the individual to its biological nature, to the vegetal and animal world. Rather than being legated to the descendents of ancient serfs, the techniques of the plowman's art are valued by even the most distinguished of individuals. It's the era of the “bergeries” or hobby sheep farms, a time when even a solid soul such as Daubenton has no problems writing a treaty for the use of shepherds which is the prototype for the advanced and open-handed popularizing book that gathers the ancient tradition of didactic works and gives it new life with a clear and graphic symbolism almost understandable by the illiterate. The etchings are the essence of this beautiful book and they are as clean and expressive as those of the Encyclopaedia. We should note that, in fact, technology requires a means of expression other than oral expression which uses already known concepts and is capable of transmitting emotions, but deals with difficulty with the expression of patterns of movement or precise material structures. The appropriate symbolism for technical processes is visual symbolism with its rich play of forms and proportions. The civilization of the word gives up its place to that of the image. Thus, the civilization of the word is by nature even more exclusive than that of the image since the image is by nature universal, one does not require a pre-established code of meanings. All verbal expression tends to become initiative. It always ends up as a specialized coded language where ancient corporate jargons are a clear example. One must be a member of a closed group in order to understand its oral or written language whereas one only needs to perceive in order to understand diagrammatic expression. It's only with the diagram that technical encyclopaedism draws together all its meaning and its power

of dissemination and becomes truly universal. Printing had given birth to the first encyclopaedism by distributing texts but this encyclopaedism could only arrive at emotional or reflexive meanings already sanctioned by established culture. By being word-based, the information travelling from person to person takes a detour through the social institution of language. The printed word, as spokesperson for the visual, primarily conveys an oral message with all the inherent limitations to this mode of expression—the command of all living and ancient languages is required to exercise the intelligence of encyclopaedic verbal meaning. This command, or at least the effort towards this command, is part of the meaning of the Renaissance. And in spite of its remaining within the domain of humanists and the learned, culture does not enjoy a direct universality through oral or written language. Perhaps, it is for this reason that the Renaissance was unable to produce a technological universality even though it tended to prefer plastic and graphic expression to all other symbolisms, particularly within the arts. As disseminator of the spatial scheme, printing comes into its own through etching. Thus, symbolic etching, used as a means for clearly translating the thinking of structures and processes and freed from all will towards allegorical expression that seeks to return to oral expression (such as talking coat of arms), appears fully developed in 17th century treatises by Descartes. Lending its expressive force and its power for precision to the service of geometry, symbolic etching is ready to constitute the requisite symbolism for a universal technology.

At last, a third instance of encyclopaedic thought appears to be announcing itself during our era but has not yet managed to constitute a universal mode of expression. The civilization of oral symbolism has once again won over that of spatial or visual symbolism because the new means of disseminating information have given primacy to oral expression. When information is converted into a printed object and then transported, the delay which separates the discovery of an idea from its expression is the same for written information as it is for figurative information. To a certain extent, printing privileges figurative information since out of necessity it uses the spatial form. The diagram does not need to be translated into a form other than its original form, whereas writing represents the translation of a series into a spatialized series, that was originally temporal,

and which must then be reconverted through reading. On the other hand, with information transmitted by telephone, telegraph, or Hertzian radio broadcasting, the means of transmission requires the translation of a spatial scheme into a temporal series that is then reconverted into a spatial scheme. Radio broadcasting specifically is particularly fitting to oral expression and cannot be adapted but with great difficulty to the transmission of a spatial scheme as it preserves the primacy of sound. Spatial information is thus relegated to the domain of costly or scarce objects, always arriving second with respect to oral information, which is valued because it rides on the coattails of vital becoming (1). Thus, a civilization is guided by a hidden paradigm at the level of the information it values. This paradigm has become oral once again: thought presents itself according to verbal semanthemes on the order of the slogan and the active presence within interpersonal relationships is on the order of the verb. Cinema and television do indeed exist, however, we must note that cinematography, because of the dynamism of its images, is a dramatic or cinematic activity more than a grapheme of simultaneity and not a direct expression of intelligible and stable form. Even though television was invented after the cinema, from its first transmission trials, cinema totally eclipsed television and imposed on it the dynamism of images. This has placed an enormous load on television, making it into a competitor and imitator of cinematography, incapable of discovering its own innate mode of expression and indentured to the public as a means of pleasure. The cinematographic movement is suffused with a hypnotic rhythm that saps the reflexive faculties of the individual and puts him into a state of aesthetic participation. Organized according to a temporal series that uses visual terms, the cinema is an art and a means of expression for emotion. The image is there as a word or phrase and not as an object containing a structure to be analyzed by the individual; it rarely becomes a motionless and radiant symbol. Moreover, television could become a means of information co-temporal with human activity, something cinema is unable of doing because being a fixed and recorded thing, it places in the past everything it incorporates. But since television wants to be dynamic, it sees itself as having to transform all the points of each image into a temporal series, or a time intervals as short as

the projection of one static frame in cinema. It thus transforms the dynamic into the static thanks to a prior breakdown into frames. Then, during the transmission of each frame, it transforms the simultaneous points of the static image into a temporal series that in the end transforms itself into an immobile spatial tableau where the rapid succession of these images creates an analysis of movement as in cinematography as a result of movement perception. This double transformation gels to the need of transmitting enormous quantities information, even for extremely simple image in its intelligible structure. Here, there is no shared measure between a quantity of information that is interesting and meaningful for the subject, and a quantity of information technically used, corresponding to several million signals per second. Television's squandering of information prevents it from providing the individual with a flexible and faithful means of expression and hampers the emergence of a truly universal visual symbolism; radio broadcasting overcomes borders, whereas visual information often remains linked to the communal life of groups; under these conditions it cannot be valued. But research on coding systems useful for inscribing the results of calculating machines on a cathodic oscilloscope screen, or to present on the same type of screen electromagnetic detection signals (1), would seem to be able to bring on great simplification through Hertzian means diagramatized images; thus, in relation to voice radio broadcasting, visual information would find once again find a place that it lost to radio broadcasting and would enable it to give birth to a new universal symbolism.

The intentions of encyclopaedism begin to manifest themselves within science and technics through the tendency towards the rationalization of the machine and the institution of a shared symbolism between man and machine. Thanks to this symbolism, a synergy between man and machine is possible because a joint activity requires a means of communication. And since man cannot **entertain** various types of thought (all translation corresponds to a loss of information), it is in this mix of human to machine relations that a new universal symbolism

must emerge in order to be aligned with a universal encyclopaedism.

Cybernetic thought has already produced research within information theory, such as human engineering, that specifically studies the relationship between man and machine; we can also conceive of a technology-based encyclopaedism.

Like the two that came before it, the new encyclopaedism must find its own means to liberate itself, but in a different way—it cannot be a repetition of the Enlightenment. In the 16th century, man was indentured to intellectual stereotypes; in the 18th century, he was bound by the hierarchical aspects of social rigidity; and in the 20th he is unwittingly a slave to his dependence on unknown and distant powers which control him and render him unable to rebel against them; the isolation enslaves him and the lack of consistent information alienates him. Having become machine in a mechanized world, he cannot find his freedom except by taking on his role and going beyond it through an understanding of technical functions thought out under the aspect of universality. All encyclopaedism is humanism, if we understand by humanism the will to bring to a estate of freedom that which has been alienated from human beings, so that nothing of the human shall be a stranger to man. But this rediscovery of human reality can work itself out in different ways: each era re-creates a humanism which is always in some way appropriate to the circumstances since it always targets the most egregious aspects of the alienation brought on or produced by civilization.

The Renaissance defined a humanism willing to compensate for the alienation resulting from intellectual and ethical dogmatism—it sought to find once again the freedom of theoretical intellectual thought. The 18th-century sought to find meaning to the effort of human thought as applied to technics, and found with the idea of progress the nobility of creative continuity which is found within invention. It defines the right of technical initiative to exist in spite of the inhibiting forces of societies. The 20th century seeks a humanism capable of compensating for the alienation which intervenes within the development of technics as a result of specialization that society demands and produces. There appears to exist a singular law to the becoming of

human thought, according to which all ethical, technical and scientific invention, which is first and foremost a means for the liberation and the rediscovery of man, but becomes through historical evolution an instrument which turns against its own ends and limits man by enslaving him—in its beginnings, Christianity was a liberating force, encouraging men to go beyond the formalism of customs and the codified prestige of ancient society.

That was the rationale that created the Sabbath for man, and not the other way around; nonetheless, it's the same brand of Christianity that reformers of the Renaissance accused of rigidity, linked to a formalism and a restrictive dogmatism that runs counter to the real and deep sense of human life: the Renaissance opposed Physis to Anti-Physis. In the same way, the technical, invoked as liberating progress during the Enlightenment, is today accused of indenturing man and of reducing him to a slave by altering his nature and alienating him from his self through specialization which is a barrier and a source of misunderstanding. The center of convergence has become the principle of enclosure. For that reason, humanism can never be a doctrine nor even an attitude that can define itself once and for all: every period must discover its humanism by taking aim at its principal danger, alienation. In the Renaissance, the narrow-mindedness of dogma engendered the birth of a new fervour and a new élan.

In the 18th century, the infinite fragmentation of social hierarchy and closed communities pushed towards the discovery of universal and non-mediated means of efficiency by way of the rationalization and universalization of the technical gesture that bypassed all the barriers and prohibitions that tradition had instituted. In the 20th century, it is no longer the hierarchical or local breakdown of society that creates alienation between men in human society, but rather its dynamic, limitless, vertiginous immensity. The human world of technical activity has become alien to the individual once again through its development and its formalism, and by setting under the guises of a machinism that has become a new bond between the individual and the industrial world which surpasses the conceptual imagination and scope of the individual. The liberating technics

in 18th century is at the human scale because it is artisanal whereas that of the 20th century is beyond the scope of the individual and constitutes within the industrial world a human reality that is compact and resistant yet alienated, as well as entirely beyond the reach of the individual as it once was in hierarchical societies.

What man needs now is not a universalizing freedom, but mediation. The new magic is not to be found within the individual's sphere of influence of his actions (his confidence bolstered by the knowledge that gives action the efficacy of certitude) but in the rationalization of the forces that situate man by giving him meaning within the human and natural ensemble. Treating teleology as a knowable mechanism and not as an indeterminable mystery demonstrates man's intention to not accept a situation as simply lived or experienced. Instead of searching for a process to fabricate objects without making a pact with matter, man frees himself from his enslavement to the finality of everything by learning how to create finality or organize a final whole which he can judge and appreciate so as to not be passively subjected to integration. Cybernetics, the theory of information and consequently the theory of finalized structures and dynamisms, liberates man from the constraining closure of organization by rendering him capable of judging this organization, rather than tolerating it by venerating it and respecting it, because he is incapable of imagining it or constituting it. Just as he did in the 18th century when he subjugated the unfortunate need to work by rationalizing it instead of suffering and resigning himself to render work more efficient, man outdoes enslavement by consciously organizing finality. Human society, aware of its own teleological mechanisms, is the result of conscious human thought, and consequently incorporates those who constitute it. Human society is also a product of an organizing human effort and creates the equation between the fact of being situated and of situating itself. The place of man within a society then becomes a relation between the element of activity and the element of passivity like a mixed status caught between redoing and perfection because it is of what is human, interrupted but not alienated. The conscience

is simultaneously demiurgic and the result of an anterior organization; social reality is contemporaneous with human effort and homogeneous with respect to that effort. Only a scheme of simultaneity, a constellation of forces represented within their relational power, could prove adequate for this type of reality—its development postulates a similar dynamic representation of man within society. Cybernetic schemes can only find their universal sense in a society already constituted in a manner that conforms with this thinking and the ability to react that is most difficult to gauge is a society's relation to cybernetic thought; it can only be created progressively through intermediary means of information that are already there, such as the exchanges between technics working synergistically on a given point. Norbert Wiener, a mathematician-teacher within a technological institute, mentions this type of grouping as a source of this new technology which is a technics of technics, at the beginning of his book published in 1948 entitled Cybernetics which is a new Discourse on Method. Cybernetics gives man a new type of majority—one that penetrates within its relations to authority by dispersing itself within the social body and there it finds beyond the maturity of reason, a type of reflection that on top of allowing the freedom to act, grants the power to create organization while instituting teleology. Likewise, finality and organization being able to be rationally thought and created, since they become matter for technics, they are not the end-all and be-all of reason, capable of justifying everything: if finality becomes a technical object, there is a beyond to finality within ethics. In this sense, cybernetics frees man from the unconditional prestige of the idea of finality. Through technics, man frees himself from social constraint; through information technology, he becomes the creator of the organization of solidarity which at one time imprisoned him. This stage of technical encyclopaedism can only be provisional; it calls that of technical encyclopaedism

that finishes him while giving the individual the possibility of returning to the social while changing status and becomes the object of an organizing construction instead of being except in this of a given that is valued or fought for, but subsisting with its primitive external characteristics to the activity of man. Thus, individual nature is no longer external to human domain. After access to freedom, access to authority manifests itself in the full sense of the term, as creative force.

Such are the three stages of the encyclopaedic spirit, which at first was ethical, then technical, and which could become technological by going beyond the idea of finality taken as ultimate justification.

Hence, one cannot say that the technics of a finalized organization are only useful according to their practical results. They are useful in the sense that they allow finality to pass from the level of magic to the level of technics. While the evocation of a superior end, and the order which realizes this end, is considered to be the last term in a search for justification because life is mistaken for finality, in an era where technical schemes are but schemes of causality, the introduction of thought within technological schemes plays a cathartic role: that where technics is found cannot be its last justification. Individual and social life includes aspects of finalized processes, but finality cannot be the deepest aspect of individual or social life, and neither can the different modalities of finalized action such as adaptation to an environment.

We can say without a doubt that it is not a veritable finality that animates regressive recurring processes of causality—at least this technical production of teleological mechanisms allows to emerge from the magical domain the most inferior and basest aspects of finality: the subordination of all means to an end, hence, the security of the end with respect to means. In becoming technical material, such an organization is nothing more than an aspect of social or individual life and can no longer mask from its prestige the possibilities of development, of becoming, of the emergence of new forms that cannot be justified by finality since they create their own as the last term of evolution: evolution is as much maladaptation as it is adaptation. The reification of adaptation is but one aspect of life; homeostases are partial functions; by compartmentalizing them and allowing not only

to conceive them but to realize them rationally, technology leaves in plain view the open processes of social and individual life. In this sense, technology diminishes alienation.

Section IV. The Need for Synthesis Between the Mode of Majority and the Mode of Minority in Accessing Technics in Education

The separation of adult education and the education of the child with respect to technology corresponds to a difference in the structure between two normative systems, and in part, to a difference between the results. The outcome is that there is still a breach between pedagogical technology and encyclopaedic technology that has not been surmounted.

Encyclopaedic technological education aims to give the adult the feeling that he is an accomplished individual, completely realized, in full possession of his faculties and of his strengths, an image of man as an individual in a true state of maturity—the requisite condition for this feeling is a universality of the right to knowledge. Therefore, there remains something abstract within encyclopaedic education and an intractable defect to universality. In fact, the immaterial gathering of all technical devices into one technological compilation that pulls them together by ordering them according to simultaneity or reason discards the temporal, sequential, quantifiable character of discoveries that have given way to our current situation. In an instant we grasp in actuality what has been progressively constructed and slowly and successively put together. The idea of progress in terms of its mythic content comes from the illusion of cotemporality which takes for a state of being something which is only a stage. Encyclopaedism, excluding historicity, allows man to possess a false entelechy even though this stage is still rich with virtualities. Determinism does not presuppose invention, and if progress is thought of as continuous, it masks the very reality of invention. The autodidact is tempted to bring everything into the present: the past can be incorporate insofar that he can roll it in to present knowledge, and the future insofar that it can be considered part of a continuous flow from the present mediated by progress. What is lacking in the autodidact is to have been brought up, i.e. to have progressively become an adult, through a temporal series of developments structured and capped by crises that allow passage onto other phases.

One would have to have understood the historicity of technical becoming through the historicity of subjective becoming to add to the order of cotemporality that of the successive in terms of time. Requiring temporal universality as well as simultaneous universality, real encyclopaedism must integrate a child's education. It can't become truly universal unless it makes the adult from the child by following temporal universality in order to obtain the universality of simultaneity: one must locate the continuity between the two forms of universality.

Conversely, technological education lacks the universality of simultaneity which is what we mean when we say that it aims at culture more than that knowledge. But any undertaking that would get rid of knowledge in order to have culture would be deluded since the encyclopaedic order of knowledge is part of culture. Hence it cannot be understood but in an abstract manner and consequently in a non-cultural manner if this order is to be understood outside of knowledge. The representation of knowledge without knowledge itself can only be carried out by grasping an external symbol, such as, for example, through the mythic and socialized representation of man that embody knowledge. Knowledge is here replaced by the figure of the wise man, by an element of social topology or of a catalogued characterology that is totally inadequate for knowledge in itself and introduces into culture a mystification which renders it inauthentic. At best, knowledge can be symbolically represented by an opinion, a biography, a character trait, or a description of a wise man's character, but these are still totally inadequate elements since they introduce, not knowledge, but an idolatry of the human underpinnings of knowledge, which is not on the same order as knowledge itself. There is more genuine culture in the gesture of a child that reinvents some technical device than in the text where Châteaubriand describes the frightful genius that was Blaise Pascal. We are closer to invention when we try to understand the geared adding device within Pascal's calculating machine (arithmetical machine) that when we read the most declamatory passages relative to his genius. To understand Pascal would be to make a machine similar to his with our own hands without copying it, by re-creating it, if at all possible, as an electronic summation device; in this way we would reinvent it rather than reproduce it, therby actualizing Pascal's intellectual and operational schemes.

To cultivate oneself is to analogically actualize real human schemas, but only by hardly bothering with the stir that this invention or that publication might have had on its contemporaries as they are not essential and can only be understood by referring to original thought, to the invention of itself.

We cannot rue the fact that a cultured high school senior should know Descartes's theory of vortices through Bélise's pretensions or the state of astronomy in the 17th century "through this long lens which scares people" that Chrysale could not endure.

There is a lack of seriousness here, a lack of truthfulness to thought which can in no way be presented as culture. These imaginative recreations of the past could find their place if they could be put in relation to their real source and understood, but not through the pharisaism of a work of art which has ends other than culture. The encyclopaedic order of simultaneity is rejected in cultural education because it does not agree with the opinions of social groups, who never have a representation of the order of simultaneity, because they only represent but a minute fraction of life at a particular time in which they can't even situate themselves. This gap between actual life and culture comes from the alienation of culture, where culture is really only an initiation to the opinions of specific social groups having existed in preceding eras. The primacy of the arts in cultural education comes from the overwhelming power of opinion. A work, and in particular a work that has survived, expresses the ethics of a group or an era in such a way that the group recognizes itself within it. A literary culture is therefore a slave to a group, it is at the level of groups from the past; a literary work is social witnessing. All the outpouring of didactic works is eliminated from culture, unless it is ancient and can be considered as a testimonial for the didactic genre. Nowadays, culture feigns to consider the didactic genre as extinguished, while perhaps never has so much expressive force, so much art, so much human presence, ever been contained within scientific and technical writings. And what is now happening is that culture has become a genre with its own rules and its own fixed norms and has lost its sense of universality.

For something that is totally educational, education lacks in

human dynamism. If we specifically consider the technical portion of education and encyclopaedism, we see that it is a valuable mediator since it incorporates aspects which make it accessible to the child as well as to other aspects that effectively symbolize successive stages of scientific knowledge. The pitfall which brings down cultural education when it wishes to become encyclopaedic is the difficulty of understanding through discursive intellectual symbols the science we wish to understand. On the contrary, technical awareness can provide the scientific knowledge which serves as the guiding principle (shadowed by discursive understanding) under the guise of a dynamic intuition so that even a young child will likely become progressively more enlightened. A true discursive knowledge does not accept gradations: it is either totally right or totally wrong because it is inadequate. Through technics, encyclopaedism can find its place in a child's education without requiring capacities of abstraction which a young child may not have at his command. In this way the acquisition of a technological understanding by the child can trigger an intuitive encyclopaedism that can be grasped through the character of the technical object. The technical object can in fact differentiate itself from the scientific object because the scientific object is an analytic object that aims to analyze a unique effect with all its conditions and its most precise characteristics. On the other hand, the technical object, far from situating itself entirely within the context of a specific science, is in fact the nexus of a multitude of scientific givens and effects arising from the most varied disciplines, integrating what at first appears to be completely disparate knowledge, that might not be intellectually coordinated even though they appear to be so within the functioning of the technical object. We can say that the technical object results from the art of compromise because in fact its structure is synthetic and cannot be understood in any other way than through the introduction of a synthetic schematism which precedes invention. The technical diagram as the relation between a variety of structures and a complex operation that realizes itself through them is by nature encyclopaedic since it actualizes the circularity of knowledge as a synergy of elements of knowledge that are still theoretically heterogenous.

Perhaps we should note that until the 20th century, technics were never able to take on the role of relating encyclopaedic work and the culture offered to the child.

Even now it is still not easy to find within technics truly universal operations, which include the schematism of sensation or thought. Today, the existence of a technics of information gives technology an infinitely larger universality. The theory of information places technology at the center of a very large number of very diverse sciences, such as physiology, logic, aesthetics, phonetics or grammatical studies, and even semantics of language, numerical calculus, geometry, theory of group organization and of regimes of authority, the calculation of probabilities, and all the technics of conveying information whether it be spoken-word, audio or visuals. The theory of information is an intra-scientific technology that permits the systematization of scientific concepts as well as the schematization of various technics. We ought not consider the theory of information as a variety of technics among technics. In reality it is a thinking which mediates between the various technics on the one hand, the various sciences on the other hand, but within the sciences and technics. It can play this role because links exist between the sciences which are not only theoretical (yet instrumental) and technical—where each science is able to take into its service a certain number of other sciences which it can use as technical sources in order to realize the effect which it is studying. A technical relationship between sciences exists. Furthermore, technics can theorize itself as a form of science and the theory of information can intervene in the science of technics as well as the technics of sciences, establishing a state of reciprocity between these functions of exchange.

It's at this level, and only at this level, that encyclopaedism and technical education are able to meet within the coherence of the two orders of universality, simultaneity and successiveness.

We can therefore say that if to this day technics has only been able to provide two difficultly reconcilable dynamisms, i.e. one addressed at adults and the other one at children, this antagonism creates within the theory of information a mediating discipline which sets up a continuity between specialization and encyclopaedism within the education of the child and of the adult. There we can find a reflexive technology founded on top of different technics which define thought and create a relation between sciences and technics.

The implications of this reflexive union of technics coupled with the end of the rivalry between theoretical knowledge and practical knowledge

are considerable with respect to the reflexive conception of man. Once this level is attained, there is no gap or rivalry between the period of education and adulthood. Succession as order and simultaneity as order organize themselves under a relationship of reciprocity, and adult time is not antagonistic to that of education. To a certain extent, the evolution of societies, up to now suspended to the determinism of youth, then to maturity and then to old age, and its corresponding political and social regimes can no longer be considered as fatal if the penetration of technics is deep enough to introduce the system of references and independent values of this implicit biologism.

A careful analysis of dualities within value systems, such as the ones between the manual and the intellectual, the peasant and the city dweller, the child and the adult, show that at the bottom of these oppositions there is a technical incompatibility between various groups of schematisms. The manual lives according to an intuitive schematism at the level of material objects, and on the other hand, the intellectual conceptualizes sensible qualities and thrives on order that stabilizes successive order according to definitions of the nature and destiny of man. He carries a certain power of conceptualization and of valuation or devaluation of human gestures and values existing at the level of intuition. The manual lives according to the order of simultaneity and is autodidactic when he wishes to accede to culture. It is according to these same differences between schematisms that the country dweller is in opposition to the city dweller. The country dweller is cotemporal with an ensemble of demands and participations that make him an integrated entity within a natural system of existence: his predispositions and his intuitions are the links with this integration. The city dweller is an individualized being, linked to social becoming more than to a natural order. He is in opposition to the country dweller in the same way that an abstract and cultured being is opposed to an integrated and uncultured being. The city dweller is of a time or an era, while the country dweller is of a territory. The first integrates himself within the order of the successive, the second into the order of the simultaneous. We generally note the attachment of the country dweller to traditions but tradition is precisely that aspect which is the most unconscious of historicity that masks the representation of the order of the successive and presupposes the invariability of succession. What is considered to be true traditionalism rests upon a representation of the series of becoming where this becoming vanishes. At last, the opposition between child and adult

perpetuates these antagonisms. The child is the being of succession, created from virtualities, changing with time while being conscious of the changes and alterations. The adult, that life presents to him, integrates himself within society according to the order of simultaneity. Furthermore, this maturity cannot be fully attained except within the measure that society is stable and not evolving too rapidly, without which a society in the process of transformation that privileges successive order, communicates to its adult members a dynamism that makes adolescents out of them.

Chapter 2

The Regulating Function of Culture in the Relation Between Man and the World of Technical Objects. Current Problems.

Section I. Various Modalities of the Notion of Progress

The attitude of the encyclopaedists towards technics can be considered as an enthusiasm generated by the discovery of the technicity of elements. In fact, machines are not directly considered to be automates by the encyclopedists, rather they are considered an assemblage of elementary devices. Diderot's collabourators are primarily interested in the organs of the machines. In the 18th century, the technical ensemble is still at the scale of the cooper's or balance maker's workshop. This ensemble is harmonized with technical elements through the intermediary activity of the artisan who uses tools or machine tools more than through the intervention of technical individuals as such. It's for this reason that the division of areas of study is carried out according to classifications of function and not according to schemata of techniques, i.e. according to the type of machine. The grouping principle and the analysis of technical beings are denotative of the trade and not of the machine. Hence, very different trades can use identical tools or almost identical tools. This grouping principle drives towards a redundant presentation of instruments and tools of similar function from one plate to the next.

Thus, the grouping principle according to technical ensembles comprising an indefinite plurality of elements is narrowly linked to the idea of continuous progress as defined by the encyclopedists. It's only when technicity is grasped at the level of the element that technical evolution

can actually take place according to a continuous line: there is a correlation between the molecular mode of existence of technicity and the continuous evolutionary flow of technical objects. A gear or a screw thread were better cut in 18th century than in the 17th century and in comparing various elements fabricated in the 17th and 18th century, the idea of the continuity of progress as a forward advance emerges in what we have named the concretization of technical objects. The evolution of the element within already constituted technical ensembles is not cause for turmoil—it improves without any great upheavals the results of the manufacturing process and allows the artisan to preserve his habitual methods while feeling that the work has become easier. With more precise instruments, his customary gestures yield better results. The optimism of the 18th century is liberated in large part by this basic and continuous improvement in the conditions of technical work. In fact, angst is born from these transformations that provoke breaks within the rhythms of daily life by rendering useless the old habitual body movements though the improvement of a tool's technicity plays a euphoric role. When a man changes his old tool for a new tool that works the same way, and is still able to reap the benefits of his apprenticeship, he has the impression that his movements are more precise, more agile, and quicker: the body's schema as a whole forces limits to retreat, to be swept back, to free up; feelings of awkwardness are reduced. With a better tool, the man feels more able and has greater confidence in himself since the tool extends the organ which is carried along by gesture.

The 18th century was the grand moment of the development of instruments and tools, especially if we understand the word tool as a technical object that extends and equips the body in order to accomplish an action, and an instrument as a technical object which prolongs and adapts the body in order to improve perception; the instrument is a tool for perception. Certain technical objects are tools and instruments at the same time, but we can differentiate between a tool and an instrument depending on whether the active function or the perceptive function is predominant. A hammer is a tool because we can very clearly perceive through our kinesthetic receptors and tactile vibrational sensibility the instant a nail starts to twist or shatters the wood when it goes in too fast. The hammer must work on the nail by driving it

in such a way that according to how the nail is driven, clear-cut information will be conveyed to the senses of the individual who has the hammer in hand. The hammer is thus primarily a tool, since it is through its function as a tool that it can function as an instrument. Even when a hammer is used as an instrument, it is still predominantly a tool. The mason can recognize the quality of a stone with his hammer, but in order for that to happen, the hammer must strike the rock in a particular way. On the other hand, the glass lens and the microscope are instruments as are the level and the sextant. These objects serve the purpose of gathering information without presupposing any type of action on the world. The fabrication of tools and instruments during the 18th century is given the greatest degree of care, and thus takes advantage of the discoveries in both statics and dynamics in the 17th century as well as discoveries in physics and geometrical optics—the undeniable progress of science is translated into the progress of technical elements. The renewed optimism arising from the concurrence of scientific investigation and its practical consequences becomes attached to the idea of progress through the spectacular display of synergy and richness that brings together the various domains of human activity. Instruments, improved by science, become useful to scientific research.

On the other hand, the notion of technical evolution is altered in the 19th century with the birth of the complete technical individual. As long as these individuals only replace animals, the disturbances are not a source of frustration. The steam engine replaces the horse to draw wagons and it powers spinning mills. Human actions are modified somewhat but man is not replaced as long as the machine only brings on a wider use of energy sources. The encyclopedists understand and give prominence to the windmill which they represent as dominating the countryside with its tall silent structure; several extremely detailed plates are devoted to perfected water mills. Man's frustrations begin when the machine replaces man: automatic weaving looms, forging presses, machinery in the new factories. These are the machines that workers will demolish during mass demonstrations because they are his rivals, not as engines but as tool wielders. Progress in the 18th century leaves the human individual intact because the human individual is still a technical individual amidst his tools of which he is the center and their wielder. It is not a question of size that distinguishes the factory from the artisan’s workshop,

but rather the change in the relation between the technical object and the human being. The factory is a technical ensemble that includes automatic machines whose activities parallel those of human beings. The factory uses real technical individuals whereas in the workshop man brings forth individuality in carrying out technical actions. From then on, the most positive and direct aspects of the primary notions of progress will never be experienced. Progress during the 18th century is a progress whose effects are felt by the individual by way of the force, speed, and precision of its movements. Progress in the 19th century cannot even be experienced by the individual since it no longer revolves around him as control center or perceptual center of the adapted activity. The individual now becomes either a mere spectator to the results obtained from the functioning of the machines, or the one responsible for the organization of the technical ensembles putting machines to work. That is why the idea of progress suffers a split, becomes bothersome, aggressive and ambivalent. Progress becomes distanced from man and no longer makes sense to the human individual since the conditions for the intuitive perception of progress no longer exist. This implicit ideation, very close to kinesthetic impressions and the facilitation of body dynamics that provide the foundation for the idea of progress in the18th century, altogether disappears except within those activities like in the 18th century where scientific and technical progress is an extension and a facilitation of an individual's abilities to act and observe (medicine, surgery).

Progress is thus thought of in cosmic terms, at the level of the results of the ensemble in an abstract, intellectual, and doctrinaire manner. It is no longer the artisans but the mathematicians who think of progress now as mankind's handhold on nature: with Saint-Simon's followers, the idea of progress upholds technocratic thinking. The idea of progress as premeditated and wanted replaces the view of progress as something experienced. Progress as conceived by the thinker is not the same as how it is conceived by the worker except in rare cases, such as printers or lithographers who have to a large extent remained artisans. Even in these cases, the advent of the machine translates itself as an aspiration for the transformation of social structures. One could say that work and technicity are linked in the18th century through the challenges of progress at its elementary stage. But on the contrary, the 19th century brings about a disjunction between

the conditions intellectualizing progress and the challenge to internal work rhythms inherent in progress. In the 19th century, man experiences progress either as an engineer or as an end-user but not as a worker. The engineer, the man of the machine, becomes the organizer of the ensemble made up of workers and machines. Progress is understood as a movement sensed through its results and not in itself within the ensemble of operations which constitute it and the elements that actualize it—an understanding valid for the crowd, now coextensive with humanity.

In spite of being loaded down by uncertainty and anguish, the poets of the end of the first half of the 19th century deeply felt progress as the general forward march of humanity. Within this progress there is something of an immense collective adventure, of a voyage, as well as a migration towards another world. There's something triumphant and "twilight zone" at the same time to this progress: it could possibly be the phrase that De Vigny sees written above the cities in his poem *The House of the Shepherd*. This feeling of ambivalence towards the machine is found in the portrayal of the locomotive and the magnetic compass; the first in *The House of the Shepherd*, the second in *The Bottle on the Sea.* This last poem shows how De Vigny feels the transitory nature (and perhaps transitory because it is contradictory) of progress in the 19th century. This unfinished and incomplete idea of progress contains a message for posterity that cannot be an end to itself. It's one of the aspects of *Destinies* to accept to live the moment of technical evolution. De Vigny rendered it justly and meaningfully by understanding that he could not be self-satisfied and closed-in on himself.

A third aspect to the idea of technical progress appears with the impact of internal self-regulation of technical individuals on technical ensembles and through the latter, on humanity. The second stage, that which corresponds to the advent of the new technical wave at the level of the technical individual, is characterized by ambivalence towards progress, as man's double-minding with respect to the machine, and by the creation of alienation. This alienation is picked up by Marxism as having its origins in the relationship between the worker and the means of production, and it is our opinion, that it does not exclusively arise from a question of ownership or non-ownership between the worker and his tools. Between this juridicial and economic relationship to property exists a relationship still deeper and more essential: that of continuity

between the human individual and the technical individual, or the discontinuity between these two beings. Despite the fact that the artisan is the owner of his instruments and tools of production in the 18th century, alienation doesn't only appear in the 19th century because the working human individual is no longer owner of the means of production. Alienation does appear the moment the worker is no longer owner of the means of production, but it doesn't only appear because of the rupture of the relation to property. It also appears at the psycho-physiological level of the individual proper, outside of all collective relations to the means of production. The alienation of man in relation to the machine does not only have a social and economical sense, it also has a psychological and physiological one: the machine no longer extends the schema of the body for the workers nor for the owners of the machines. Bankers, whose social roles were celebrated by mathematicians such as the disciples of Saint-Simon and Auguste Comte, are as alienated from the machine as are the new proletarian class. There is no need for a master-slave dialectic to account for the existence of alienation within the ownership class: the relation of property with respect to the machine includes as much alienation as the relation of non-ownership though it corresponds to very different social standings. From either side of the machine, above it, below it, the man of the technical elements which is the worker and the man of the technical ensembles who is the industrial boss overlook the true relation to the individualized technical object as it exists in the machine. Capital and labour are two modes of being, the one as incomplete as the other in relation to the technical object and to the technicity of the industrial organization. Their apparent symmetry can never mean that the union of capital and labour would reduce alienation. The alienation of capital is not alienation with respect to labour or with respect to its contact with the world (as in the master-slave dialectic), but with respect to the technical object. The same goes for labour: that which is missing in labour is not that which capital possesses, and that which is missing in capital is not that which labour possesses. Labour possesses the intelligence of technical elements, and capital possesses the intelligence of technical ensembles. But it's not by combining the intelligence of elements with the intelligence of ensembles that we can compose an intermediary and unmixed intelligence which is the technical individual. The element, the individual and the ensemble follow each other along a temporal line. The man of the element is

backward with respect to the individual. But the man of the ensemble that has not understood the individual is no further ahead than the individual. He is trying to insert the present-day technical individual into a structure of the ensemble that comes from the past. Labour and capital are backward with respect to the technical individual conveyor of technicity. The technical individual is not of the same era as the work that activates it or the capital that frames it.

The dialogue between capital and labour is false because it is in the past: on its own, the collectivization of the means of production cannot bring about the reduction of alienation. It can only bring it about if it is the underlying condition for the acquisition of intelligence of the individuated technical object by the human individual. This relation between the human individual and the technical individual is most delicate one to create: it presupposes a technical culture which introduces the possibility of different attitudes towards work and action (work corresponds to the intelligence of elements and action to the intelligence of ensembles). Work and action have in common the preponderance of finality over causality, and in the two cases, effort is focused on a certain objective. The use of resources is in a position of minority with respect to the results: the action schema counts less than the result of the action. On the other hand, in the technical individual the equilibrium between causality and finality disappears. From the outside, the machine is made to obtain a certain result, but the more the technical object individualizes itself, the more this external finality disappears to the benefit of the internal coherence of its functioning. This functioning must be achieved in relation to itself before it can enter into relation with the external world. Such is the automatism of the machine and of its self-regulation: at the level of regulation, there is not only causality or finality but functionality. Within self-regulated functionality, all causality has a sense of finality, and all finality a sense of causality.

Section II. — Critique of the Relation Between Man and the Technical Object as Presented by the Idea of Progress in Thermodynamics and Energy Physics. Recourse to the Theory of Information

Man can use the intuition of schemes of functionality to relate with individualized technical beings. He can be coupled to the machine equal to equal, as a being

that participates in its regulation and not only as a being that directs it or makes use of it through incorporation into ensembles, or as a being that serves it by providing it with raw materials and elements. Neither an economic theory nor a theory of energy can account for the coupling between man and machine —economic or energetic links are too exterior in order to define this coupling on their own terms. There is inter-individual coupling between man and machine when self-regulating functions are better achieved by the man-machine couple then by man alone or by the machine alone.

Let's take the case of what is usually called memory. Leaving aside all mythological assimilations of vital functions to artificial functionality, we can say that man and machine present two complementary aspects in how they use the past. The machine is capable of preserving very complex monomorphic documents that can be very precise and rich in detail for a very long time. 300 m of magnetic tape can conserve a recording of a magnetic coding of sounds between 50 -10,000 Hz, corresponding approximately to one hour of listening, or two hours if one reduces the upper range of frequencies to 5000 Hz. A 300 metre roll of film can record approximately 30 minutes worth of visuals at a resolution in the order of 500 lines, which allows us to differentiate approximately 250,000 points on each frame. Thus, the magnetic tape can record 3,600,000 distinct sonic events that can be distinguished one from the other, whereas the cinematographic strip can record 120 million distinct points. (The difference between these numbers isn't only a question of relative grain size between the magnetic tape and the sensitive film, as they are in fact of the same order of magnitude. It comes primarily from the fact that audio recording corresponds to a linear track on a tape, whereas the recording of images corresponds to a decoupage of successive surfaces upon which almost every point can be a medium for information). Thus, that which characterizes the machine's preservation function is that it is absolutely without structure. Film does not record well-defined images, such as geometrical shapes, better than chaotic images such as grains in a mound of sand. In a certain way,

crisp contrasts between well-defined surfaces are less well recorded than the disordered uniformity of grains of sand because of the dispersal of light within the film itself that creates a halo effect around well lit surfaces with sharp edges. Likewise, magnetic tape does not better record musical sounds having a form or continuity than haphazard sound or noise; the machine does not have the facility to select forms, hence, order is not a consideration in the preservation function of recordings made with machines. Human perception can discern forms as perceptual unities while watching or listening to recorded documents but the recordings per se do not really comprise these forms. The incapacity of the machines preservation function is relative to the recording and to the reproduction of forms. This incapacity is general, it exists at all levels. A considerable degree of complexity is required to get a calculating machine to display numbers that can be easily read directly off a cathode ray tube. The *numéroscope* is made up of very delicate and complex montages which use codings to reproduce tracings that cannot always be read very well. It is a lot easier to produce Lissajous' figures than to write down the number 5. The machine does not preserve forms, but only a translation of these forms through coding in terms of distributive divisions of space and time. These distributive divisions can be long-lasting such as that of the magnetic tape, or permanent such as those of the silver grains within sensitive film, or altogether provisional, such as the pulses that travel through a mercury column with a piezo-electric quartz at each end that record partial results during the operation of various calculating machines. It can also be fleeting but sustained, as in the case of the recording of digits on a mosaic grid in certain types of cathode ray tubes, somewhat similar to the iconoscope, equipped with two electron guns, one for reading and writing and the other for feedback (RCA's selectron and MIT's memory tube). The plasticity of the media must not be confused with the true plasticity of the recording function. It is possible to erase in a thousandth of a second the digits recorded on the beryllium grid of a selectron tube and replace them with others. But the rapidity with which successive recordings can take place on the same media does not in any way mean that the recording itself

is plastic. Taken on its own, each recording is perfectly set. It is obviously possible to erase the magnetization of oxide grains on magnetic tape and record anew, but the new recording will be completely independent of the preceding one. If the first one is poorly erased it will hamper or scramble a subsequent recording, instead of facilitating it.

On the other hand, in human memory it is form which is preserved. The preservation in itself is but one restricted aspect of memory which is the power of selecting forms, the schematization of experience. The machine could not fulfill function in the same way unless the already recorded magnetic tape was better than a new tape to record new sounds, which is obviously not the case. The plasticity of machine memory emerges from the media itself, whereas the plasticity of human memory is the plasticity of the content itself. We can say that the function of preservation of memories in man lies in memory, since memory is usually thought of as an ensemble of forms and schemas that welcomes the recording of additional memories because it combines them with pre-existing forms. Conversely, machine recordings are carried out without pre-existing memory. From this inherent basic difference, human memory is at a disadvantage when it comes to the recall of objects with no order whatsoever. It would take a long time to memorize the relative position of 50 coloured chips with different shapes placed at random on a table: even a blurred photograph is better than the human account when it comes to establishing the relative position of the various objects—the memory of the machine wins out when it comes to multiplicity and disorder, human memory wins out with unity of forms and order. Every time a task requiring integration or comparison comes up, the most complex and most sophisticated machines yield results that are much inferior to those that human memory can achieve. A calculating machine can be coded to translate, but its translations will remain very elementary and coarse. It presupposes a diminution of each of the languages to a simplified base, with a reduced vocabulary

and fixed turns of phrase. This is because the machine lacks the plasticity of integration, which is the aspect of vital memory which instantly distinguishes it from the memory of the machine. The storage of a calculating machine or of a translation machine (which is nothing more than a calculating machine coded in a specific way) is very different from the function of the present through which memory exists in man at the level of perception, through perception, presently giving meaning to a word as a function of the general sense of the phrase and the phrases that precede it, or again based on all past experiences in terms of the person that is speaking. Human memory welcomes contents that have the power of form in that they can retrieve themselves and cluster themselves as if acquired experience served to code new acquisitions that make it easier to interpret or to fix them. In men and more generally in living beings, *content becomes coding*, whereas in the machine coding and content remain separate as condition and conditioned. A content introduced into human memory will settle into place and take form with already existing content. The living is that in which *a posteriori* becomes *a priori*. Memory is the function by which *a posteriori* elements become *a priori* elements.

Hence, complex technical operations require the use of the two forms of memory. Nonliving memory, that of the machine, is useful where the faithful conservation of detail is more important than the syncretic character of memory integrated into experience, meaningful in relation with other elements. Machine memory is that of the document and of the results of measurement. The memory of man is such that even after a number of years it can evoke a situation because it can still call up the same meanings, the same feelings, the same dangers as another situation, or simply because the concrescence has meaning according to the implicit or vital coding that constitutes experience. In both cases memory permits self-regulation, but in man it allows self-regulation according to an ensemble of meaning significant within vital memory that can only develop in the person. Machine memory establishes meaningful self-regulation within the world of nonliving beings. The meaning of how human memory functions ends where the meaning of how machine memory functions begins.

The coupling of man to machine begins to exist the moment a common coding of the two memories can be discerned, in order to be able to realize the conversion of one to the other in order to allow synergy to happen. An example of this coupling is supplied by the permanent telephone directory file. Summarized information from recently gathered data from various sources and classified under different categories is recorded onto magnetic tapes. A catalog and a telephone calling device allow, through a variety of selectors, to quickly read whatever is recorded on any tape. Human memory is here in its element since the names and words on the various headings have specific meanings. On the other hand, the machine is that in which a definite series of pulses provokes the going on-line of a specific disk drive. This faculty for selection, definite and exact, is very different from that which motivates a researcher to dial one phone number rather than another one. Thus, this pure example of man machine coupling allows us to understand the coupling mode that exists in other cases: coupling takes place when two beings accomplish one unique and complete function. The possibility of this happening exists every time a technical function requires specific self-regulation; the functions that comprise self-regulation are those where the completion of the task is directed not only by the model to be copied (according to some finality or end-product), but by a partial result of the task, which intervenes as a condition. In artisanal processes, control by means of information gathering is frequent: man is simultaneously the driving force of the tool and the perceiving subject that regulates actions according to partial instantaneous results. The tool is simultaneously a tool and an instrument: it is a medium for action that extends the organs as well as a conduit for recursive information. On the other hand, the machine as a closed and complete individual able to replace man does not generally possess a system of self-regulation—it unfurls a sequence of stereotyped actions according to a predetermined conditioning. This first type of machine is that which can be called a mechanical being without self-regulation. It can be considered a practical technical unit but strictly speaking not a technical individual.

In spite of appearances, it’s the truly automatic machine

that is least able to replace man because regulating a function which exists within the automatic machine presupposes variability within the workings, i.e. the adaptability of its functioning while carrying out the work. A naive enthusiasm for self-regulating automatons makes us forget that it's precisely these machines that most need man, while other machines only need man as a servant or organizer; self-regulating machines require man as a technician, which is to say, as an associate. They relate to man on the level of regulation, not at the level of elements or ensembles. But it is through regulation that automatic machines can be attached to the technical ensemble within which they function. In the same way, the human individual is not attached to the group according to elementary functions (whether they be active or perceptive) but through self-regulation which gives it its personality and character. Thus, the machine is integrated to the ensemble not only in an abstract and liminal fashion through its function, but also by the way it carries out its task at every moment as a function of the requirements of the ensemble. There is no such thing as pure internal self-regulation that is entirely isolated: the results of an action are not only results in themselves but also results that relate it to the exterior milieu, the ensemble. The aspect of self-regulation through which *attention must be paid to the environment* as a whole cannot be accomplished by the machine on its own, even if it is perfectly automatic. The type of memory and the type of perception that are appropriate for this type of regulation requires integration—the transformation of an *a posteriori* to *a priori* that only a living being can realize within itself. There is something alive within a technical ensemble and the integrating function of life can only be ascertained by human beings. The human being has the capacity, on the one hand, to understand the functioning of the machine and, on the other, to live: we can have a technical life as being that which produces in man the interrelation of the two functions. Man is capable of assuming the relationship between himself as a living being and the machine he has built: technical operations require a technical and natural life.

Technical life does not consist of telling machines what to do, but in existing at their level as a being that assumes the relationship between them, capable of being coupled, simultaneously or successively, to various machines. Each machine can be compared to a monad, in that each one is in itself isolated. The capacities of the machine are

not only those that were set up within it by its maker; the machine unfolds its properties in the same way that substance presents its attributes. The machine is the result of its essence. Conversely, man is not a monad, given that the primary active event within him is how an *a posteriori* becomes an *a priori*. Technical man exercises this function not prior to the fabrication of the machine, but during its operation. Having now become a correlation, he makes sure that the machine functions presently because his life is made up of rhythms from the machines which surround him and he brings into relation one with the other. He makes sure that the function of integration and prolonged self-regulation outside of each monad of occultism interconnection and intricate vacation as well as. The technician is to a certain extent the man of ensembles, but in a very different way from that which characterizes industrial man. Like the worker, industrial man is driven by finality: he's focused on results and that's what constitutes his alienation. The technician is the operations man in process of self-fulfillment: he does not assume command but becomes the self-regulating function of the working ensemble. He internalizes the sense of work and a sense of industrial direction. He knows the internal schemas of the works and organizes them in relation to each other. On the other hand, machines are unable to solve general problems; to them, general solutions are beside the point. Whenever it becomes possible to replace a complex operation by a larger number of simpler operations, we use this method within the machine—for example, calculating machines that use a binary numerical base (instead of a base 10 system) to resolve all operations to a sequence of additions.

We can affirm that the birth of a technical philosophy at the level of ensembles is only possible through an in-depth study of regulation, which is to say information. Real technical ensembles are not those which use technical individuals, but those which use a fabric of technical individuals related through interconnection. Any philosophy of technics which starts out from the reality of ensembles using technical individuals without placing them in relation with information is not a philosophy of technics— it remains a philosophy of human power through technics. We could call autocratic philosophy of technics that which takes a technical ensemble as the location where we use machines to obtain a power.

The machine is only a means, the end is a conquest of nature, and the domestication of natural forces by means of a first indenturing. The machine is a slave that serves to make other slaves. A similar dominating and enslaving inspiration can be found alongside a request for freedom for man. But it is difficult to free oneself by transferring slavery onto other beings, whether they other men, animals or machines. To rule over a people of machines that enslave the whole world, is still to rule, and all ruling presupposes the acceptance of schemes of enslavement.

Technocratic philosophy is itself imbued with the violence of enslavement, insofar that it is technocratic. The technicism arising from a reflection on autocratic technical ensembles is inspired by an unfettered will to conquer. It is excessive: it lacks self-control and cannot keep itself in check. It is a force which goes and that can't perpetuate itself in the being during its ascendant phase of success, of conquest. The doctrines of Saint-Simon triumphed during the Second Empire because there were docks to be built, railroad lines to be laid out, bridges and viaducts to be erected across valleys, and mountains to be pierced by tunnels. This aggressive conquest has the character of the rape of nature. Man gains possession of the entrails of the Earth, harrows and tills, prevails over obstacles which to date had never been overcome. Technocracy takes on the sense of violating the sacred: to throw a bridge across water over a spit of land, to link an island to the continent, to tunnel or break through an isthmus is to modify the configuration of the Earth, to make an attempt on its natural integrity. There is the hubris of supremacy that accompanies this violence and man plays a demiurgic role: he accords himself the title of creator or at least casts himself as foreman of creation. It is Faust's dream recaptured by an entire society, by the ensemble of technicians. In fact, it is not enough that the technicians develop themselves in order for technocracy to be born, technocratism represents the will to power that arises within a group of men having knowledge but no power, the knowledge of technics but a lack of financing to put it to work and legislative power to free themselves from all constraint. In France, technocrats are essentially "polytechnicians," i.e. men that in terms of technics play the role of intelligent end-users and organisers rather than true technicians. These mathematicians think in terms of ensembles, not in terms of individual units of functioning; it is the corporate enterprise more than the machine that holds their attention captive.

Moreover and essentially, in a manner even more profound, to the psycho – social conditioning adds that which comes from the technical state. The nineteenth century was unable to produce anything other than a technocratic technologic philosophy because of the discovery of motors rather than regulation. This thermodynamic age. However, a motor is well, and in a certain sense, a technical individual, for it cannot function without being comprised of a certain number of regulations all the least of which are automatisms (admission?, discharge); but these automatisms are auxiliary; they are necessary for the reinitialisation of the cycle. Sometimes, the addition of automated regulators such as the Watts Governor (a centrifugal regulator, said ball (and pinion) regulator) on fixed machines, individuates the heat engine in a very complete manner; however, the regulators remain as accessories. When a heat engine must produce a great force caused by an extremely discontinuous rhythm (?), it helps that a person is at the ready to activate the regulator lever before an increase in the load, this is because the regulator, acting after too long a delay, risks being activated well after the engine has slowed down due to the sudden increase in load: this is how a steam engine is used to mill a large log into boards: without human intervention, the saw blade would stall or the belt would fall, if not for the operation of the regulator: the worker operates the regulator lever half a second before the saw engages the log: the engine then, at full power is accelerating when the load is suddenly increased. On the other hand, the Watt regulator is extremely efficient and precise when the load variations are long and progressive. A similar incapacity in facing rapid variations is explained by the fact that in heat engines, even if there exists an automatic regulation, this automatic regulation does not possess channels of information that are distinct from its effectors. In the Watts Governor there is indeed a feed back channel, but this channel does not distinguish from the channel that permits the motor to drive a resistant body: it is on the exit channel where the regulator is connected; it is thus necessary that the entire assembly consisting of the wheel drives, the main axel, the volumetric cylinder and the

circular alternating movement system be already slowed by its loss of kinetic energy for the regulator to intervene and augment the engine's intake stroke, and as a consequence, its power. However there is, in the indistinguishable nature between the effector conduit (energy channel) and the conduit of a negative reaction (the information channel) a grave inconvenience which greatly reduces the efficiency of the regulation, and the degree of individuation of the technical being: when the engine slows down (which is necessary for so that the regulator can act), the reduction of the rpm causes a reduction in the power (the power of the motor, at medium and low rpms, of which do not intervene with the throttling of the steam within its shaft, is proportional to the sum of all of its elemental work accomplished in one unit of time by successive strokes of the piston). The reduction in angular speed carries with it as well a deterioration in the conditions of its resumption that the regulator itself is supposed to enable.

It is this lack of distinction between the energy channel and the information channel that marks the thermodynamic age, and that constitutes the limit of individualization of the steam engine. Suppose, however, that a gauge measures every instant the moment that the transmission shaft exits the steam engine, and that the resulting measurement is sent back to the steam inlet (or the fuel inlet, or the air fuel inlet if it concerns and internal combustion engine), in order to increase the steam intake as a function of the increased resistance imposed on the transmission shaft; then the channel by which the measure of resistance is returned to the steam inlet is modified and distinct from the air fuel inlet (steam, cylinder, piston rod, crank shaft, pin and transmission shaft): there is no need for the motor to slow for the power to increase: The delayed recurrence of this information through the information channel can be extremely short by the standards of the energy channel, for example several one hundredths or thousands of a second, whereas, a the cycle of a fixed steam engine is around a quarter of a second. It is natural then that the intervention of the information channel as distinct from the energy channel, in the engines, brought a very profound modification to the philosophy of technology. This advent was conditioned by the development of information vehicles, and particularly where there were weak currents. We should also note that electrical currents are considered as channels of information rather than channels of energy

The electrical current, as a vehicle of information, has no equal other than radio waves or a light beam, which is as well comprised of electromagnetic waves like the radio wave: it is that the electrical current and the radio wave share an extreme rapidity in transmission and capacity allowing them to be modified with precision, without any appreciable latency, so much as in frequency as in amplitude. Their capacity to be modulated ensures their ability to be faithful carriers of information, and their transmission speed as rapid carriers. What becomes important then , is no longer the power transmitted, but the precision and fidelity of the modulation transmitted through the information channel. Aside from the scale defined by thermodynamics, a new category of scale appears that permits a characterization of the information channels, and allows for a comparison between them. This elaboration of new notions has a direction for philosophical thought, because it offers the example of new values that up until now had no sense in the technological, only in the thought of human conduct. Thus, the thermodynamic defined the notion of the performance of a conversion system like a motor: the performance is the relationship between the quantity of energy placed at the entry of the engine and that which collected at its exit, there is a change in the form of energy; for example we translate thermal energy to a mechanical energy; this is thanks to the understanding of the mechanical equivalent of the calorie, we can define the performance of the engine as a transformer of thermal energy to mechanical energy.

More generally, in all devices that create a conversion, we can define an performance which is a relationship between two energies; thus, there is a performance of the furnace, a relationship between the chemical energy represented by the relationship between the quantity of chemical energy contained in the system of combustible fuel and the heat effectively released; a performance of a furnace system, defined by the relationship between the calories of energy produced by the furnace - boiler and the thermal energy effectively transmitted to the water in the boiler; there is an performance of the engine that is the relationship between the energy contained in the system consisting of the hot steam sent to the entrance and the cold source of the exit, and the mechanical energy effectively produced by the trigger in the cylinder (a theoretical performance, governed by Carnot's principle). In a series of energy transformations, the calculated performance between the first entrance and the , last exit is produced is the product of all the partial performances.

This principle is even applicable in the case where energy collected at the exit is of the same nature as that that is introduced at the entrance; when we charge a storage battery, there is the first partial collection that converts electrical energy to chemical energy; when we discharge, there is a second partial performance that is that of the conversion of the chemical energy to electrical energy: the performance of the accumulator is thus the product of these two performances. However, when one uses and information channel to transmit information, or when we save information on a substrate to conserve it, or when we pass this substrate of information to another substrate (for example, by a mechanical vibration to an alternating current where the amplitudes and the frequencies follow this vibration), there is a loss of information: what is collected at the output is not identical than what entered.

For example, if we wish to transmit a current of acoustical frequencies by an information channel that is a telephone circuit, we notice that certain frequencies are properly transmitted: for them, the modulation collected at the exit is identical to that which was inputted into the circuit. But the bandwidth of a telephone circuit is narrow; if we introduce a noise or a complex sound at the entry of the channel, there follows a considerable distortion: the modulation collected at outlet is by no means comparable to what was introduced at the inlet: it is constituted with an impoverishment of the original; for example the fundamentals of complex sound between 200hz and 2,000hz are properly transmitted, but stripped of their higher harmonics. Or even, the circuit introduces a harmonic distortion, that is to say that a sinusoidal sound introduced to the inlet is no longer represented by a sinusoidal voltage at the outlet; the phenomenon, despite their apparent difference, are otherwise the same: the circuit that introduces a harmonic distortion is an information channel of narrow nature, that will transmit without an appreciable deformation a sound having an harmonic frequency that appears at the outlet even when it was not at even at the inlet, when that circuit possesses a resonance with that harmonic frequency. A perfect information channel would be one that would give all of the modulations at the outlet, regardless of how rich or complex they would be at the inlet. We could attribute it with a performance equal to 1, like the perfect engine.

These performance characteristics of the information channels are not energetic characteristics, and quite often a good output of information is accompanied by a bad energy performance: an electromagnetic speaker has a better energy performance than an electrodynamic speaker, but a very bad performance in information. If one thinks about it, this helps to explain, that in a transformative system, the better energy performance is obtained once there is a tight connection of resonance between two elements: a transformer where the coils are skillfully tuned to a certain frequency and an excellent coupling between the primary and secondary for this frequency: but this will mean a bad coupling for the other frequencies: it selectively transmits this frequency then, this causes a considerable deterioration once we try to transmit a larger band; a transformer destined to transmit information at a weaker energy performance, but constant for a large band of frequencies. Energy performance and information performance are not then two amplitudes that are related one to the other: a technician is often obliged to sacrifice on of the two performances to obtain the other. This is an essential form of the information channels, and the conditions of proper transmission are very different than those of an energy transmission at a high performance. The resolution of problems relative to the information channels implies a different approach than what is appropriate to the resolution of problems in applied thermodynamics [1]: The thermodynamic technician tends towards a gigantism of constructions and the scale of effects, because thermodynamic performance improves with the dimensions of engines and installations. It is admittedly possible to build a steam engine at a small scale, but the performance obtained is weak; even if it is very well built, it cannot achieve an excellent performance because heat losses and mechanical friction come to play in a notable way. The turbine is a energy transformation system of thermal energy to mechanical energy that offers a superior performance to an alternative engine; but for a turbine to be able to function under good conditions, one needs a major installation. The performance of three small thermal generators remans

[1] Or, more generally energetic.

inferior to that of a unique generator of the same power as the three smaller ones together. The rules governing an increase in performance with the dimensions of engines are a practical general law of energy that exceeds the framework of itself; an industrial electrical transformer has in general a superior performance compared to a 50 watt transformer of nominal power. However, this tendency is much less prevalent with newer forms of energy, such as electrical energy, as it was with the ancient forms, such as heat, nothing prevents the construction of a high performance transformer at a smaller scale; if we slightly neglect the performance of low powered devices, it is because a loss of performance is less critical for those than for the industrial devices (heat gain, in particular, is more easily dissipated, for the reasons that a small steam engine has a weaker performance than a larger one).

Quite to the contrary, the information technician is driven to find the smallest possible dimensions compatible with the residual thermodynamic requirements of the devices that he uses. Indeed, information is just as useful, in a regulator, in that it intervenes with less of a delay. However, the increase of dimensions of engines and transmission information devices increases the inertia and the time of transmission. The telegraph key has become too heavy: the cable could transmit far more signals than the key can produce; one single cable could simultaneously run thirty communications. In an electronic tube, the transit time of electrons between cathode and electrode greatly limits the admissible frequencies; the smaller the electronic tube is the one that can climb the most in frequency, but this same tube has as well a very week power, thus its smaller dimension does not allow it to diffuse enough heat without arriving at a temperature that compromises if function. It is possible that one of the causes of the tendency to reduce the dimensions, observed after 1946, resides in the discovery of the imperative of information technology: constructing technical individuals and above all the elements of a very small dimension because they are more perfect, and have a better performance of information.

Chapter 3

Limits to the technological notion of information to acknowledge the relationship of man and the technical object. The margin of indetermination/indeterminacy in the technical individuals. Automatism.

However, a philosophy for techniques cannot base itself/ be built (se fonder) exclusively on an unconditional study of the form and of the form's yield in the transmission of information. The two types of yields/efficiency (rendement), which seem to diverge, and do actually diverge at the origin, yet are found further along: when the quantity of energy that is needed to carry the information aims at a very low level, a new type of yield/efficiency loss appears: one which is owed to elementary discontinuity of energy. The energy which is used to carry the information is in fact modulated in two ways: artificially, by the signal to be transmitted; essentially, in accordance to its physical nature, by the elementary discontinuity. This elementary discontinuity appears when the average level of energy is of a size order not much superior to the instantaneous variations due to the elementary discontinuity of the energy. The artificial modulation blends at that point with the essential modulation, with that white noise or that background fog which superimposes itself onto the transmission. It is not a harmonic distortion, as it is an independent modulation from the signal, and not a deformation or a degeneration of the signal. Therefore, to diminish the background noise, one can diminish the passing band, which will also diminish the information yield/efficiency of the considered channel. A compromise must be adopted to save a sufficient yield/efficiency of information for practical reasons and an energy yield/efficiency high enough to maintain the background noise at a level that it won't disturb the signal's reception.

This antagonism, hardly mentioned in recent works on the philosophy of information techniques, nevertheless marks a non- univocal characteristic of the notion of information. Information is, in a sense, that which can be infinitely varied, that which requires, to be transmitted with the lease possible loss, that we sacrifice the energetic yield/output/efficiency so that in no way there will be a shrinkage of the many possibilities. The most faithful amplifier is the one which has a very uniform energetic yield/output/efficiency and independent of the frequencies scales; none are favoured by it, doesn't impose any resonance, no stereotopy, no pre-established regularity to the open

series of varied signals it must transmit. But information, in another sense, it that, to be transmitted, what must be above the level of pure hazard phenomenon, like the thermal unrest of white noise; information is then what possesses a regularity, a localization, a definite domain, a determined stereotopy from which information distinguishes itself from pure hazard. When the background noise level is high, we can still save the information signal if it owns a particular law, that is to say if it offers a certain predictability within the temporal series' progression of the successive states which constitute it. For example, in television, the fact that the time basis frequency is well determined before-hand allows the extraction of the synchronizing tops of the background noise, which are as important, by blocking the synchronizing devices for nine-tenth of the time, and by un-blocking them for just a short time (one millionth of a second, for example) as the synchronizing top is to arrive, in accordance to the pre-defined law of recurrence (it is the comparing device of phases, used for remote receptions). Therefore, we are quite bound to treat the reception of the synchronizing signals as an information. But this information is extracted much easily from the background noise, as we can limit the disruptive (perturbation) action of the background noise to a slight (faible) fraction of the total time, thus rejecting all the manifestations of the background noise which fall outside of that instant, as un-significant. This device is obviously not effective against a parasitic signal, which itself also obeys a law of recurrence with a period that resembles/is near by (voisine) to the period provided for the signal to be received. So there are two aspects of the information, which are technically distinguished by the opposing conditions that they require/necessitate (nécessitent) in the transmission. The information is, in one sense, that which brings on a series of unpredictable, new states, belonging to no pre-definable sequel; thus it is that which demands from the information channel, an absolute availability in relation to all aspects of modulation which it transports/distributes (acheminer); the information channel itself must not bring/carry (apporter) any predetermined form, cannot be selective. A perfectly reliable amplifier should be able to transmit all the frequencies and all the amplitudes. In this sense, the information has particular common characteristics with purely contingent phenomenon, without laws, like the molecular movements of thermal agitation, radioactive emission, the intermittent electronic emission from thermoelectronic or photoelectric effect. That is

why a very reliable amplifier [2] gives a more important background noise than an amplifier with a reduced passing band, because it uniformly amplifies the white noises which are produced in its divers circuits by divers causes (in the resistance thru thermal effect, in the tubes thru the discontinuity of the electronic emission). However, the noise does not have any meaning whereas the information has meaning. In an opposite sense, the information distinguishes itself from the noise because we can assign a particular code, a relative standardization to the information; in all the cases where the noise cannot be directly lowered under a particular level, a reduction of the margin of uncertainty/indeterminacy (indetermination) and of unpredictability of the information signals is carried out (opérer); this is the case, as previously indicated, of the reception of synchronizing signals by a Phase Frequency Detector. What is here reduced, is the temporal margin of uncertainty: we suppose (on suppose) that the signal will take place at a particular moment of a temporal interval equivalent to a minimal fraction from the period of the recurring phenomenon, perfectly determined by its phase. The device can be finely regulated as the stability of the transmitter and the stability of the receiver is greater. The more the predictability of the signal increases, the more this signal can be easily distinguished from the phenomenon of hazard, which is the background noise. This goes also for the reduction of the frequency band: once a circuit cannot transmit speech (parole), because of a too strong back ground noise, we can use a transmission of signals of a single frequency, as we do with the Morse alphabet; at the receiving end, a filter tuned to the single emitting frequency, only lets by the sounds which the frequency is included within this narrow band; a low level of background noise can only pass, a level which is lowered as the received band is narrower, that is, a sharper (pointu) resonance.

This opposition represents a technical antinomy, giving philosophical thought a problem: the information is as though the product of chance (l'événement du hasard), but it is distinguishable from it. An absolute stereotypy, excluding everything new, also excludes all information. Yet, to distinguish the information from the noise, we base ourselves onto a feature of reduction of the limits of uncertainty. If the temporal bases/basis (bases de temps) were really non-unadjustable (indéréglables) as Leibniz's monads, we could reduce as much as we want the moment of sensitiveness of the synchronizing oscillator:

[2] A large passing band

the synchronizing impulsion informative role disappears completely, because there will be nothing to synchronize: the synchronizing signal would have no more unpredictable characteristics to (par rapport) the synchronizing oscillator; for the information nature of the signal to remain, there needs to be a certain remaining margin of unpredictability. The predictability is a background (fond) receiving this supplementary accuracy, distinguishing it in many cases beforehand from pure chance, partially pre-forming it. The information is therefore at mid-point between pure chance and absolute regularity. We can say that form, conceived as absolute regularity, as much spatial as temporal, is not an information but a condition of information; it is what greets the information, the a priori which receives the information. The form has a selectivity function. But the information is not from the form, nor an ensemble of forms, it is the variability of forms, what is brought (l'apport) through a variation in relation to a form. It is the unpredictability of a form variation, not the pure unpredictability of all variations. We would therefore come to distinguish three terms: pure chance (hazard pur), the form, and the information.

However, to this day, the new phase of the philosophy of techniques, which followed the contemporary phase of thermodynamics and of energetics hasn't been able to properly distinguish the *form* from the *information*. Indeed, an important hiatus exists between the living and the machine, and consequently between man and machine, which come from the fact that the living needs information, whereas the machine makes use essentially of forms, and is so to speak constituted with forms. Philosophical thought will not be able to properly grasp the meaning/sense (le sens) of the machine and man coupling, unless it comes to elucidate the real rapport/relationship (rapport) that exists between form and information. The living transforms information into forms, the *a posteriori* into the *a priori*; but this *a priori* is always oriented towards the reception of the information to be interpreted. The machine, unlike the living, has been built following a number of particular schemas, and it functions in a determined way; its technicity, its functional concretization at the elemental level, are determinations of forms.

The human individual appears then to have to convert into information the forms laid down (déposées) in the machines; an information is not brought forth by the operating of machines, but only an assemblage and a modification of forms; the functioning of a machine does not have sense, cannot give rise to real information signal for another machine; a living being (un vivant) as mediator

is needed to interpret an operation (fonctionnemet) in terms of information, and to reconvert it into forms for another machine. Man understands/includes/comprises (comprend) machines; he has a function to play between machines, rather than above the machines, so as to have a real technical ensemble. It is man who discovers the meanings: the meaning is the sense taken by an event in relation to an already existing forms; the meaning is what makes an event have information value.

This is a complementary function to the inventive function of technical individuals. Man, machine's interpreter, is also the one, from his own schemas, who founded the rigid forms that give the machine the ability to function. The machine is a laid down/deposited (déposé) human gesture, fixed, having become stereotypy and power of renewal. The two-state tipper (basculateur) has been thought and built once; man has imagined (s'est représenté) its function a limited number of times, and now the tipper indefinitely fulfils its reversal of balance function. It perpetuates in a specific activity the human process that composed it; through its construction, a type of passage was achieved from a mental operation to a physical operation. There is a real and profound dynamic analogy between the process which man thought of the tipper and the functional physical process of the built tipper. Between inventing man and functioning machine exists an isodynamism relation, more fundamental than the one Form psychologists had imagined, to explain perception, by naming it isomorphism. The relationship of analogy between machine and man is not at the corporal level; the machine does not need to eat, it does not perceive, nor does it rest, cybernetics literature wrongly exploits this apparent analogy. In fact, the real analogous relationship is between man's mental process and the physical process of the machine. These two processes/operations (fonctionnements) are parallel, not in the everyday, but in the invention. To invent, is to make one's mind/thoughts (pensée) function as a machine could function, not according to causalities, too fragmentary, nor in accordance to finality, too unitary, but in accordance to a dynamism of a lived process, grasped because produced, accompanied in its genesis. The machine is a functioning being. Its mechanisms concretize a coherent dynamism, which at one time existed in thought. Thought's dynamism, at the time of the invention, converted itself into functioning forms. Conversely,

the machine, while functioning, undergoes or produces a certain amount of variations around the fundamental rhythms of its functioning, as resulting from its defined forms. It is those variations, which are significant, and they are significant in connection to the functioning archetype, which is thought, through its process of invention. One has to have invented or re-invented the machine for the variations of the machine's running/working (fonctionnement) become information. The motor's noise does not have in itself an information value; it acquires that value through its variation of rhythm, its modification of frequency or timbre, its alteration of transients, which translate/convey (traduise) a modification of the running/functioning in connection (par rapport) to the functioning, which results from the invention. When the existing correlation between machines is purely causal, there is no need for human intervention, to mutually interpret the machines. But this is a necessary role when machines entail a regularization; a machine which entails a regularization is in effect a machine which harbours (recèle) a certain margin of indeterminacy in its functioning/running; it can, for example, run fast or slowly. From that time, the variations of pace are significant and can take account of what is happening outside of the machine, in the technical ensemble. The more machines are automated, the more the possible variation of pace become reduced; they can then go by unnoticed: but what happens here is the same has what happens to an extremely stable oscillator, synchronized by an even more stable oscillator: the oscillator can still receive information, as long as it is not rigorously stable, and even that its margin of indeterminacy of its running is reduced, synchronization still has meaning (sens) within this margin of indeterminacy. The synchronizing impulsion has meaning when it intervenes as a slight variation on this temporal force of the functioning states' recurrence. As well, the reduction of the indeterminacy of the workings does not isolate the machines from one another; the significant variation, which has information value, is made more precise, more rigorous and more subtle (fine). But this always in connection to the essential schemas of the invention of the machine, that these variations have sense.

The notion of the perfect automaton is a notion obtained by a transfer to the limits, it harbours (recèle) something contradictory: *the automaton would be such a perfect machine, that the indeterminacy of its working would be nil (nulle), but, which could even receive*

interpret or emit information. So, if the margin of the indeterminacy of the functioning is nil, there is no possible variation: the function repeats itself indefinitely, and consequently this reiteration has no signification. There is maintenance of the information through automatization only because of the sharpness (finesse) of the signals increases with a reduction of the margin of indeterminacy, making the signal keep their significant value, even if this margin of indeterminacy becomes extremely narrow. For example, if oscillators are stable to roughly the thousandth in frequency variation, synchronizing impulsions of which the possible phase rotation would be, roughly, ten per cent variable during that time, or that would not be a steep front and would have a variable duration, would only have a weak information value for the synchronization. To synchronize pre-stabilize oscillators, brief and perfectly cut impulsions are used, also, its phase angle is rigorously constant. The information is all the more significant, or rather, a signal has all the more information value, intervening more in agreement with the autonomous form of the receiving individual; in this way, when an synchronizing oscillator's own frequency/duration/interval (fréquence) is distanced (éloignée) from the frequency/duration/interval of the synchronizing impulsions, synchronizing does not happen; synchronization happens, on the other hand, for signals all the more weak as the autonomous frequency/duration and the frequency/duration of the synchronizing impulsions get closer to one another. However, this relationship must be finely interpreted: for the recurring impulsions to be able to synchronize an oscillator, the impulsions must arrive/happen (arrivent) at a critical moment of the functioning: the one immediately preceding the reversal of balance, in other words, just before the beginning of a phase; the synchronizing impulsion arrives as a very low additional quantity of energy, which accelerates that passage to the next phase, at the moment when this passage was still not perfectly accomplished; the impulsion *activates/triggers* (déclenche). That is why a greater sharpness of synchronization, the highest sensitivity is obtained when the autonomous frequency/interval would be slightly lower than synchronizing frequency/duration. Compared to this form of recurrence, the impulsion that have a very small lead, take on sense, transport/convey (véhicule) information. The moment when the oscillator's balance will invert is the one where a metastable (métastable) is created, with energy accumulation.

It is the existence of the critical phases that explain the difficulty to synchronize a functioning (un fonctionnement) which does not give brisk reversals of states: a sinusoidal oscillator is synchronized with less ease than a relaxation oscillator; the indeterminacy/uncertainty margin is in fact less critical in the functioning of a sinusoidal oscillator; its functioning can be modified at any moment of its progress period; on the other hand/on the contrary (au contrairea), in a relaxation oscillator, indeterminacy/uncertainty is accumulated at each end of the cycle, instead of being spread all through the duration of the cycle; once the balance is reversed, the relaxator (le relaxateur) is not sensitive anymore to the arriving impulsion; but when it is about to tip over, it is extremely sensitive; on the contrary, the sinusoidal oscillator is sensitive all through the phase, but poorly.

So, the existence of the margin of uncertainty in machines must be understood as existence of a certain amount of critical phases in the functioning; a machine able to receive information is one, which localizes its uncertainty/indeterminacy temporally, at sensitive moments, rich with possibilities. This structure is one of decision, but it is also the relaying one. The machines which are able to receive information are the one, which localize their indeterminacy.

This localizing notion of the functioning decisions is not absent from the cyberneticians' works. But what this study is lacking is the notion the reception of information's reversal and the emission of information. If the functioning of a machine shows critical phases, like the ones from a relaxation oscillator, it can emit, as well as receive information; therefore, a relaxation oscillator emits impulsions, because of its discontinuous functioning, which can be used to synchronize another ralaxator. If we carry out a coupling between two relaxators, the two oscillators synchronize themselves, in such a way that we cannot tell which one is synchronizing and which one is being synchronized; in fact, they are mutually synchronized, and the ensemble functions as one oscillator, with slightly diverging periods, belonging to each of the oscillators.

It may seem too easy, to oppose open machine and closed machine, following the sense Bergson gives to these two adjectives. But, this difference is real; the existence in a machine of a regulation, leaves the machine open, in a way where the machine localizes the critical periods and the critical points, that is to say, those ones

from which the energetic channels of the machine can be modified, change characteristics. The individualization of the machine goes hand in hand with this separation of the forms and the critical elements; a machine can be in contact with the outside, insofar as it has critical elements; now, the existence, in the machine, of these critical points, justifies man's presence: the flow (régime) of the machine can be modified by an incoming outside information. Thus, a calculator is not only, as we generally say, an ensemble of tippers. It is true that a calculator has many determined forms, the functioning of the series of tippers, representing a series of adding operations. But if the machine only consisted of this, it would be unusable, as it would not be able to receive any information. In fact, it also includes what we can name a system of decision schemas; to make the machine function, beforehand, it must be *programmed*. With the multivibrator supplying the impulsions and the series of tippers adding, there would still not be an adding machine, a calculator. It is the existence/presence (l'existence) of a certain degree of indeterminacy/uncertainty, which makes the calculating possible; the machine is made up of an ensemble of selectors and commutations, controlled through programming. Even with the simplest case, a ladder made of tippers and having impulsions, like the ones used with the Geiger-Müller counter tubes, there is a degree of indeterminacy in its functioning; Geiger's tube, under tension is in a similar state as a relaxation oscillator at the moment it is about to start a new phase, or to a multivibrator at the moment when it is to tip over, on its own. The only difference is that this metastable state [corresponding the Geiger-Müller counter tube's tension plate (plateau de tension)] extends itself in a durable way in the tube, until an additional energy start to activate an ionization, whereas in the relaxator or the multivibrator, this state is transient, because of the continuing activity of the resistance and capacitance circuits, at the exterior of the electronic or thyraton tube.
This margin of indeterminacy is found again in all the devices, of all types, which can transmit information. A continuous relay like a triode, thermoelectronic or crystalline, can transmit information because the existence of a definite/precise potential energy, at the edges of the feeding/supplying (d'alimentation) circuit is not enough to determine the quantity of effector (effectrice) and actual energy,

that is sent in the exit circuit: this relation open with possibilities in the actualization of energy is only closed by the extra condition which is the arrival of information on the control organ. We can define a continuous relay as a transducer (transducteur), that is to say, lie a modulable (modulable) resistance interposed between a potential energy and the energy's actualization site: this resistance is modulable by an exterior information to the potential energy and the actual energy. Still, the word, "modulable resistance" is still too vague and inadequate; if, in fact, this resistance was a real resistance, it would be part of the actualization domain of the potential energy. Now, in a perfect transducer (transducteur), no energy is actualized; neither is any put in reserve/stock (en réserve): the transducer does not belong either to the domain of potential energy, nor to the domain of actual energy: it is truly a mediator between these two domains, but it is neither an accumulating domain, nor an actualizing domain. It is during this passage from potential to actual that information intervenes/occurs (intervient); information is condition (condition) of actualization. Now, this notion of transduction can be generalized. At a pure state in the different types of transducers, it exist as a regulating function, in all machines having a certain margin of localized indeterminacy in their functioning. The human being, and more generally the living, are essentially transducers. The elementary/basic (élémentaire) living, the animal is in itself a transducer, when it stocks chemical energy, and then actualizes them through different vital operation. This function of the living, of building up energetic potentials and consuming it suddenly, was well expose by Bergson; but Bergson was preoccupied to show a temporal condensation function, that would be constitutive of life; now, the relationship between the slowness of the accumulating and the instantaneous abruptness of actualization still does not exist; the living can slowly actualize its potential energy, as with thermal regulation or muscular tone (tonus); what is essential, is not the different temporal regimes of potentialasation and actualization, but the fact that the living intervenes (intervient) as transducer between this potential energy and this actual energy; the living is *what modulates*, that into which there is modulation, and not a reservoir

of energy or effector. Also, it is not enough to say: the living assimilates; assimilation is a liberal and actualisable (actualisable) source of potential energy in the transducing functions.
Now, the relation of man to machines happens at the level of the transducing functions. It is in fact very easy to construct machine, which can accumulate a superior amount of energy than the one man can accumulate in his body; it is also possible to use artificial systems that make up superior effectors than the one's from the human body. But it is very difficult to build transducers comparable to the living. In fact, the living is not exactly a transducer as the ones a machine can be made of; it is that and something more; mechanical transducers are systems, which contain a margin of indeterminacy; information is what brings determinacy. But this information must be given to the transducer; it does not invent it; it is given to it through a similar mechanism as the one of perception in the living, for example, by a signal originating from the way that the effector functions (the gauge of the male output of a thermal machine). On the contrary, the living has a capacity to give itself information, even with the absence of perception, because it has the capacity to modify the forms of the problems to be solved; for the machine, there are no problems to resolve, but only transducers modulated by datum; many transducers acting upon (agissent) each other depending on the commutable schemas, as Ashby's homeostasis, do not constitute a problem resolving machine: the transducers in a reciprocal causality relationship are all *within the same time*; they condition each other in the actual; there is never a problem for them, a thrown thing in front, a thing in front of us that we have to step over. Resolving a problem, is to be able to step over, it is an ability to operate a remelting of the forms, which are the actual datum of the problem. The resolution of real problems is a vital function, where a recurring mode of action is supposed, which cannot exist in a machine: the recurrence of the future onto the present, of the virtual onto the actual. There is no real virtual for the machine; the machine cannot reform its forms to resolve a problem. When Ashsby's homeostasis commutes itself during its functioning (because we can attribute to this machine the ability to act upon its own selectors), a jump of the characteristics occurs, wiping out all previous functioning; at each instant/moment (instant) the machine exists

in the actual, and its ability to apparently change its forms is not very effective, as there is nothing left of the previous forms; all happens as if there was a new machine; each functioning is momentary; when the machine alters its forms through commuting, it does not commute to be able to have a particular form, oriented towards the resolution of the problem; there is no form transformation, which is oriented by a foreboding/premonition/intuition (présentiment) of the problem to resolve; the virtual does not react onto the actual, as the virtual cannot play a role, (jouer un rôle) as the virtual, for the machine. It can only react to something positively given, actually made. The ability that the living has of modifying itself, in function of the virtual, is the sense of time that the machine does not have, as it does not live.

The technical ensembles are characterized by the fact a relationship between the technical objects institutes itself at the level of the margin of indeterminacy of the functioning, of each technical object. This relationship between technical objects, in so far as it correlates the indeterminacies, is of a problematical sort, and cannot, for this reason, be fulfilled by the objects themselves; it cannot be the object or the result of a calculation: it must be thought out, laid out, asked (posé) as a problem, by a living being and for a living being. We could express what we have named a coupling between man and machine, by saying that man is responsible for the machines. This responsibility is not the producer's/maker's (producteur), as much as the produced thing emanates form him, but it is of a third/tierce (tiers), witness to some difficulty that he is the only one that can solve it, as he is the only one able to think; man is witness to the machine and represents them to each other; the machines cannot think nor live their mutual relationship; they can only behave one onto another, in the actual, according to causality schemas. Man as witness of the machines is responsible of their relationship; individual machine represents man, but man represents an ensemble of machines, as there is no machine of all machines, as there can be a thought (pensée) aiming/pertaining/directed (visant) to all machines.

We can name technological attitude, the one that makes a man not only concerned with the use of a technical being, but of the correlation of technical beings in relation to each other. The present opposition between culture and technique, results from the fact that the technical object is considered to be identical to a machine. Culture does not understand the machine; it is inadequate

to the technical reality because it considers the machine as a closed block, and the mechanical function as repeated stereotypy. The opposition between technique and culture will last until culture discovers that each machine is not an absolute unity, but only a individualized technical reality, opened according to two means: the relationship to the elements, and the interindividual relationships within the technical ensemble. The role assigned to man by culture, to be near the machine, is one of precariousness/cantilevered (porte-à-faux) compared to the technical reality; it supposes that the machine is sustantialized, materialized, and consequently, devaluated; in fact the machine is as so solid and not so substantial as culture supposes; it is not as a block that it is in relation with man; it is through a free plurality of its elements, or through its open series of the possible relationships with other machines, within the technical ensemble. Culture is unjust towards the machine, not only by its judgments or by its prejudices, but at the level of knowledge itself: culture's cognitive intention towards the machine is to substantialize (substantialisante); the machine is locked in this reductive vision, which considers it as in itself finished, and perfect, making it coincide with its actual state, with its material determinations. Towards the art object, a similar attitude would be to reduce a painting to a certain amount of dried up and broken paint, on a stretched cloth. Towards the human being, a similar attitude would be to reduce the subject to a fixed unity of vices and virtues, or of characteristic traits.[3]

Reducing art to art objects, reducing humanity to a series of character traits bearing individuals, is to behave as we do when we reduce technical reality to a collection of machines: so, in the first two cases, this attitude is judged crude, in the second case, it gets through as conforming to the values of culture, while it is operating a similar destructive reduction as the two previous cases. Only, it operates while holding an implicit judgment through thinking (pensée même). This notion of the machine is already falsified, like the representation of a foreigner through group stereotypes.

Now, it is not the foreigner as a foreigner that can become an object for cultured thinking; it is only the human being. The stereotype

[3] This reductive attitude can exist towards a whole region (regionalism)

of the foreigner cannot be changed into a correct and adequate representation, unless the relationship between the one judging and the one who is the foreigner, diversifies itself, multiplies itself, to acquire multiform mobility, which confers to it a particular consistency, the definite power of reality. A stereotype is a two dimensional representation, like a face without depth and without plasticity. For the stereotype to become representation, the experiences with the foreigner must be multiple and varied. The foreigner is no more a foreigner, but other, when there are foreign beings, not only connection to the judging subject, but also in relation to other foreigners; the stereotype falls when this relation of man to the foreigner is completely known between other people, instead of locking the subject and the foreigner in a mutually immutable asymmetrical situation. Similarly, the stereotypes pertaining to the machine can only be modified if the relationship between man and machine, (an asymmetrical relationship as long as it is lived in an exclusive way), can be objectively seen as taking action (en train de s'exercer) between the independent terms of the subject, between technical objects. For the representation of the technical contents to be incorporated into culture, there need to be an (objectivation), for man, of the technical relationship.
The prevailing and exclusive attention given to a machine cannot lead to a discovery of technicity (technicité), no more than the relationship with one type of foreigner will give view to the inside of their mode /custom (mode de vie) of living, and to know it, depending on the culture. Even the company of many machines will not do, no more than the successive company of many foreigners; these experiences only lead to xenophobia, or to xenophilia, which are contradictory attitudes, but equally passionate. To consider a foreigner through culture, on must have seen the play, exterior to oneself, objectively, the relationship, which makes two beings be strangers/foreigners one to another. Similarly, if a unique technique is not enough to give a cultural content, a polytechnic school (polytechnique) does not do either; it only begets a technocratic tendency or techniques taken in whole (en bloc).