Michel Tibon-Cornillot

GENETICS AND THE INHUMAN IN MAN

For several decades, molecular genetics have given rise to a new order of phenomena, profoundly disturbing the classic ideas that men have of their identity and their place in the universe. What becomes of the classic figure of man when hybridizations permit the systematic crossing of the frontiers between species? What do the possibilities opened by cloning and especially the grafting of foreign genes in mammals mean to us?[1] What happens to the classic structures of relationship when the introduction of foreign genes into the cells of embryos allows us to obtain individuals that are heirs of the genetic patrimony of eight or twelve different parents? The list of all these strange phenomena would be long, and the disquieting nature of the results thus obtained gives spec-

Translated by Jeanne Ferguson

[1] For example, experiments at the University of Pennsylvania, consisting of cloning the promoter of the gene of the metalothioneine of the mouse and fusing it with the gene of the growth hormone of the rat or man. DNA is injected, the purified recombinant obtained from mouse embryos at the unicellular stage and in this way transgenic mice are obtained, two to three times larger than the normal species.

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tacular effects that, for the scientific mind, are not satisfactory. It is thus in a different perspective that we must reflect on the rapid irruption of this new order of phenomenality brought about through the genetic approach.

The present study is based on a primary affirmation concerning the nature these manipulations have in common, the introduction into the world of man of an "inhuman" dimension. It assumes a previous research on the meaning of this *shifting* toward the inhuman as well as on the most correct interpretation to give to this "inhuman".

I. The Theme of Shifting

1. *The shifting of the philosophical toward technoscience*

The concept of shifting may be understood on two levels, both however being connected. The first concerns the shifting of the philosophical toward technoscience; to understand it we may start from a preliminary affirmation that each of us can make, namely, the rapid degradation of philosophical discourse that for centuries in the West has monopolized the position of fundamental questions concerning the individual and collectivity. To be sure, this degradation is linked to the institutionalization of philosophy in large bureaucratic entities, but such cultural movements have deeper roots. Underlying this collapse of a kind of discourse that has for so long been valued is not really the disappearance of the questions traditionally posed by philosophy, such as "What can I know? What must I do? What may I hope for?" but a shifting in direction of these questions toward science and technique. Thus it is the same movement that allows the understanding of why contemporary philosophy has become an unimportant activity or at least limited to a more and more restricted public, and why technical achievements, the theoretical and practical elaborations of sciences such as theoretical physics and molecular genetics pose radical questions to our societies, questions that up until now were the appanage of philosophical discipline.

Three examples are revelatory of this shifting:

– the first is borrowed from one of the achievements of atomic physics and concerns thermonuclear weapons. This obliges most

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of us, imperatively, to ask ourselves the question of a possible destiny common to men, a universal and fundamental question incarnated by the thermonuclear menace and one that classical philosophical expression has dulled because it has not been universally understood;

– the second example has already been mentioned. It is linked to molecular genetics and concerns the progressive collapse of the classic figure of man that for centuries has underlain the problematics of the subject as it has been elaborated in Western philosophy;

– finally, the development of techniques that simulate life and the extension of living-mechanical interconnections impose an important renewal of the classic frontiers between living organisms and artificial organs.

These three examples clearly illustrate this shifting of universalizing and radicalizing questions of Western philosophy toward scientific and technical activity. Such a shifting however brings about profound transformations in the expression of the posed questions, the most important of which are undoubtedly the following:

– one of these transformations depends on the passage between an exclusively discursive expression, representative of the fundamental questions of philosophy and the treatment of these questions in a theoretical and technical operativity that is essentially involuntary. Neither quantum physics nor molecular biology are primarily concerned with these ancient questions concerning the individual and collective destiny of man: they function and develop from well-defined and partial objectives and yet part of the theoretical and practical surges of their activity may modulate that destiny;

– the other transformation arising from the shifting of the philosophical toward the technosciences depends on the fact that the concerned disciplines, essentially physics and genetics, *silently and involuntarily respond* to these questions that until recently seemed pertinent. Thus molecular genetics, occurring at the intersection of knowledge concerning the fundamental elements of inert matter —atoms, molecules, macro-molecules—and the primary structures of life, cells, in practice answers questions concerning the specificity of life with regard to non-life, the origin of life, by *developing an operativity based on the essential continuity between*

inert matter and the organization of life without however reducing the one to the other.

Such is the first type of shifting that should allow a sound reasoning of the posed problem, genetics and the inhuman in man. It inevitably envokes a final remark: the radicality of the problems posed by certain sciences and techniques of today, allied with their non-discursive expression, puts reflective activity in a disconcerting situation. Furthermore, if we admit that traditional philosophical thought continues to work on questions that have become archaic and without a direct interest for us, we can understand the time-lag in operation between the scope of the questions brought up and the scant conceptual means that we have for reasoning them out. It is a matter here of an explosive situation whose expression we can easily see, for example in the lag between research in genetics in full expansion and the naming of a "commission of experts having to do with the ethic" based on ultraclassic philosophical problematics, assembling men and women chosen for their institutional or political position and not at all for the broadness of their views on the changes that are taking place.

2. *The shifting of the epistemological and phenomenal center of gravity*

The second type of shifting concerns the change of dimension in the phenomena studied in corpuscular physics and molecular genetics, that is, the abandoning of all reference to sensory experience, the crisis that it creates in the field of knowledge and the return effect of non-human phenomena in the world of man. To describe this new type of shifting it is sometimes interesting to go back to the history of physics and to some observations that certain physicists have made with regard to the exercise of their discipline. In 1929 Max Planck asked that "... the results obtained in quantum physics through mathematical procedures be reintroduced into the expression of our sensory world so that it will be of some use to us".[2] The new view of the world introduced by corpuscular physics

[2] Max Planck, *The Universe in the Light of Modern Physics,* (1929), quoted by Hannah Arendt in *La Crise de la Culture*, "Idées", Gallimard, 1972, p. 345.

must be retranscribed within the framework of sensory experience. If not, he added in the same work, "... it is worth no more than a bubble ready to burst at the first gust of wind".[2]

Planck made these observations before the atomic revolution. It seems that the development of physics proved him entirely in the wrong. Not only has quantum physics developed in a remarkable way at the theoretical level as well as in a certain number of technological achievements but as yet no one has been able to fill the growing gap between the type of determinism at work at the level of human sensory experience, the space-time that is connected with it and the determinisms governing corpuscular phenomena. At the heart of the conceptual apparatus of quantum physics have appeared a certain number of phenomena, such as non-separability and reversibility of the systems that are not at all comprehensible as an aid for the categories and ideas of human reason that spontaneously finds its ultimate source in the sensory experience of man. Without taking a position in this debate and affirming that two types of clearly-separated determinisms exist nor that the separation between the order of knowledge on the human scale and that acquired at the corpuscular level is definitive,[3] we must admit that in shifting the phenomenal field of the sensory toward the corpuscular, physicists have broken up the classic framework of knowledge rooted in human experience.

We may retain some broad lines of this new situation of knowledge introduced for the first time in theoretical physics, that, as we shall see, also concern genetics:

– a change in dimension of the studies phenomena, a shifting from the phenomena of sensory dimension coming from classical mechanics, for example, toward corpuscular phenomena;

– the establishing of a mainly mathematized conceptual apparatus breaking with the classic determinism of phenomena of human dimension;

– the appearance of paradoxes, manifesting a crisis at the very heart of human knowledge;

– the impossibility to establish a convincing continuity between

[3] In fact, many physicists and mathematicians estimate that the time and space paradoxes observed are only paradoxical because of the weakness of the formalizations used, an explanatory unification of all phenomena being a fundamental requirement.

the order of sensory phenomena and corpuscular phenomena, allowing us to give to the latter a sensory interpretation.

To be more precise with regard to this last point, it must be said that bridges are being established in an astonishing way between these two orders of phenomena but not at all in the sense desired by Max Planck from the atomic ahuman toward a phenomenality with a human dimension, a sort of humanization of the atom. These bridges, these links, seem rather to be in an inverse direction, that is, in a return, an irruption of phenomena linked to the corpuscular dimension of matter within the sensory world of anthropocentric dimension. The thermonuclear bomb and the introduction for the first time on the planet of stellar temperatures are good examples of the profound strangeness of this new phenomenal order with regard to the order of phenomena among which man lives.

These remarks apropos of a situation created by nuclear physics refer to an affirmation that never ceases to impress us and which essentially consists of a shifting and a decentralization of the exercise of human rationality to apply it to an order of *ahuman* phenomena. In a way, this shifting in the order of knowledge goes back to the classical world. Thus the spontaneous and sensory consciousness that humans have of their experience rooted in their bodies and their "common sense" world is perturbed, but the classical phenomenal field is also disturbed. What theoretical physics reveals is a movement proper to the sciences in which seemingly they are not concerned with the human dimension, with the place of man in the universe nor with his position in the evolution of the animal species. Here there is a constant inaugurated by the end of Ptolomeian cosmology and the organization of the world around the Earth and Man. Moreover, the Copernican revolution maintained its strength only through the scientific certainty attached to it and remained on the order of representations: the irruption of "non-human phenomena" in the sensory world produces convictions that are more important in other ways.

Molecular genetics is obviously inscribed in this context of shifting from the field of knowledge and practice, of a sensory and macroscopic phenomenality, toward a phenomenality that no longer comes directly from the human existential approach, toward an ahuman phenomenality. This shifting takes place on two levels,

one inherited from cellular biology and favoring microscopic study at the cellular level, the rupture in the two macro- and microscopic orders with regard to life not being total, the other coming from the models of physics and chemistry and introducing the corpuscular order into the study of life. The constitution of the specific object of genetics has taken place through a series of shiftings in the traditional questions concerning life. As we have said, it has responded quietly and implicitly to the questions concerning the specificity of life with regard to matter, as well as to the fundamental question of the origin of life. It has done so by admitting into practice a continuity of legitimacy between the living and the inert serving as a base for any fruitful approach to life without simplistically reducing it to the inanimate. By favoring the macro-molecular approach in the study of life, genetics establishes an approach to a level that shifts and overturns the traditional concepts on which our representations are based, thus joining the upsets we have seen in knowledge with regard to atomic physics. In the same way, we witness a return in the phenomenal field of anthrocentric dimension of a field of phenomena that are irreducible to the classic experience that men have of their bodies and their traditional rapport with the environment.

Such, therefore, is the second type of shifting, perhaps more fundamental than the first because of the subject treated.

II. The Ahuman and the Inhuman

After this theme of shifting, the second important point concerns the meaning we must give to the concept of inhumanity.

The evocation of the phenomenal surges of genetics, everything that covers the suggestive concept of "genetic manipulation" immediately arouses fright or an unhealthy curiosity. These understandable reactions are inscribed in the framework of a profoundly anthropocentric sensitivity, finding its justification in two dominant ideological perspectives:

– the first is inspired by a classical anthropocentric or ethnocentric humanism for which moral, political and economic efforts must be organized around man and for man. In this context, the progress of science and technique is seen as a working process of

mastery curbed or deviated by inappropriate frameworks such as:

– contradictory ways of economic and social production, where we find all the Marxist schools and their variants; mistaken impulses, a retrograde spirit, prescientific mentalities, in which we find all scientisms and neo-scientisms.

In this framework genetics, its activity and its results are measured by the standard of a so-called humanist project of mastery, thus becoming either "an honest contribution of the sciences to human progress", or more often an inhuman undertaking, characteristic of a terrible epoch and the wickedness of man. The ahumanity of the new type of genetic phenomenality most often becomes inhumanity with all this concept has of negative judgment. The disavantage of this judgment is its basis in a problematic of *Aufklärung*, itself so deeply involved in the modern disasters that we may wonder at its having survived.

Opposed to these humanist currents, at a deeper level of analysis but in a context of radical condemnation of the sciences and technique, is found the Heideggerian position and all the opinions that gravitate around it. Briefly, we may define it in this way: "The present situation of the sciences and technique is the last disastrous avatar of a philosophic and cultural experience caught in the impasse of a metaphysics in which the correct problematic of the truth has given way to an ontological philosophy confusing the problematics of being with that of beings". Several quotations allow a better understanding of this condemnation without appeal of the present situation.

Close in thought to Heidegger, Hannah Arendt says, "Has not each step taken by science since the time of Copernicus brought almost automatically a lessening in its dimension?"[4] thus taking up the central theme of Heidegger in his lecture on techniques in *Essais et Conférences*. In fact, Heidegger clearly saw the remarkable paradox of this shifting of philosophy toward the sciences and technique, a growing ascendency linked to a growing inhumanity: "It seems to us that everywhere man meets only himself. However, man today no longer truly meets himself anywhere, that is, he no longer meets his being anywhere".[5] He rejects the duo

[4] Hannah Arendt, *op. cit.*, p. 350.

[5] Heidegger, *Essais et conférences*, "La Question de la technique", Gallimard.

of ascendancy and dishumanization in the name of an idea of being that, gone astray, founders in metaphysics without the only way remaining to us giving way, a return to a notion of being, a return to the origins of philosophic thought.

However, Heidegger's position contains a fundamental ambiguity to the degree in which it presents today's situation as a radical loss. It does not allow thinking about the sciences and technique because it develops a metaphysical rejection in their regard that makes all thought faithful to its project totally impotent. Finally, Heideggerian thought is profoundly ethnocentrist to the degree in which it refers the origin of all thought on reality to the origins of Western culture, particularly in its Greek dimension. In short, there is no serious exploration of meaning and illumination at the heart of this movement of "disclosure" and "inspection" of science and technique.

The present study on genetics and the inhuman in man has a different perspective, essentially interrogative and *a priori* positive. First of all, the inhuman in question here is not inhuman but ahuman. It is thus a matter of withholding all value judgment with regard to this shifting, decentering and the change it brings about within the world of sensory experience and of asking ourselves how it may be possible to interpret such a phenomenal ahuman in such a way that it may be inscribed in individual and collective thought in a positive manner. These are the different points that must be examined with regard to molecular genetics.

III. The Real Rupture Brought About by Molecular Genetics

To follow developments, it would be useful to recall a certain number of concepts that have allowed the founding of genetics. As Antoine Dauchin reminds us, it is to "August Weismann that we owe the clearest formulation of the importance of selective hypotheses in the transmission of heredity and especially that of the basic concepts of the genetic code".[6] He then cites a text from Lysenko's *Agrobiologie* that is a very precise presentation of the positions of

[6] Antoine Dauchin, *L'Oeuf et la poule*, Fayard, 1983, p. 28.

his adversary, the idealist Weismann: "... Weismann imagines a special hereditary substance, the germen, and states that it is expedient to look for the hereditary substance in the nucleus [...] Weismann holds that there are two broad categories of living matter: hereditary substance or ideoplasm and the nourishing substance or trophoplasm. He further states that the carriers of the hereditary substance, chromosomes, appear as an autonomous world apart with regard to the body and the conditions of existence of the organism".[7]

It could not be more clear, and in his arrogant assurance Lysenko cannot know to what point Weismann's position is strong. In the last sentence of the quoted text, Lysenko rejects Weismann and his idealist conception, bringing as support for his rejection the definition itself of selective hypotheses*: "Thus according to Weismann the hereditary substance has no neo-formation; the hereditary substance does not develop while the individual develops, it can undergo no correlative modification".[8]

We know the aftermath: Lysenko contributed to the brilliant success of the Russian genetic school, one of the best. As for Weismann, he had perfectly defined the fundamental concepts of genetics: the germen* being what is now called the genetic program and the soma*, its organic expression, a distinction that will be taken up again in the concepts of genotype* and phenotype*. In addition, by refusing all influence of the soma on the germen, of the phenotype on the genotype, Weismann strongly adopted the selective hypothesis, affirming the impossibility of an external action influencing the hereditary patrimony.

This series of basic concepts was refined by the work of Hugo de Vries, rediscovering Mendel's laws. The introduction of the notion of genes and alleles* of genes linked to the notion of mutation, in fact, allowed the understanding of the evolutionary process without abandoning the selective hypothesis. It is also due to Mendel's work that the postulate of the existence of separate parts of the genotype, the genes, more or less independent of each other, was established. It is to the merit of Morgan, finally, and

* See the Lexicon at the end of this article.

[7] Lysenko, *Agrobiologie*, Editions de Moscou, 1953.

[8] *Ibid.*

thanks to his studies on the Drosophila, that these hypothetical genetic particles are connected to a concrete and perceptible support, the chromosomes.

The problem that dominated genetics for several decades was to understand how to connect phenotypic characters with such or such a gene. The unbreachable difference and distance between the genetic support and its expression maintained by the selective hypothesis necessitated the establishment of knowledge allowing us to follow the interpretation of hereditary restrictions as well as the reproduction of the chromosomic structure. We know how the second break-through of genetics was obtained by the establishment of the concept of macro-molecules, which was going to open the way to fundamental discoveries of the genetic code and the thorough exploration of knowledge of the role of enzymes in cellular metabolism.

The introduction of physico-chemical postulates has thrown a new and explanatory light on the nature of life. Undoubtedly it is there that we find the most profound shifting of genetics with regard to our conception of life. It is through this perspective that genetics has undergone an important change and achieved a remarkable power and productivity. These postulates do not at all mean that living organisms must be reduced to physical phenomena but that the knowledge of these macro-molecules, their structure proper to life, allowed the thorough investigation of knowledge proper to it. This step toward physiochemistry directs the attention of geneticists toward a phenomenal level that drains the *a priori* instructivists with regard to the specificity of life and poses the question of its definition in a different way, within a fundamental continuity between the animate and the inanimate. Why all these reminders? Because by placing themselves at this physicochemical level the geneticists have brought about a rupture whose implications are still unclear but whose effects we are beginning to see.

a) *The end of the anthropocentrisms*

First of all, this shifting toward the physicochemical has established, this time definitively, a fundamental relationship between

all living things, at least at the macromolecular level. This seems trivial, but it is important to remember that representations underlying molecular genetics definitively prohibit any discussion of inequality, with regard to human genetics, for example. Benno Müller-Hill,[9] a German researcher, has shown in two of his works concerning Nazi genetics, essentially a formal genetics it tried to apply to humans, crude and groping methods of selection, involving bovines and pigs. It is necessary to understand how the length of time required for the experiments in selection and ignorance of the constituent elements involved gave rise to approaches that were not at all scientific, such as racial anthropology. Also, surprisingly, corpuscular physics was never well received by the Nazi regime. They explained themselves with regard to atomic physics, a Jewish physics, as they called it. Why? Because according to them it reduced all hierarchies between living and inanimate entities to constitutive, atomic and similar structures. From that to the claim that nuclear physics encouraged an egalitarian and decadent perspective the step was quickly made. This result is now well known: German genetics was literally and figuratively broken by the Nazi regime, literally under bombs, figuratively because the fundamental contact with the physicists did not take place. It occurred afterward in the United States and in England. The short, basic book of Schrödinger, *What is Life?*, was written in 1944 in Dublin where he had taken refuge.[10]

The macromolecular approach definitively exploded the last anthropomorphic remains (of which racial anthropology is an avatar) that could become encrusted in the obscure areas of formal genetics. Not only can racial and social inequalities not find in any way their basis in an enterprise that developed by uncovering the mysteries of metabolism of the colon bacillus but even more, for

[9] Benno Müller-Hill, *Die Philosophen und das Lebendige*, Campus Verlag, Frankfurt am Main, 1981; and *Tödliche Wissenschaft*, Aktuell, "Ro-Ro-Ro", Rohwolt Verlag, 1984.

[10] On this subject, see the article entitled "Emigré physicists and the biological revolution" in *The Intellectual Migration, Europe-America 1930-1940*, ed. by R. Flemming and Baylin, Harvard Univ. Press, 1969; also the study by Michel Morange, "À propos de Schrödinger et la Biologie moléculaire", *Fundamenta scientiae*, Vol. V, No. 2, 1984; see also our article "Génétique et totalitarisme", ed. by the Centre Georges Pompidou in the collection *1984 et les présents de l'univers informationnel.*

someone who devotes himself to this discipline, the humbling of the figure of man who is really no more privileged at the level of a molecular approach can bring a more and more important respect for all living things. Thus, the shifting of attention brought about by genetics does not bring with it a non-egalitarian view of man; on the contrary, it tends to remove the whole species from the dominant position attributed to it through all its philosophic and religious representations throughout the centuries, with regard to its environment and the animal and vegetable kingdoms.

Such is one of the first points that the shifting of knowledge toward the macromolecular level in genetics may evoke. First, not the chaos of hybrids and cloning, and so on, but the discoveries of a cosmic dimension in which the human species is immersed, a dimension that it had forgotten and that this scientific approach allows it to rediscover. On this point we may close with a whimsical observation: a human-chimpanzee hybrid can remind us of the monsters of the Middle Ages in which medieval man believed, but if he were present, he would also be a living creature, twice a brother, since he would link us to the human as well as to the primates. As for the moral and pedagogic value of such a hybrid, what do we know about it? Would it be worse than a bureaucrat organizing the deportation of millions of kulaks? It is not certain! What will the effect be on man of such a presence? Negative, because that would devalue the image that man has of himself? But the rise in the number of mass murders surely devalues more the image that we have of ourselves.

To end the first of these free interpretations suggested by molecular genetics, we may make this last affirmation. The apparent chaos that more and more realizations of molecular genetics allows—hybrids, transgenics, and so on—is linked to a cosmic dimension that is not only on the order of discursive representations or those of art (Hieronymus Bosch) but passes through concrete realizations. Each of us knows that societies do not live by bread alone but also by the great myths. In this sense, François Jacob is correct when he says "... in certain aspects, myths and sciences fulfill the same function. They both furnish the human spirit with a certain representation of the world and the forces that animate it." Under the pressure of rationality, these great collective myths, a part of which nourished the exercise of rationality, have undergone a

serious collapse which no doubt explains the degraded forms they assumed in Nazi Germany or under Stalinist totalitarianism. It seems that today we witness a new alliance between myth and science, not in a relationship of subordination (Nazi genetics) but in the treatment itself that sciences like physics and genetics have of the real. In this sense it should be said that these represent and realize the great organizing myths around which our societies are founded and perpetuated.

b) *The "metaselective" loop*

The second kind of reflection that is aroused by the shifting toward an ahuman phenomenality in genetics concerns another point that is rarely mentioned but that is however quite remarkable. We have already frequently mentioned the somewhat frightening nature that genetic manipulations may take. This reaction is similar to the one we have when faced with monstrosities or certain animal species. Aware of the remarkable fecundity that has allowed the molecular approach in biology, the speed with which technical achievements accumulate, we must admit that they have a point in common, the structural identity of macromolecules, and identity that is maintained transversely throughout all living entities. In effect, once the sequences of nucleotides forming the DNA chains or the sequences of amino-acids are known as well as the structures of the four bases ACGT* or the twenty amino-acids and the code that links them, it is possible:

1) to manufacture them *in vitro*, thus opening the possibility of reproducing known genes or, why not, starting from an artificial polymer, to look for the proteins degrading it, make a sequence of them, reconstruct a nucleotidic macromolecule and try to insert it in the genome of a competent bacteria. From there, we can imagine and realize a multitude of cases of figures connected with genetic manipulations *in vitro*;

2) the structure of DNA, proteins, being common to all living things, it becomes possible:

– to break interspecific barriers[11]

[11] This obviously presupposes that transformation techniques be perfected, allowing the introduction of foreign DNAs; that we are able to avoid the expulsion, rejection of these DNA fragments by the host-organism, and finally that we can insert these foreign DNA particles in the genome of a bacteria.

– to manufacture hybrids
– to transform the genomes of different species.

Basically, all genetic manipulations are organized around these broad directions of research, they themselves based on this permanence and identity of macromolecules throughout all species. The real revolution introduced by this approach is not essentially in the multiple phenomenal productions to which we give so much attention but in the fact that the foundation and development of molecular biology allows us to act on the genome, on the support of heredity. The paradox is thus the following: molecular genetics is the end result of a complex movement of which one of the fundamental postulates depends on the victory of selective hypotheses supposing a frontier between the fluctuations of the environment and the support of the genetic patrimony. There can be no action of the environment on the genome; its transformations are due to mutations to which the phenotypic expression in rapport with the environment is more or less adapted; a selection thus takes place among the mutants.

Now, these selective hypotheses that have led to the formation of molecular genetics are not contradicted by the realizations of contemporary genetics. The human species has access to the genomes of living organisms and can modify them. Admitting that the technical apparatus, the protocols of action and theorizations apparently belong to the environment, we must recognize that for thirty years we have been in a situation that no longer enters into the framework of the postulate fundamental to the origin of genetics: the separation genotype-external milieu. In a sense, we may speak of a heredity of acquired characteristics. But neither does this situation mean that this selective postulate has proven false, and that we must go back to Lamarck. It only manifests the amplitude of the epistemological and phenomenal confusion in which we find ourselves.

Without going deeper into the epistemological meaning of this contradiction by asking, for example, what becomes of the statute of selective hypothesis, we may however make this final remark: at the moment in which man's continuity with the rest of living things is revealed, at the moment in which his stubborn anthropomorphism wavers and everywhere arises the "ahuman" that he has discovered and installed within himself, a question comes up with

regard to man: What does the irruption of the first attempts made by a species on genetic patrimonies that were formerly submitted to other laws mean to the biosphere? What this initiates seems more interesting than the partial findings we have so much difficulty in facing.

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(E.H.E.S.S.)

LEXICON

SOMA-GERMEN: these two concepts introduced by August Weismann are the basis of the theory he proposed to account for heredity and allow the connecting of Darwin's selective theory to the transmission of genetic characteristics according to Mendel. "He [Weismann] distinguishes the germen containing what is called today the genetic program from the soma that is its expression" (A. Dauchin, *L'Oeuf et la poule*, p. 31). The soma is the part of the cell that does not contain genetic material.

GENOTYPE-PHENOTYPE: We call genotype the material itself of the germen that, in selective hypothesis, is not modified by external factors, and phenotype the kind of organization, expressed for each individual, of its genotype.

ALLELE: a gene may have several alleles, each being determined by the structure of the corresponding DNA. The idea of alleles introduced by Hugo de Vries goes along with the fundamental concepts of mutation and recombination, dominance and recessivity, and so on.

SELECTIVE HYPOTHESES: these hypotheses such as they are commonly admitted in biology do not directly coincide with the first definitions proposed by Darwin. They are in the main based on the distinction between a special hereditary substance that is now called genetic program, and the soma or phenotype, resulting from the development of this program for a given species. In the framework of these hypotheses, there is no influence from the external milieu on the genotype, which, however, is submitted to internal changes and mutations. Without going into detail, we may say that selective hypotheses allow the conception of living beings and their evolution as a material system evolving under the influence of contingent restrictions" (cf. Dauchin, *op. cit.*, p. 28). See also Dauchin, *ibid.*, p. 44 *et seq.*, on the distinction between instructive theories and selective theories.

ACGT: these letters stand for the four major bases of DNA. A:Adenine; C:Cytosine; G:Guanine; T:Thymine.

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