

BIOTECHNOLOGY, MAN AND THE BIO-ENVIRONMENT

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It is a great honour for me to have been invited by the Biopolitics International Organisation to see, as chairman, that this third day devoted to recent developments in life-sciences should work satisfactory.

The philosophical concern of the Organisation presided over by Dr. Agni Vlavianos-Arvanitis should by no means elude the lecturers who are to speak today. So, the different papers will answer the motives of our gathering which I feel raises the issue of the responsibility of scientific research regarding man and all the forms of life he is associated with.

Let us therefore try to pose the problem. And since we are in Athens today, let us bear in mind the "myth of Prometheus". As you know, the "Titan" in that myth brings the heavenly fire to men, which endows them with intelligence, wisdom and glory, whereas his brother Epimetheus heedlessly trusting the messenger from irate Jove, spreads wretchedness and illness among men of old age. And ever since man has fostered the hope that Prometheus' gifts would outdo those of Epimetheus.

Now, let us imagine that after attending Aeschylus's tragedy devoted to the myth of Prometheus, an Athenian theatre-goer of 460 BC had fallen asleep, and should awake today May 9th 1987, 20 centuries later. Let us imagine that you were asked to present him our time. You would no doubt be tempted to impress him with some of the most dazzling achievements carried out by man's intelligence and skill. The scope would be unlimited and your visitor would go from one surprise to another. Then, after a moment of reflection, he would ask you whether today's men, in spite of their ever increasing knowledge and power, are happier than they used to be.

You would certainly object that happiness does not necessarily depend upon scientific and technological progress, but upon many other things. Let us rather talk of well-being, of standard of living, of protection against disease.

You would point out that the plague and the cholera, rabies and TB have almost been eradicated, that surgeons can now open hearts, replace kidneys as well as prevent infants and elderly people from dying so that the average life span is more than twice as long as it used to be.

Your visitor could not help marvelling at such new powers; so, he would say, scourges are gradually disappearing, whereas in my own time, there used to be in remote corners men who would die of starvation.

Alas, you would answer, starvation is more effective today than in Pericles's time. Yes, but Pericles, in his fight against Sparta or the Persians, would drive to death soldiers who did not ask for it.

And you would answer that today's wars are far more deadly than in those times.

But aren't most of the wounded and of the sick cured, he would point out, judging by the scientific discoveries you have just mentioned? And you would answer that countless people die every day who theoretically could be cured owing to the present medical achievements, and that entire populations are starved to death while others store surplus food and you would conclude, saying that we even suffer from a strange phenomenon since, as man's power increases, deep anxieties rise in his mind, as if he ought to be punished for having played the sorcerer's apprentice, so that never has man been so uncertain of his future as nowadays.

Your Athenian theatre-goer would probably point out that we make paltry use of the fruits of our intelligence. Let us now go back 20 years in the past.

You certainly remember the deeply moving pictures of the Apollo mission, a dazzling demonstration of human technology. Paradoxically, the first steps in the conquest of space have brought about a better knowledge of our planet and of the precariousness of the living conditions on it. The space conquest has shown that this earth has its limitations, being seen from the moon as a mere dot lost in the midst of space, and it must certainly be the only planet in the solar system to offer the right conditions required by a form of advanced life, so that mankind should rest satisfied with living on earth without any prospect of emigrating away from it for many years to come.

This is one of the reasons why statesmen have come to show growing concern for the very acute problems of this planet.

At the very moment when men set foot on the moon, public opinion felt more and more anxious about the after-effects of pollution and destruction's of the environment. And it is in the most highly developed countries, technologically speaking, that the notion of the preservation of Nature was born, a notion of which politicians are growing aware.

The question is to raise the issue of scientific responsibility confronted by what I shall briefly call: the power and the frailty, the power and the frailty of human life both on the organic and spiritual level, the power and the frailty of the whole pattern of living organisms intricately bound to each other and linked to the life of the human species, that is to say the bio-environment.

The appearance of bio-technologies and new technologies bearing directly on our living world and our social behaviour is now entailing major developments in our way of life. Already, the technologies derived from physics and chemistry that have brought about new machinery, new materials, new appliances, new drugs, have changed our living conditions, which is easy to check, if we compare them with those extant where, on this planet, such technologies are not yet in use. Already, these technologies have entailed an increasingly artificial environment contrasting with the image we would have of an environment in which man would life in close contact with Nature.

But, one must be intellectually wise and wary in one's estimate, and bear in mind that any new artifact is bound to modify our ways so that, in this regard, we should consider farming and cattle breeding as technologies, which have borne upon the living world exactly as, in their time, fire and the wheel were the first implements to transform the physical and the chemical world.

In comparison, our age is characterised by the over-exponential acceleration of the number and extension of upheavals produced by such technologies, and we must expect a similar acceleration from the very moment molecular biology allows the making, on a large scale, of what we would call living artifacts.

One must have in mind such an historical and anthropological dimension, if one is to avoid two contrasting attitudes:

- one being a naturalism fostered by a nostalgia for a mythical golden age when man supposedly lived in harmony with himself and with nature;
- the other one being a progressive modernism based upon an optimistic assessment of the intrinsic value of progress as exemplified by any new scientific and technological discoveries.

The first approach consists of forgetting that human nature has always been shaped by cultural and technological modifications. The second consists of setting no limits, and considering that any technological achievement, provided it is possible, must be implemented and that it will always be possible, later on, to remove any unwished-for after-effect, whether it be ecological disturbances, new somatic and psycho-somatic illnesses or social perversions.

According to such an approach a boundless confidence in the value of the continuity of scientific progress per se fosters hopes that new discoveries will help stamp out those unwished-for consequences, so that on the whole, the final balance should remain positive.

As a matter of fact the crux of the problem lies in the fact that new technologies have unforeseen and irremediable consequences so that one must always bet upon the future. Moreover it is as if such bets were being laid unwittingly, as if responsibility was diluted within a nameless collectivity, since scientific activities pay no attention to them and create a "fait accompli", sometimes even under the very noses of their authors.

Indeed, no planification of basic research is likely to succeed, for the discoveries with the most momentous consequences never result from decisions concerning those very consequences. For instance, the two biological discoveries having brought about biotechnologies, that is to say genetic engineering and the fusioning of cells with cloning possibilities were made in laboratories of molecular and cellular biology as the normal development of previous research programs, so that their most likely applications appeared as "fait accompli" to their very own authors.

Conversely, the technologies for medically assisted procreation, whether it be artificial insemination, in-vitro fertilisation or the reimplantation of fertilised eggs, were voluntary applications, on women especially, of relatively well controlled technologies concerning cell preservation and cell manipulation.

In this case, the decision was taken in total awareness by doctors and biologists, to answer childless couples' demands.

The application of new technologies to a health problem is never the result of major basic discoveries but stems from the will of therapists answering the needs and demands of suffering subjects.

In this respect such technologies can be assimilated to organ transplants or heroic surgical interventions with the difference that the outcome goes well beyond the demands of those concerned, in so far as it has to do with reproduction.

In this respect too, such technologies are the direct outcome of the researcher's and the therapist's "Promethean" desires echoed by the consumer's dreams and desires of omnipotency inherent in scientific research, always in quest of what is dramatic and spectacular.

Better still, in the case of the discovery of restriction enzymes and genetic engineering for which the pursuit of applications was far from the prime impulse, the biologists who were the authors were scared by the prospect of such applications to the extent that they tried to ban the carrying on of that work.

This is worth mentioning for it was the first time a scientific community attempted to reflect without preconceptions, to make a critical assessment and a planification. One may assume that they had in mind the example of the atomic bomb which had demonstrated that scientific progress does not necessarily imply the progress of civilisation.

Very soon the fears proved to have been exaggerated and it was not long before research in genetic engineering was resumed. This exemplifies the unforeseeable nature of the consequences of basic discoveries which can only be assessed "a posteriori": then it is too late to prevent those applications from becoming possible and feasible.

Everything takes place as if objective and natural reality were modified without anybody having decided it. So, it is up to social structures, morals and mentalities to make the best of it.

One may say that scientific progress is not necessarily profitable.

As a consequence there should be decision taking bodies passing judgement on whether or not there ought to be modifications in the social behaviour bound to follow society's use of new technologies. This holds true for computer technologies as well as for biotechnologies. Regarding biotechnologies and man as a human being, what is likely to happen from the moment he appears to himself no longer as an original product of haphazard fecundating but as the result of manipulations and determinations carried out by others?

Any extension of practices especially that of transgenesis on fertilised human eggs, even though it may have started as a therapeutic answer, is liable to strengthen dramatically an image of ourselves as biochemical systems reduced to molecular interactions. If in the context of today's gathering we are already not to elude serious questions then we must ask ourselves the question of the psychology of such men as will be the products of those practices. For it is the issue of the self that is at stake, the issue of man's consciousness and conscience.

And since we happen to be gathered here on a famous historic site, let us say that what is at stake is the difference there is between Homer's characters, characters devoid of self-awareness in terms of duty, attempt, will, soul, conscience and thought and Plato's characters for whom such words ring the same as for us; whereas in Homer's language those very words spell an organic impersonal meaning compounded of heart, breath and gall.

What I fear for the in-vitro man is that, like Homer's character who watches what takes place in him with everything he supposes as coming from the gods, the man resulting from biotechnologies with a self-image increasingly influenced by genetic conditioning would see his self-awareness as a person vanished away from his consciousness.

Then we would find ourselves back in the situation of Homer's characters, except that the gods' interventions will be superseded by the efforts of molecular structuring.

To be exhaustive on that point, if we really want to keep the reality of human personality in our own culture while admitting the existence of societies that would not be based upon that reality, and if we want as well to keep the reality of the monogamic family cell, it is best not to practice transgenesis upon embryos and it is best to deal with the problems of sterility individually, since polygamy and adultery could become implicit and justified through a mere technical act requiring no more than insemination or surrogate motherhood.

We have thus approached the most difficult aspect of that problem, evoking the possibility of perverse influences of biotechnologies on human beings.

Now, what about environment, which is no doubt a more material field and whose perception may be easier than self-perception. Since very ancient times, in order to transform and make use of the biosphere, man has relied on mere empirical techniques of selection over a span of tens or even hundreds of years so that farming and cattle-breeding benefited from them in the course of centuries. Today, owing to the techniques of gene implanting and chromosomal modifications on the fertilised eggs, vegetal and animal species may sometimes be modified within a single generation. This ranges from seedless fruit, nitrogen fixing plants as well as "jack-of-all-trades" micro-organisms programmed to carry out specific and controllable tasks such as degrading waste and pollutants, the synthesis of edible proteins, or the production of enzymes and human hormones in the field of the pharmaceuticals industry.

All these achievements change both in number and in frequency the technical innovations likely to transform the biosphere and the ecosystem. They are in fact nothing but a prolongation of the activities resorted to by men, always tempted to control Nature and transform it into a less

natural environment for better or worse. The "better" lies in the fact that Nature thus transformed is far less hostile and far more docile to man's requirements.

I have in mind, in my own field, the research programs aimed at acclimatising in a biotechnological way vegetal species to Sahel soils, desert and salty lands, which will allow African populations to practice a type of farming most likely to yield food, without which they would be doomed to die or remain dependant on food importation. Similarly to Sahel soils, the research program on the adaptation of oleaginous vegetables produces raw materials badly needed in the field of space research or pharmacy. Selection and cloning will facilitate the production of a vegetal material. So much for the "better" side, thus generating an economy as well.

Now, let us deal with the "worse" part. We shall say that it arises from the fact that delicate ecological balances which had been established throughout centuries or even thousands of years can now be upset overnight by those controlling activities only concerned with transforming a single aspect of the environment such as suppressing a parasite.

Let me quote for instance the research work carried out by one of my teams on the development of degradable non-toxic biopesticides using as raw material saccharose which is in the process of becoming more and more a surplus staple food. This in itself is worthwhile since at the same time the aim is to replace traditional toxic products of agro-chemistry.

But I am personally aware and make others aware of the unknown factors in research residing in the side-effects entailed by new products and their unforeseeable consequences. Less dangerous are our development programs for biodegradable detergents which will prevent polluting the earth, the phreatic meres, lakes and rivers. More optimism is possible in that direction due to the fact that alongside the disturbances, an ecological awareness has developed which raises new needs biotechnologies can now cater for.

However on a social level one should be aware that biotechnologies involve economic issues, which explain why big companies are prepared to invest money and time, whether it be health industries or agro-industries. Though it is also to be noted that the development of these new activities is generally concentrated in a small number of developed and industrialised countries. From that point of view, biotechnology follows the course of the computer industry in so far as it deepens the gap between underdeveloped countries and affluent ones.

Besides, biological research is likely to be more and more oriented in that direction, at the expense of basic research upon major issues such as the superior functions of the brain, the mechanisms of the evolution of species, and the origins of life.

As a conclusion I would like to point out that biotechnology, short of bringing knowledge, builds up know-how and tools liable to entail a rapid progression in terms of results. Which is to say that correspondingly new changes take place and that new problems crop up, calling for quick decisions. The more urgent a problem becomes the fewer options it allows since the situation has lost its flexibility and one must obey the obvious necessity. The mistake lies in waiting for the choice to become impossible. In other words, the lack of foresight entails the lack of freedom in decision-making; which is why those whose job is to make decisions ought to call upon forecasters.

But the forecasts being called upon for official decisions, meaning governmental ones, should be brought before the public for it could mislead the opinion to let it and make it believe that forecasts are made on the basis of know-how only. Forecasts always tend to be made without plurality of data, without method awareness, without critical evaluation and without co-operation. These are all urgently needed to give this natural and individual activity a co-operative aspect obeying requirements of intellectual cogency.

Let us agree with Bertrand de Jouvenel to say that we should prevail upon specialists in the field of exact or so called sciences to become aware of an urgent need for moral science to tackle provisionism, short of which social needs will be only met by an extension of technology and biotechnology. An approach towards objects will be extended to subjects, themselves then becoming manipulated as objects.

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