

UNIVERSITIES HAVE TO PROMOTE LONG-TERM POLITICS: ANTHROPOLOGY AND ECOTECHNIQUES AS TEST CASES

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As you know, I have many friends here in Szeged, in your departments of anthropology, ecology, and biology in general. When you asked me to say a few words, I felt embarrassed. Which topic to choose without disappointing some friends? I do not know if I will succeed, but I thought that one common denominator of this friendship was that all of us were dealing with studies of "long-term effects" and that all of us were confronted with problems relating to the structure of our teaching at least at an M.Sc. or Ph.D. level. Therefore, I will focus on these two topics and on the challenges linked to these aspects.

We often hear, and I believe it, that biology will become the science of the 21st century, and that the new biological techniques can change human evolution profoundly. It is true indeed that some modern techniques are very near to the science fiction of 20-30 years ago, and they are addressing us, or some of us. I do not want to speak here about *in vitro* fertilization, which will always remain a marginal way to procreate. I want to focus on the better prevention of disease,

- the better treatment of disease,
- the better detection of genetic disease,
- the better treatment of genetic disease, possibly through genetic engineering,
- the almost perfect possibility of contraception,
- the choice of the sex of the child,
- the choice of some other traits of the child,
- the possibility of cloning,
- the techniques of individual behaviour control,
- the techniques of collective behaviour control, and
- the techniques of efficient eugenism.

The problem is no longer how human beings will evolve, but who will choose how we will evolve and what control we can have over this choice.

We have never been in a situation where we could influence human beings, our society and our future so much. It is more than bioethics, it is global ethics, a part of human biology and anthropology.

Anthropologists are perhaps best placed to make this link between philosophy and science, because we can explain

human evolution and its limits,
the definition of Homo and its myths,
the structure of societies and its manipulations,
the human variation and its nationalistic abuses,
and the influence of sexuality and procreation and its phantasms.

These new challenges are in fact linked to the ethical problems of the definition of a person. Which "sacrality" to give to human life? Human beings have primarily an undetermined nature. Man is free enough to die for his freedom; seeing the good, he can choose the worse. His "humanitas" lies in its freedom, in his nature not to have a nature, in his capacity to fight over each code one would like to impose on him.

A new challenge for each of us probably also lies in the European political situation, where the European political movements were implicated in the past in the opposition between communism and liberalism. Today, sociodemocrats and/or liberals lack their past enemies, but are in fact not victorious; they are suffering from the breakdown of communism because somewhere these "enemies" were also the "allies".

A political vacuum has been created in East and West, and this vacuum has been filled up in many countries by nationalism. It is the concept of the general interest which is put in doubt. If the different human groups and the different cultures may not or even must not communicate with each other, and may not or even must not be mixed, if cultures must be pure and each reference to common values is only tyranny, then there is no choice: it is the way back to the romantic view of communities viscerally closed on themselves, it is the incapacity to surpass the atavic singularities to communicate with each other, and it is the opposition between particularism and universalism.

Human biology can again play an important role here because we know that a large part of human variability is in fact an intrapopulational variation. We know today how to interpret human variation: for instance, for the variance of enzymatic polymorphisms, 86% of the differences lie between individuals of the same population, 7% between populations of the same race and 7% between racial groups. For mtDNA also, most of the variability (90%) is attributable to differences between individuals in the same geographical race and only 10% to interracial differences (MELNICK et al., 1992).

It is no longer possible to justify aggression or simply discrimination on the basis of scientific arguments. But we know that xenophobia is still present, and that nationalism and nationalistic aggression are still part of our actuality.

In biology, it would be impossible in such a short time to mention the different challenges in all subfields of biology from molecular biology to ecology, from genetics to physiology, from geology to botany, and so on. Let me merely cite as an example the challenge of linking anthropology to human genetics and molecular genetics.

New challenges are indeed linked to the new discoveries in primatology (chromosomal, genetic and molecular data) and to the new discoveries of molecular anthropology (in terms of DNA analysis for taxonomic and phylogenetic purposes and in terms of mitochondrial DNA).

Studies at a biochemical level have confirmed the absence of a sharp division between humans and other primates.

The "molecular clock" has been constantly used and updated in recent years. Indeed, if one assumes that the differences between evolving lineages accumulate at a constant rate, than the fossil record can be used to calibrate a molecular clock of genetic distances between living species. There is now good agreement between the fossil and the molecular evidence of our ancestors, and about when the lines leading to modern humans, chimpanzees and gorillas began to separate.

Mitochondrial DNA has been used too. Differences in the genetic code of nucleus and mitochondrion are linked to their independent origin; moreover, mitochondrial genes lack the introns and the long parts of DNA without function. Mitochondrial DNA (mtDNA), with only about 16500 bases, has been completely analyzed in humans. Other helpful properties are their quick evolution (because there are no repair enzymes, mutations can not be corrected and mtDNA accumulates genetic changes at about 10 times the rate of nuclear DNA), their occasional crossing of their barriers between species, and of course their mainly matrilineal inheritance. It passes down the female line, because sperm provides almost no cytoplasm (and hence no mitochondria) to the fertilized egg. The matrilineal inheritance has led to publicity about the search for "Eve". The problem turned out to be a failure of understanding.

In fact, all these biochemical studies, but also the discovery of fossils on the one hand and studies of other animals (their behaviour, their anatomy and their biochemistry) on the other have confirmed the absence of uniqueness of our species; we are no longer on the pedestal on which we have wanted to place ourselves. This line of research has been among the most significant in anthropology. "The essence of evolutionary theory is not that all species are the same, but that they are all produced by the same biological processes and by the mechanism of natural selection. Now that the biological and evolutionary character of the hominids has been established, the main task facing paleoanthropologists is perhaps less to show that humans are not unique, for all species are unique, but to show how that uniqueness can be the product of processes that are themselves general to all living matter. We should recognize that we are a unique species, but also that we are just another unique species." (R.FOLEY, 1987).

In population genetics too, we are far away from an analysis of only blood groups and protein polymorphism: the knowledge of some polymorphism is becoming extremely precise at a molecular level and DNA technology is opening up new ways.

For instance, study of the highly polymorphic HLA is leading to new possibilities. Further, it is now possible to study a polymorphism of the Y chromosome. Indeed, the SRY male determining region has been discovered in a 35 kilobase segment near the end of the short arm of the Y chromosome and the gene

responsible for maleness has recently been found, the testis determining factor (TDF). It is known to translocate on the X chromosome and it has been used in experimentation to transform the sex of female embryonic mice for instance.

At a DNA level, we are in a period of molecular revolution in biomedical research: gene cutting, splicing, mapping, cloning and sequencing is ongoing. Initiatives are being taken to sequence the entire human genome. The use of these data in biological anthropology is only starting, but is already bringing unique perspectives (DEVOR, 1992):

- restriction fragment length polymorphism,
- DNA sequencing,
- repetitive DNA,
- hypervariable DNA,
- mitochondrial DNA.

Perspectives exist for the study of new polymorphisms by anthropologists, but there is also a need for molecular biologists to understand the variation of the genome between individuals, between populations and between related species. In fact, they need some anthropological interpretation. The new DNA analysis does not change the philosophy of anthropological research; it permits only examination of

- the genetic variability of the genome in more detail;
- more genes (not only blood groups and some proteins);
- the molecular basis of some morphological adaptations.

Ecotechniques are in fact related somewhat to anthropology and to human ecology because this is more than the study of the relationship as concerns humans and nature: this connection is not univocal, as humans are not only adapted to their environment, but also react to and alter it, freeing themselves from nature itself. During human evolution, the relation between humans and environment has undergone change and humans have become emancipated from nature by way of culture and technology.

Today, human beings are no longer considered the centre of the world: the cosmos is becoming the centre, which has to be defended against human beings. The biosphere is receiving an intrinsic value, higher than the value of the species *Homo sapiens*. A crisis is being created and the carrying capacity of the biosphere is forcing us to find a new relationship between man and nature. Human evolution is a history of symbiosis, control and later the domestication of nature; it is also a history of the violation of nature exacerbated by the exponential development of technologies and population densities.

Human beings are today obliged to take measures in favour of future generations, and to think in terms of long-term effects. Today, we are much more dependent on collective wisdom and ideological (or political) decisions. This is a result of our failing to consider human beings as forming part of the global ecosystem.

In anthropology, we regard man too often as an island outside nature; we have perhaps a tendency to think of him as being above nature because he developed original qualities and because he succeeded in the conquest of nature. In fact, we have

to consider anthropology in terms of ecology, and to place anthropology inside human ecology. Man is not opposed to nature; he is autonomous but dependent on it. We must give ecological thought to anthropology.

Ecology and the problems of Seveso, Bhopal, Chernobil, acid rain, the glass house effect, etc. crystallize the anxieties, and integrate technical and political problems. Ecology is evolving from the "ecological niche" studies to the biosphere problems.

The protection of nature is today synonymous with the protection of humanity: it is in short-term politics a protection of the quality of life, but in fact in long-term perspectives a protection of human life itself.

All these aspects influence our teaching of biology. The problem, but perhaps the advantage, of our teaching is that we must keep a broad basis; biologists will continue to be generalists, but we must avoid being specialists in nothing. A holistic approach must be kept at the beginning of the studies (in the graduate studies), where we must receive a very serious background of the different biological subdisciplines. This is also related to the job market, where employment in academic positions is diminishing: this means again the importance of acquiring overall training, even in non-biological areas, in order to expand employment opportunities beyond traditional biology. At a B.Sc. level, we do not have to fear to say as Socrates did "I know only one thing: that I know nothing". It is typical of biology, of science in general, of a spirit of science in any way, to find fewer certitudes than doubts, and fewer answers than interrogations. To become free of an illusion of comprehension is in fact a first step to knowledge.

Of course, at the M.Sc. and Ph.D. levels our students need appropriate training which will involve specialized teaching and research in one of the subfields of biology.

In other words, we must take our responsibilities to offer to our students a good B.Sc. level with a rather large biological background, with a not too narrow specialization, but offering to our M.Sc. and Ph.D. students a large network of expertise.

At the M.Sc. and Ph.D. levels we must also be honest with ourselves and confess that we can not offer the whole range of biology to our students: indeed, we have to be modest about the expertise our own home university can offer and we must be ready to help our students:

1. to choose the correct university for the topic in which they wish to specialize (not what we want to impose);
2. to choose the correct experts in each subfield: It is therefore important to promote: a network, the mobility of staff and students, joint projects.

Within TEMPUS biology, we took the initiative of a European Ph.D. in biology, and we hope to continue in this way.

Our strategy to maintain our academic freedom must be internationalization and must be networking.

Let us not fear envisaging ethical debates in our studies. A modern society can not exist without educating individuals to use their freedom of thought maximally, and without educating people to be continually critical, to respect rational laws, but to reject manipulations. We will not escape the biology of the 21st century and its possible risks; let us prepare ourselves to explain these risks, this education being the only way to preserve democracy.

Sartre stated that "L'Homme est obligé à chaque instant d'inventer l'Homme". I would say biologists are obliged to invent biology continuously. We are obliged to engage ourselves in the new debates, and to accept the corollary confrontation with others.

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