Challenges of the Biological Anthropology, and Problems Related to Global Bioethics*

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INTRODUCTION

Biological anthropology has always been the study of human evolution and of the biological human variability, past as well as present. Anthropology is the study of the mechanisms at the origin of this variability and of factors, socio-economic for instance, influencing this variability, it is the natural history of Man. In function of this global goal, the subtopics are numerous from growth and development to human paleontology and paleoecology, from biodemography to primatology, from molecular anthropology to forensic anthropology, from genetical anthropology to the anthropology of nutrition, from paleopathology to human ecology, …

Natural history of Man is still the background of all anthropologists, although an evolution has been felt with the development of new techniques in molecular biology and in statistics for instance. However, it is not because we use new techniques that we would be necessarily better anthropologists. We must not use a reductionnistic reasoning, but a holistic thinking.

The future of anthropology lies in the analysis of nature-nurture! You will say an old problem for a challenge, nonsense ! No, it has more and more sense by the fact that today we have the possibility to analyse better "the nature" through refined genetical analysis and to analyse better the "nurture" through the technical possibilities to measure environmental factors and through a better evaluation of health and socio-economics factors. Moreover, with computer technology, we have now the capacity to analyse "mountains" of information where we can mix "thousands" of factors of natural environment and the many genetical analysis results.

We do not need all competences (from prehistory to genetics), we will not be polycompetent but we must be able to focus on priority problems and to stimulate the complementarity of the disciplines.

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Nature-nurture has a sense. What is non-sense today is to reduce anthropology to the only genetical factors! Even if tomorrow we would have a perfect knowledge of the human genome, we will still be obliged to study the interaction with environmental factors. What is nonsense today is to reduce anthropology to the only ecological factors ! Because even in a perfect analysis of these factors, we have to take into account the genetical susceptibilities of the human beings.

A FEW EXAMPLES

Lest us take a few examples.

1. Obesity

We know that cardiovascular diseases are the final consequence of some pathological processes fundamentally linked to obesity (as well as diabetes, hypertension, hypercholesterolemia) and opulence because it is linked to excess of food, sedentarism, and life style of developed countries. Nowadays, all these factors can be easily quantified. But, these cardiovascular diseases are also developed on a background of genetical susceptibility.

At the same time, it is a societal problem, not only in the developed societies but also in the developing countries. There are the risk factors that in the past were limited to adult ages. Nowadays, the risk factors linked to obesity are appearing earlier and earlier in children. Moreover, these children have also high levels of total cholesterol, triglycerides and have hypertension.

In obesity, the role of leptin is clear (Zigman and Elmquist, 2003). Leptin is a hormone secreted by the adipocytes, which informs the brain about the state of fat reserves. Mice (ob/ob) deficient in leptin are obese and sterile. In human beings also, congenital deficiency in leptin leads to obesity and absence of puberty. It suggests that leptin produced by the fat tissue is probably a crucial signal in the induction of puberty. It also reveals the link between fat tissue and the start of puberty played by leptin. A correlation exists

for instance between age at menarche and the level of seric leptin.

Other genes are candidates in the genetical determination of age of puberty, genes linked to the neuroendocrinian axe. These genes were revealed by the fact that precocious menarche is a risk factor for breast cancer. It is not the task of this paper to be complete at this level: let us only mention the gene CYP3A4 (catabolism of testosterone), the gene FGFR1 (receptor 1 of the fibroblast growth factor), the receptor GPR54 (receptor linked to the G-proteins).

As far as body composition is concerned, genes were identified also such as the genes IGF-1, the growth hormone releasing hormone (GHRH), GH (in fact the axis GH-IGF-1), neuropeptide Y (NPY), the PPAR_2 polymorphism (peroxisome proliferators- activated receptor_2. Influences on feeding through UCPs (uncoupling proteins), the beta-adrenergenic receptor gene were signalled also.

For obesity, we are nowadays confronted of course with morphometric and sanitary factors, as well as life style, but also with genetical factors (Rebato, 2003). The whole is becoming a societal problem of nature-nurture.

2. Human Ecology

Human ecology is a transdisciplinary part of anthropology analysing the interaction of Man with his environment, its consequences and proposing solutions (Bernis, 2003). Again, you will say it is not new, of course you know the excellent work done by C. Bernis and N. Wolanski in this area, you know that already in 1976 I created a Master in Human Ecology which is since 30 yeas a success. However, it will be a domain which will create many job facilities in the future for anthropologists: this is due to the environmental problems (such as desertification, deforestation, global warming, air pollution and acid rains, ... which are universal and which will become more and more worrying) as well as the interest politicians are showing for environmental problematic (and this not only in green parties).

Thus, the concept of humanity is, today more than yesterday, of primordial importance. The history of societies is a history of definition of territories. But, the conditions of life of human populations have changed: humanity is confronted to a surpopulation, to an acceleration of exchanges of persons or of trade and an instantaneous exchange of informations. The humanity has nowadays only one territory, perhaps that human beings do not realise it yet.

By this fact, it will be the task of anthropologists to study the consequences of the environmental changes on human biology, health and culture, to understand the interaction between biology and culture, health and diseases, sex and gender, and to differentiate the individual and populational effects of environmental changes.

What do we understand by environment ? It is an inherent difficulty to analyse environmental factors. On anthropometry we can cite:

- social factors
- psycho-social factors
- demographic factors
- family and in particular maternal environment
- physical environment
- nutritional factors
- socio-cultural factors
- psychological factors
- smoking, alcohol, drugs, ...

Human ecology, looking to environmental factors, can however nowadays not neglect genetic susceptibilities and new domains such as genetic toxicology.

3. Biology of Human Reproduction

The biology of human reproduction is the key to understand ecological, evolutive, ethical and biosanitary aspects. It is a typical example of interaction between biology and culture. For instance, the history of human populations cannot be summarised only by a list of periods and names. It is a history of individuals who reproduce, who eat, who educate their children. Fossils were not “fossil” and the study of evolution is not limited to the study of bipedism or of the brain (Susanne, 2003): the human life was constructed through marriages and mixing.

Sexuality is an important centre of human life, an invisible guide of many of our actions. As anthropologists, we have to understand this sexuality in biological terms but also in social terms (marriage, sexual relationships, conception, birth, puberty, parenthood, ...). Cultural influences play also an essential role for instance in all the existing nuances between sex and gender.

It is an anthropological domain of nature-nurture interactions almost by definition.

4. Ageing

Following world concerns about rapid

demographic changes and about ageing of societies, many anthropologists are working on different facets of the biology of ageing. A substantial body of knowledge has been published on morphological and physiological changes with senescence, such as on bone mass, body composition, haematological profiles, organ functions and culture responses, physiological equilibrium levels, ... In the comprehension of these changes, we will have again to analyse with precision nature-nurture interactions.

For instance, bone ageing results from an interaction between genetic and environmental factors (such as diet, physical exercise, geographical factors) (Kobyliansky et al., 2000). Bone mass is reaching a peak in the third and fourth decades of life but is clearly decreasing with age in both sexes afterwards (Rogucka et al., 2000). Ethnic differences in bone ageing implicate an evaluation of the genetic and environmental factors to this process. Many papers have already illustrated the environmental and genetic correlations in bone ageing but the exact nature of the interaction between both environmental and genetic factors must be elucidated.

5. Growth: From Morphology to Genetics

Though there are population differences in growth patterns which are gene-dependant, often growth is also considered as a mirror of social and nutritional conditions.

When the international biological programme (IBP) started in 1962, the hope was to distinguish the relative contributions of constitution and environment to human adaptability, this has not given really clear results because of the difficulties in measuring the many factors of environment and in characterising the genetics of populations.

Body is, more than morphology, an image lying between biology and culture (Rebato, 2005). It has also a epidemiological interest by the narrow link between distribution of fat and susceptibility to different diseases (atherosclerosis and diabetes mellitus for instance). Distribution of fat is influenced by transmissible factors, but transmissible means not only genetical, it also means environmental and/or familial transmission (food habits, physical activities, health and hygiene, socio-economical and cultural factors, ...). Genetic analysis of quantitative traits (human morphometric measurements of human body) has already a long history and is typical of nature-nurture analysis. Path analysis of groups of relatives allow however to better analyse the proportion of trait variation attributable to familial factors and to non genetic transmissible factors (Rebato et al., 2005). Models allow also to reveal single large-effect genes effects (Ginsburg and Livshits, 1999).

6. It is not my intention to give an exhaustive list. In fact, all aspects of anthropology could give more examples. The human reality results of the co-evolution of the cultural and biological systems. Let us still cite:

- population genetics: population genetics cannot limit itself to gene frequencies but needs analysis of environmental conditions, which can determine natural selection. When we are looking to natural selection in human beings, we have to see it in terms of biology and culture. For instance, individuals survive and reproduce and selection itself is the result of differential reproduction. But, reproductive success depends on many cultural factors and behaviours, at least as much as biological and/or genetical factors.
- human evolution: in human evolution also, genetical aspects are present. Let us mention for instance the gene MYH16, linked to the development of the jaw muscles, *musculus masseter* and *musculus temporalis*. A mutation during evolution would have limited the development of these muscles, facilitating the development of the neural skull (Hill and Walsh, 2005). Mutations of the gene for microcephaline could also be involved.
- molecular anthropology: you will be astonished I am not mentioning the enormous genetical advances as such. It is because it is too evident: he human genome project is bringing many possibilities of anthropological studies. But, if it is evident that, from fecundation to death, DNA codes for a plastic system, capable of adaptation to environmental changes. Let us not oppose molecular or genetical anthropology to more morphological anthropology: even if the knowledge of the human genome would be perfectly controlled, we know that the expression of genes is differential in function of age and in function of environments. Also, molecular anthropologists can not neglect the nature-nurture interactions.

SOCIETAL APPROACHES

The actual globalisation is probably incom-

patible with a sustainable development (R. Petrella, 2003): indeed, the international economical system is supporting only activities bringing supplementary values to the capital and only the free movement of capitals must be garanteed.

However, the tendencies of globalisation at demographical, epidemiological, environmental level generate profound changes in the biology of human populations.

- Biological changes:
- longevity
- ontogenesis (growth and maturation)
- body composition
- control of child mortality
- Demographical changes:
- fertility and mortality
- urbanisation
- overpopulation
- Epidemiological changes
- decrease infections and parasites
- increase tumoral, cardio-vascular, degenerative diseases

All these changes must result in ethico-political changes: political and economical decisions are necessary to struggle against inequalities at gender and populational levels.

Moreover in a multiethnical, pluricultural and plurilingal Europe, the possibilities of development of anthropology are numerous if we decide to enter societal debates. If anthropologists do not want to be present in societal debates, the risk is to be reduced to simple "technicians". We cannot avoid asking questions of social, cultural and ethical nature. An ethics which faces without dogmatism the problems related to the precarious equilibrium between Man and the other elements of Nature is urgently needed.

One of the anthropological problems is that many populations are losing their "personality", their cultures are considered as folklore, their language as dialect, their arts as artisanal, their believes as superstitions. Globalisation and occidentalisation devalorised and destructed completely these populations.

Until half of the 20th century, migrations seemed to us, Europeans, as normal. They were going from North to South (or maybe to the USA and Canada). But, after the decolonisation and now with the globalisation (occidentalisation of the world) they are going from South to North, linked to the poor development of the South and the images of an European Eldorado given by the TV images. We are here in fact confronted to the social costs of the economical violence.

Many questions arise, some are political but many are linked to anthropological questions:

- at ethical level, what justified to guarantee the ethnic (or social) cohesion of a society ?
- what are the rights of migrants ?

Societal implications (Susanne, 2004a) are numerous, borders are not only political, they are also economical and socio-cultural. Our societies are prone to the richness of cultural diversity, but racism is also gaining in power in front of populations largely different in their cultural and/or religious origins (Susanne et al., 2003; Susanne, 2004b).

CONCLUSION

The essence of anthropology is the systemic study of the complex interrelationship between humans and their environment. In the past, this interrelationship was often incomplete, involving only a few characteristics. Statistical tools of multivariate analysis allow now to involve multiple characteristics, as well genetical as environmental, in a holistic approach.

Indeed, we will need more and more a holistic approach. Meanwhile, the whole of ecology is undergoing fast changes with automatisation of environmental measurements. At the same time, the whole of genetics is undergoing a kind of revolution by human genome analysis and by development of "chips" and nanotechnology to analyse rapidly large samples. The result is perhaps that specialisation in anthropology is inevitable but it is surely that we will need anthropologists capable of a holistic approach.

Our richness is our diversity. Let us accept this diversity but let us work at the same time to a common spirit. Let us accept the fusion of "hard" and "soft" science in Anthropology, the scientific and humanistic approaches.

At the other side, anthropology cannot escape of societal approaches. We can not neglect our history, the past is still influencing some spirits. It is no longer possible to justify racism or simply discrimination on the basis of scientific arguments or even of pseudo-science. But we know xenophobia is still present, that nationalism is still part of our actuality, that in some European countries extreme right-wing parties are in the power.

Let us be attentive! Due to its social and environmental influences, anthropology is becoming a matter of discussion, where some debates require a good knowledge of anthropology by the general public (debates about

races, migrations, ageing, nutrition and obesity, human genome project, creationism,…) . Where political decisions and laws are to be supported by scientific arguments and not by philosophical manipulations, democracy can only be attained by objectivity and in this case by a basic biological education.

Human beings often fear their freedom: it is a tool we can not bring under perfect control. We prefer often stereotypes and ideological totalitarian remedies to calm our feelings of inferiority and our metaphysical anguishes. Man has to be aware of his animality to take "his own animal" in charge. We should, however, be very careful in the use, and even in the misuse, of anthropological data.

All this has anthropological implications, we can not work on a uncontrolled way, the public opinion has the right to judge the positive or negative side of our research. In Anthropology, our history being what it is, we must be double careful.

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KEYWORDS Anthropology. Racism. Holism

ABSTRACT Natural history of Man is still the background of all anthropologists, although an evolution has been felt with the development of new techniques in molecular biology and in statistics for instance. However, it is not because we use new techniques that we would be necessarily better anthropologists. We must not use a reductionnistic reasoning, but a holistic thinking. We do not need all competences (from prehistory to genetics), we will not be polycompetent but we must be able to focus on priority problems and to stimulate the complementarity of the disciplines. Our richness is our diversity. Let us accept this diversity but let us work at the same time to a common spirit. Let us accept the fusion of "hard" and "soft" science in Anthropology, the scientific and humanistic approaches. We can not neglect our history, the past is still influencing some spirits. It is no longer possible to justify racism or simply discrimination on the basis of scientific arguments or even of pseudo-science. But we know xenophobia is still present, that nationalism is still part of our actuality, that in some European countries extreme right-wing parties are in the power. In Anthropology, our history being what it is, we must be double careful.

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