

ANTHROPOBIOLOGICAL SURVEYS IN THE FIELD. Reflections on the Bioethics of Human Medical and DNA Surveys

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Anthropobiology is the branch of anthropology that studies humans as a biological species, focusing on evolution and variation, and including areas such as primatology, paleoanthropology, human genetics, and human ecology; some applied fields are bioarchaeology, biometrics and forensic anthropology. It is related to medicine on one side, especially epidemiology and nutrition, and of course to cultural anthropology on the other side, because there is no natural history in Man without a cultural component: biological evolution shaped hominids towards a bigger and more efficient brain, and brain became a culture-maker organ. That is why bioanthropological practice borrows from both fields (Parkin and Ulijaszek 2007). Here we shall consider only biological research, not medical experiments, which raise completely different issues, such as drug testing. This paper explores some field problems, conceptual as well, met by anthropobiologists, which are common to those faced by cultural anthropologists.

Formerly known as physical anthropology, anthropobiology, the aim of which is to describe and explain human polymorphism, has been suspected in the past century to focus mainly on racial classifications and then to encourage or justify discrimination, inequalities, or even persecutions. Craniology for instance, because of some of the ways it was used in the past, is often mistakenly portrayed as a racist tool, a view shared by a lot of cultural anthropologists, but also popularized by some biologists (Gould 1981). That is why some ethnologists are reluctant to refer to physical anthropology (“*You treat people like animals!*”), while anthropobiologists have long understood that human evolution is a biocultural process. In genetics for example, the population is the group within which people intermarry preferentially (marriage is here considered as the way to transmit genes to the next generation). It is then defined by marriage circles: most traditional populations are endogamic, i.e. they impose the choice of a spouse within their own culture and vicinity, and sometimes inside the same broad family. It is then clear that biologists rely upon cultural concepts to define their object of study. In human biology, the population is called the *deme*, while an ethnic group is defined not on a genetic basis, but *only* on cultural traits. These ethnic traits, including food, beliefs and behaviours, are key issues for understanding risk factors in epidemiology, while the deme refers to the genetic substratum (Risch *et al.* 2002).

Ironically, as genetics made extraordinary progress since Landsteiner's initial discovery of blood groups one century ago, genetic markers are now seen as grossly supporting a reconstruction of races, through a geographical approach (Bamshad *et al.* 2004). Also, forensic anthropology sometimes uses a racial framework, mainly to comply with administrative requirements. But this approach faces growing difficulties as the proportion of people of mixed ancestry increases (Cox *et al.* 2006). In fact, because there is never any gap in genetic continuity, frontiers of races are impossible to delineate.

A cultural anthropologist trained in biology, Franz Boas, also a leading anti-racist campaigner of the interwar period, was among the first to show, using anthropometry, that any concept of 'race' was merely a social construction. Sociologists and some anthropologists, however, still find it interesting and informative to study the popular uses of the race concept.

I. Field methods

Since Malinowski, cultural anthropologists advocate observations by participation to the local life of the societies they study. The first step is to learn the language and, progressively and painstakingly, to understand the explanation underlying behaviours and beliefs. Such an effort is usually not made by the biologists, first because they are always in a rush, to bring back fragile samples to the lab; second because they work in various societies and places and could not master all the local languages; and third because they hope to study biological phenomena at the species level, with large transcultural comparisons. There are vast areas of fieldwork common to social and biological sciences, like collecting genealogies, or data on behaviour. Another, very interesting subject is related to ethnosciences, which deal with the knowledge that indigenous society have about nature. One aspect, still not very developed, of convergence between human biology and cultural anthropology would be to study how traditional societies invent their own human taxonomy (Cormier 2002), and also, how they see the *evolutionary* relationship of humans with other animals, especially primates.

The collaboration between biology and social sciences led to enlightening progress in public health, like the discovery of the role of food habits in the occurrence of naso-pharyngeal cancer in South Asia (Hubert *et al.* 1993), or the involvement of anthropologists in the management of emerging diseases like Aids, or Ebola (Hewlett *et al.* 2005). Medical, and especially public health and epidemiology, is thus a growing area of interest common to ethnologists and bioanthropologists (Craig 1986, Gulati 2006, McElroy and Townsend 2003, Trostle and Harwood 2005), generating specific ethical questions (Meskell & Pels 2005).

A. Anthropometric and epidemiological studies

What may distinguish cultural surveys from biological ones is the qualitative nature of the former, and the quantitative of the latter. For biologists, measuring is the baseline. From initial skull studies by Samuel Morton (1839), until the end of the XXth century, human variation has been studied through various metric and non-metric methods. Physical anthropology was focusing both on soft parts, to determine growth and nutritional status, and on genetic characters like skin colour, hair structure, and other "culture-free" traits not evenly distributed among humans, and related to a geographic origin (E.G. eye fold and other anatomic peculiarities). Anthropometry was mostly interested in head or skull size and shape, but also in stature or body proportions. The rationale was that bone measurements (made on the living as well as on skeletons) had a strong genetic component; in the early days when too few blood markers were available, this method proved to be quite reasonable and brought a large amount of data on the history of the human species (Lahr 1996). And obviously, on past populations and fossils where no genetic data are available, only metrics enable taxonomic studies.

Nowadays anthropometric measurements, on adults as well as on children, are mainly used as a tool for assessing nutritional status, for epidemiological surveys. The usual measures are stature, sitting height, weight, arm circumference, and various skin folds. More sophisticated techniques can be used, as the impedancemeter, which measures total body fat. Methods to assess energy balance include food consumption surveys (Hladik, this volume), and energy expenditure studies; the latter may involve the use of rather heavy spirometry equipment, and some scoring activities, such as running on a treadmill or riding an ergometric bicycle. Some cultural anthropologists working on food studies understand the important contribution quantitative data can make to their studies (Gariné 2006).

Other biological anthropological explorations can be more or less invasive. In the case of taste studies, surveyed people are just asked to taste, and spit without swallowing, decreasing dilutions of elements like sugar, salt, or bitter substances, to determine their taste threshold, which relates to a genetic ability. For exploring lactose intolerance, people must drink a fair amount of milk or lactose, and blood sugar (sometimes hydrogen content of expired air) is measured several times; intolerant subjects may suffer transient abdominal pain or diarrhoea, which limits the acceptability of the test, though it is a very interesting way to study the coevolution of man and animal domestication (Beja-Pereira *et al.* 2003).

B. Genetic studies

Today, biological anthropologists seeking historical relations between groups carry out direct studies on DNA. Collecting DNA can be more or less invasive: it is easier to collect cheek swabs or saliva than blood. Blood collection is complicated in the field. First, cold conservation is needed, and necessitates a quick return to the lab. Second, the handling of samples carries the risk of viral disease transmission, like hepatitis and HIV. Third, surveyed people are usually reluctant to be bled. This can be due either to a traditional reason (“*blood is sacred*”, or “*blood cannot regenerate*”, so that taking even a very small amount is considered an amputation). This aspect requires a highly developed anthropological sensitivity. Interestingly, stools are an alternative source of DNA, which is already proving useful in primatology (Sommer, this volume).

However, collecting blood gives a larger DNA harvest, and allows us to study sera, where the antibodies against infectious diseases are found. Sera can be stored for decades, and can be used as archives for tracing emerging diseases, as in the Aids example, when sera from the late 1950s were retrieved in freezers and proved the presence of Aids at this early date. This epidemiological dimension has a great public health interest, and also has potential benefits for the study of evolution, as pathogens coevolved with humans (Wirth *et al.* 2005). In this manner, many microorganisms can be used as markers of human migrations: e.g. viruses (HTLVs: Black 1997; polyomavirus: Pavesi 2005; HIV : Yusim *et al.* 2001), bacteria (*Helicobacter pylori*: Suerbaum & Achtman 2004; *Treponema spp.*: Froment 1994; *Streptococcus* agent of dental caries: Caufield *et al.* 2007), endoparasites (*Plasmodium* of malaria: Kwiatkowski 2005; hookworms: Reinhard *et al.* 2001, tapeworms: Hoberg *et al.* 2001) or ectoparasites (lice: Reed *et al.* 2004, jigger flea: Lucchetti *et al.* 2006).

In sum, the rationale for conducting anthropological genetics is to search for human origins; to document human diversity within its ecological context, and to understand the evolutionary forces which shaped it, reconstructing diasporas, past migrations and palaeodemography; to define the evolutionary role of diet and disease, and eventually develop pharmacogenetics, enabling the production of treatments which match people’s particular metabolism. To achieve these aims, field studies are mandatory.

II. Ethical issues and problems

A. Benefits for surveyed peoples

Essentially, anthropobiological surveys are not harmful to people. Asking them to perform some exercises, or even sampling a tube of blood is of little consequence, from a strictly medical point of view. Often, the visit of a research team is also an occasion for leisure; sometimes, when a time-consuming task is requested, it can also be an opportunity for earning some money. Usually there is no payment for blood; the giving of blood is a voluntary act freely participated in: blood cannot be bought. However, because these surveys are conducted in remote areas where no modern medical care is available, the least which can be done for people at local level is to offer a medical examination, and general acts like systematic de-worming, and detection of chronic disease like

hypertension (by measuring resting blood pressure), diabetes (by researching sugar in the urine with a lab stick), or sickle-cell anaemia. The two former exams can be done on the field; the latter requires the electrophoresis of haemoglobin in the lab, and another field trip to bring back the results to individuals, but it is a highly appreciated practice which allows a follow-up of the survey, and meets the concern of the people: to receive some results about their blood.

One problem is often that non-Westerners living in remote areas imagine that, when their blood is examined, all the diseases they bear can be detected, and eventually cured; researchers must be clear in discouraging such hopes. Also, most of the results obtained from the blood for purposes of research cannot be communicated to donors. For example genetic markers of anthropological interest will be of no use for them; instead, some genetic tests useful in medicine, like detecting sickle-cell anaemia (as seen above), are interesting and can be returned to the participants for their own safety. Serologies of infectious diseases studied in fundamental research raise delicate issues and it is often questionable whether one should communicate some of the results. First, the presence of antibodies is often the sign that the infection is finished, and cured; second, in the few exceptions when this is not the case (hepatitis B and C), most people are chronic carriers and do not suffer from the infection, so giving a result can be more harmful; third, the treatment is not accessible for economic reasons. Aids is a particular case: the incubation is very long, up to ten years, but eventually as far as we know most infected, untreated people will develop the disease; it is very important to monitor patients before they develop signs of the disease; also, drugs are now cheap or free, and even if the disease is not cured, it can be stabilized. But some people are reluctant to give their blood in medical surveys, because they suspect they will be tested for Aids without their consent. In developing countries, up to 90% of the virus carriers ignore their infection, and they spread the disease without knowing. However, cheap and quick tests are now available, which can give a good answer in five minutes, so testing can be done on the field for people, in growing number, who ask for it. The key issue here is to preserve the autonomy and freedom of participants in our research.

At the national level, human biology projects, which must be approved by ethics committees, also must bring some benefits to the country. Such initiatives can be, as we did in Cameroon:

- foundation of a gene bank, where samples are deposited for free access to medical research
- establishment of a sera collection, which acts as a library where all infectious diseases (including those to be discovered) affecting people, can be retrieved
- academic and practical training of students and colleagues, including going all together into the field, participating in local universities teaching, and training students and colleagues in Europe.

A problematic situation, met by cultural as well as biological anthropologists, occurs when a severe case of disease is met in a village during the field survey. When it is an acute situation like an accident or any surgical emergency, there is usually no major difficulty in evacuating the patient to the nearest hospital. The problem arises when it is a chronic case (from usual chronic hypertension, to severe renal insufficiency, or cancer, or any other life-threatening condition). Local people cannot afford the long, sometimes life-long, and expensive treatments, nor can the research team. Usually, the only solution is an arrangement with local health facilities, but unfortunately treatment of these kind of cases are often impossible to conduct properly.

In all cases, fundamental research must not lose the final interest of its purpose: alleviating the burden of diseases. For example, in 2002, genetics accomplished a triple marvel, sequencing the whole genome of the malaria parasite (*Plasmodium falciparum*), of its vector (*Anopheles gambiae*), and of its victim (*Homo sapiens*). Yet the fact that more than one million victims die of malaria every year, means that this success, if it is to be such, has to be translated into new therapies (see figure below).



Figure: Genomic fantastic breakthroughs. Not enough? More than one million people die each year of malaria. Drawing by Christian Seignobos, IRD©, with author's permission.

B. Difficulties and constraints

1. Facing cultural identities

Obviously, when biological surveys are conducted, the basic rights of the surveyed people must be protected. The first medical commandment has always been "*primum non nocere*" (first do no harm). Problems are then not caused by damaging the health of those surveyed, but usually when local beliefs may be hurt. In the emic/etic dichotomy, cultural anthropologists are more interested studying the *emic* aspect, i.e. the indigenous point of view, while biologists are more interested in the *etic* side, i.e. explaining the situation from outside. This general difference of approach can lead to different perceptions of the same reality.

A good example is the broad question of indigenicity. The definition is far from clear (Kuper 2003). At first sight it appears simple; the indigenous peoples are the first settlers and, in a colonial context, in the New World, they represent the survivors of the first nations, who have been invaded, spoiled, and all too often, massacred by outsiders. But things are more complicated, since aborigines and invaders often interbreed, a case also observed during slavery. Indeed in the Ancient World, it is vain to attempt to define indigenicity. In sub-Saharan Africa for instance, most of the present inhabitants live in areas which their ancestors have occupied since the dawn of mankind. Often herders or hunter-gatherers are presented as indigenes just because they did not adopt agriculture, and therefore because their way of life is endangered by economic development. This leads to apparently ludicrous situations, like in Kenya where Maasai are viewed as indigenous while Kikuyu are not.

More generally, each population has its own narrative of origin, and biological theories may be seen to compete with folk explanations regarding human origins. Biblical creationists are not different, in that way, from some Australian, or Native American groups, claiming that God created them locally. As some Native Americans (here from the Havasupai tribe) put it, they "*were raised to believe that the retreat of waters from a global flood had carved the Grand Canyon, and that the Canyon is the birthplace of the human race*" (Rubin 2004). Considering the "out of Africa" story as insulting their traditions, they deny the results of DNA studies: "*that was like a scientist asking Christians from Nazareth to give blood for a diabetes study, then producing research to suggest that Jesus never existed*" (Rubin 2004). Some cultural anthropologists may be sympathetic to this kind of myths, because they express certain values within a community, while many biologists are not at ease with this attitude, because it challenges the biological unity of mankind. One example of this conflict: an organization formed in 1993 to oppose the Human Genome Diversity Project (HGDP), called Indigenous Peoples Council on Biocolonialism (IPCB 2005), accused the worldwide genetic project, nicknamed *Vampire project*, to be racist, because the aim of the HGDP was to target DNA from some indigenous communities.

A similar controversy arose with respect to the study of cannibalism. The debate was started with a book by Arens (1979), later expanded by Barker *et al.* (1998), claiming that accounts of cannibalisms were to a very great extent inventions of travellers or colonialists aiming to despise “savages”. The debate also involves bioarchaeology, from Neanderthal to recent populations. For example, when apparent evidence of this behaviour--human flesh in a fossil stool--was found in a Precolumbian Anasazi village (Marlar *et al.* 2000), Native American communities became angry, because it contradicted the stereotype of the Indian-in-harmony-with-Mother-Earth (Dongoske *et al.* 2000). The subsequent debate, in which the scientific status of the stool analysis was questioned, underlines how very careful and scientifically cautious academics working at the interface of the biological and the social have to be when working with potentially sensitive material and interpretations.

2. Handling human remains and fluids

In Europe, anthropological museums are full of human remains. Most of these remains are of local origin, but a minority comes from overseas, and is now subject to repatriation demands. Conversely in the US, it is mainly the local, Native American bones, which are the subject of such claims. Biological anthropology is not the only science involved, archaeology is also concerned (Layton 1994, Vitelli 1996). In the Kennewick case (a 9,000 years old human skeleton claimed for repatriation by local tribes of the Pacific North-West USA), the federal government decided in favour of the tribes, but biological anthropologists appealed, and eventually won their case. Those cultural anthropologists who participated in this debate appear to have been quite divided, some supporting the tribes’ point of view, others their biological colleagues. Journalists, who popularize and transmit scientific knowledge to the public, called their readers’ attention here to the different kinds of ‘truth’ that were being debated in this extended controversy (Coleman & Dysart 2005).

Clearly, conservation of human remains (bones, flesh, hair, but also mummies) raises special problems, even when they do not come from oppressed minorities (Turner 2005). Some of these bodies have been collected on battlefields, excavations, or various other ways, including the worst, but there is still a gap in legislation. Archaeological exploration of a burial is, literally, a desecration, and still, even in European law, a crime. Also, beyond death, some indigenous peoples refuse that anything from a dead persons, bones but also photographs, or names collected for genealogies, can be recalled. Obviously these data are basic tools in field anthropology, and most excellent ethnologists use them despite the reluctance of some tribes. There is then an urgent need of legal texts to allow archaeologists and anthropologists to work, together with the communities, for the benefit of bringing back to light the life of past populations. Guidelines of best-practice for example in the UK (DCMS 2005) are currently developed, acknowledging the fact that some peoples believe the spirits of their people cannot rest in peace until their bones are laid in their native ground (Mihesuah 2000). When the material in question is DNA and, worse, cell lines, or fetuses and still-born babies, the issue is even more sensitive. In all these cases, human remains are kept for research, though some people maintain that medical research cannot lay above their own beliefs.

This fact entails a host of important moral issues: many people waiting for a graft (mainly kidney, heart and liver) die because of a lack of consenting individuals, or families of individuals, who die in such circumstances that an organ donation could be possible. Of course in traditional societies, such a graft was not conceivable, but with modernity a lot of people are ready to accept an evolution on these practice, though most families, in developed countries, are still very reluctant to allow an organ to be taken from the body of a beloved parent. The same is true for blood transfusions: during the First and Second World War, there are stories of German soldiers preferring to die instead of receiving “racially inferior” blood. Beside this racist view, many religions also forbid transfusion. Forensic anthropology has also difficulties, because it requires the dissection of a human body (Walsh-Haney & Lieberman 2005), for judiciary or medical reasons. Faced with these limitations, biological anthropologists and medical doctors have to defend a higher standard of ethics, where human life is put on the top of all else.

In a deeply controversial book (Tierney 2002) devoted to Amazonia, and namely to the Yanomami group, the anthropologist Napoleon Chagnon was accused of encouraging aggression and homicidal attitudes, while the geneticist James Neel was suspected of spreading measles in order to study natural selection. A specially convened committee of the AAA later found that none of these accusations were the case (AAA 2002). But these accusations still fed hate and suspicion against anthropologists dealing with human biology. Today, some indigenes ask for the return of frozen blood from Neel's campaigns, as said Davi Kopenawa, a Yanomami representative, at the Annual Meeting of the Association of American Anthropologists, held in Washington in 2001: "*I would like to speak again about the book and the blood which was taken from my kin and taken from there and today is stored in a refrigerator. I would like to know what they want to do with this blood and why do they keep it. I want them to give the blood back to me so that I can take it back to Brazil and spill it into the river to make the shaman's spirit joyful*" (CCPY 2001). This problem clearly illustrates the debate about the fate of any body part, either solid or liquid, removed from a living person, and still in storage after his or her death.

3. Balancing individual and community rights versus mankind rights

A difficult issue is to obtain written informed consent from surveyed people, especially when they live in remote areas, and are illiterate. How can the biologist be sure that the aims of his/her research is correctly understood? Also, when people give their agreement for one study, and the samples are kept for years, how are we to consider a new development leading to re-use of the material for other studies, which were of course not forecast in the initial survey? Should we destroy the samples after use? Go back to the field and ask for permission anew? Ask the government? Or simply consider that when people agree to give blood for medical research, it encompasses all future developments of biological research (provided that it is conducted with all ethical guarantees)? This is not a theoretical concern. In 2000, Oxford Professor of Biological Anthropology, Ryk Ward promised, after discussion with locals, to give back the blood samples he had collected among the Native American group, the Nuu-Chah-Nulth, because he used them for an anthropological investigation (Ward *et al.* 1991) which went beyond the initial medical research he had conducted years before (Weiss 2003). In 2004, the Havasupai tribe filed two lawsuits seeking \$75 million against Arizona State University, on the basis that blood samples collected in the early 1990s were used for more than the agreed-upon diabetes research (Rubin 2004). For biologists, the ideal situation would be that sampled people give blood to science, and accept any kind of research on their blood, provided that all ethical guarantees are given, but biological anthropologists, like all other fieldworking academics, have to work in league with the peoples they survey.

Problems may arise in field research, when people refuse the surveys. For instance, a new virus was recently discovered in a Pygmy of the Cameroonian rainforest by our team (Calattini *et al.* 2005): HTLV-3 is the third virus of the HTLV (Human-T Lymphocyte Virus) retroviruses family. It happened that a woman, divorced with the princeps HTLV-3 case, was married to a man HTLV-2 positive, and had one HTLV-1 child among her children. It was then extremely important to get some blood from that lady, who was at the meeting point of the three viruses. We do not know if these viruses can recombine in an individual, but if so, it creates a potentially big health hazard. She refused to be bled, which is her right. It could be argued that ethics, which can protect individual rights, should also consider the issue of rights at a higher level: when mankind is potentially threatened.

In the general context of biopiracy, one of the fears frequently met is that human DNA could be patented for commercial use. There is also an unsound idea that Native genes, more than any others, are treasures which could generate fortunes. Such a conflict rose in 1995, when it was revealed that Carol Jenkins, a skilled biological anthropologist, and her associates at the Papua New Guinea Institute of Medical Research and at the National Institutes of Health (USA), were accused of patenting the genome of a Hagahai tribesman in the highlands of Papua New Guinea. (The patent was in fact not on the genome in itself, but on a HTLV-1 virus integrated in this genome).

HTLV-1 is a plague, and developing detection tests in blood banks are a great priority; as these tests are commercialized, the felt economic need for patenting rises. Though Jenkins discussed the idea of the patent with the tribe, and was supported by its members, who would earn half the royalties, a small NGO called RAFI (Rural Advancement Foundation International) released a provocative statement on the internet, saying that “*On March 14, 1995, an indigenous man of the Hagahai people ... ceased to own his genetic material.*” Eventually the patent was approved but, the next year, withdrawn (Pottage 1998). Even though accounts such as this may be outweighed by the examples where collaboration between biological anthropologists and locals has worked well, to their mutual benefit, the point remains: biological anthropologists working in the field have to be very aware of how their work may be represented by others who may have different interests.

III. Conclusion

Cultural and biological anthropologists face the same problems on the field, but often choose different perspectives. One of the problems is related to conservation issues: when an indigenous population lives in a park, should it be expelled to ensure peace to wild life, or not? It is a common mistake in anthropology (as in ecology, regarding environment), to consider cultures as immobile. They are in perpetual evolution, and, due to a vivid dynamics of adaptation, what is true today will not be tomorrow. The strategies used by some activists to defend cultural identity are then more based on a short-term agenda than on an immutable cosmogony. A Pygmy can still be a Pygmy, is he an academic professor or a naked hunter-gatherer. Innumerable societies around the world, adopted christianity, Islam, or whatever change, without disappearing. One and often two generations after the end of colonialism, the concept of *ethnocide* (i.e. a cultural killing, while genocide is a physical killing), as formulated by Robert Jaulin (1970, unfortunately never translated into English), should be revisited.

Sensitivity of tribal populations is extremely high, due to the innumerable crimes perpetrated against them during colonization. Listening to their grieves is a way to assume the historical responsibility of Western nations. Because of these crimes, a part of Occidental opinion is ready to be sympathetic to indigenous views; while some cultural anthropologists try to keep a neutral position, others think that the only way to embrace anthropology is to fight aside with the tribes. Biologists are not involved in such a choice. For example, while Professor Cavalli-Sforza proposed the Human Genome Diversity Project (HGDP) mentioned above as urgent, because of the quick “disappearance” of indigenous groups, a criticism was that instead of spending money to save DNA it was wiser to act in such a way that these groups do not disappear. This example shows THAT the two attitudes are not opposed but complementary; most tribal groups do not disappear by physical extinction but by *miscegenation*.

The fundamental question for anthropologists, both cultural and biological, is then: has Occidental science a universal meaning, or is it just one conception equal to any others? Very important collections (bones, blood) have been saved by biological anthropologists. It can be argued that these collections now belong to mankind's patrimony, destroying them would be an absolute loss and would impoverish not only museums, but also future generations. Also, offering one's blood for epidemiological or genetic studies, not only helps fundamental and applied research, but can be seen as an affirmation of solidarity which connects *ego* to the rest of mankind.

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