

# **Biology, Education and Ethics**

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Since Upsala's CBE first meeting in 1974, a lot of things have changed... During this last quarter of century, the research in biology has led to the enormous expansion of our knowledge.

For example, the ability to maintain cultures of totipotent human's embryo cells points towards new directions in fundamental research. There is a great hope that, one day, we shall be able to use such cells for repairing deficient tissues, or even for replacing whole organ.

Other potential therapeutic utilisations would involve the re-programming of differentiated somatic cells, by introducing them into nucleus-free ovocytes and thus obtaining new embryos, and new stem cells, or by taking foetal blood cells from the umbilical cord, etc.

Yet such striking scientific achievements also trigger important ethical questions:

- Should we be producing such cells, since they come from human embryos, and specially from deliberately aborted foetuses?
- Should human embryos be the object of research at all?
- Should therapeutic ends justify cloning means?

## **What to do now ?**

Questions about living organisms are never neutral, and there can be no single answer. DNA is currently the emblem of such issues. Isn't it absurd for biologists to want to patent it? Shouldn't it be pronounced the common property of humankind?

This is a hot topic, now that a race has escalated between private and public research institutions! The DNA molecule is the basis for countless techniques, named 'biotechnologies' or 'genetic engineering' by specialists, but which the public is not afraid to call genetic 'manipulations'.

As long as these are used for therapeutic purposes, or as historical and legal tools, such modifications are well accepted by the public. In contrast, there are equally virulent opponents and supporters of Genetically Modified Organisms in the food business. Clearly, a number of technological blunders (AIDS-contaminated blood supplies, growth hormones, mad cow disease, etc.) have led deliberate risk-taking to be questioned.

What is possible to do? Who should decide? Should we let the market function on its own? Should there be a vote, like in Switzerland? Should we try consensus conferences, or citizen councils? In all these cases, what should be known for decisions to be taken? Which knowledge is a priority? Biological knowledge has become fundamental. Without biological references, individuals are just as illiterate today as they were last century if they couldn't read.

## **Biological education and mediation**

Schools do now provide more biological information, especially at the secondary level. Unfortunately, the absence of genuine reflection has made most biology curricula completely

indigestible. They accumulate anecdotal, non-situated data. Receptors, G-proteins and kinases are mentioned, without being placed within the cell's metabolism. Individual organisms, the knowledge of existing species, the organisation of life, and even evolution itself have virtually disappeared.

At the university, teaching still occurs within historical subdivisions. Cell biology, biochemistry, immunology, molecular genetics are still taught separately, each according to its own internal code. Ecology, integrative biology, ethology or anthropology is only given a limited place. Practicals are often problematical, end up being illustrative rituals which do not initiate students to a scientific approach.

Museums, science exhibits, and the media are providing a growing platform for biological issues. However, such presentations frequently make use of outdated cultural references. Individuals are compared with machines, brains with computers, organisms with robots obeying microscopic commands, whereby each act would be determined before birth.

This rarely takes the possibility of questions into account: public worries, or the loss of confidence in science, are never discussed. For many people, this leads to boredom, and much incomprehension, like what previously happened with Physics. The image of Biology has become murky, which it wasn't, 25 years ago.

### **What can do the biologists ?**

Some biologists - still very few - are coming out. They would like to renew the dialog between science and the citizen, so they initiate communication campaigns. This can lead to even bigger problems, as the public is increasingly distrustful, and wary of new dangers.

Such scientists are aware of their ethical responsibilities, but remain clumsy in the way they fulfil them. Most of them believe that they are contributing to the benefit of mankind, wherefore they often forget to question their own methods.

What should be done? Should we question ourselves, and unravel the current links between biology, ethics, education and society, as directly and critically as possible? This is the aim of our meeting. But, we must go beyond this.

The solution is surely not additional classes, more concepts, or more public information regarding the contents and methods of research. What appears to be key in biological education, is to trigger openness and availability in each individual's mind, and to foster their curiosity for that which is not obvious, for problems.

It is necessary to provide food for thought, and approaches for linking biotechnology, ethics and society, in order to distinguish the stakes at hand, and to ask experts the 'right' questions.

Outside school, we should take advantage of the current controversies surrounding dioxin, GMOs or mad cow disease, since they trigger a genuine desire for understanding in the population. They provide learning opportunities, for which we must think through the tools and resources to use.

Given the difficulties of such a task, we need to construct knowledge networks, including schools, the media, and internet-like webs.

### **A clear project**

But first, the biological community must have clear projects. And, we must question ourselves - as some already do - regarding biology's place in society. Criticising some biological practices, seeing how its approaches are becoming social challenges, considering the way in which the market, or policies, determines research, does not mean having an anti-scientific attitude. Instead, biologists must engage in such a questioning approach. If not, what is the purpose of knowledge without meanings?...

These questions are not only internal questions, which should be dealt with behind closed doors. This is a public debate, to be shared as broadly as possible.