

## **New tools, new directions (Introduction)**

**André Giordan, LDES, University of Geneva, Switzerland**

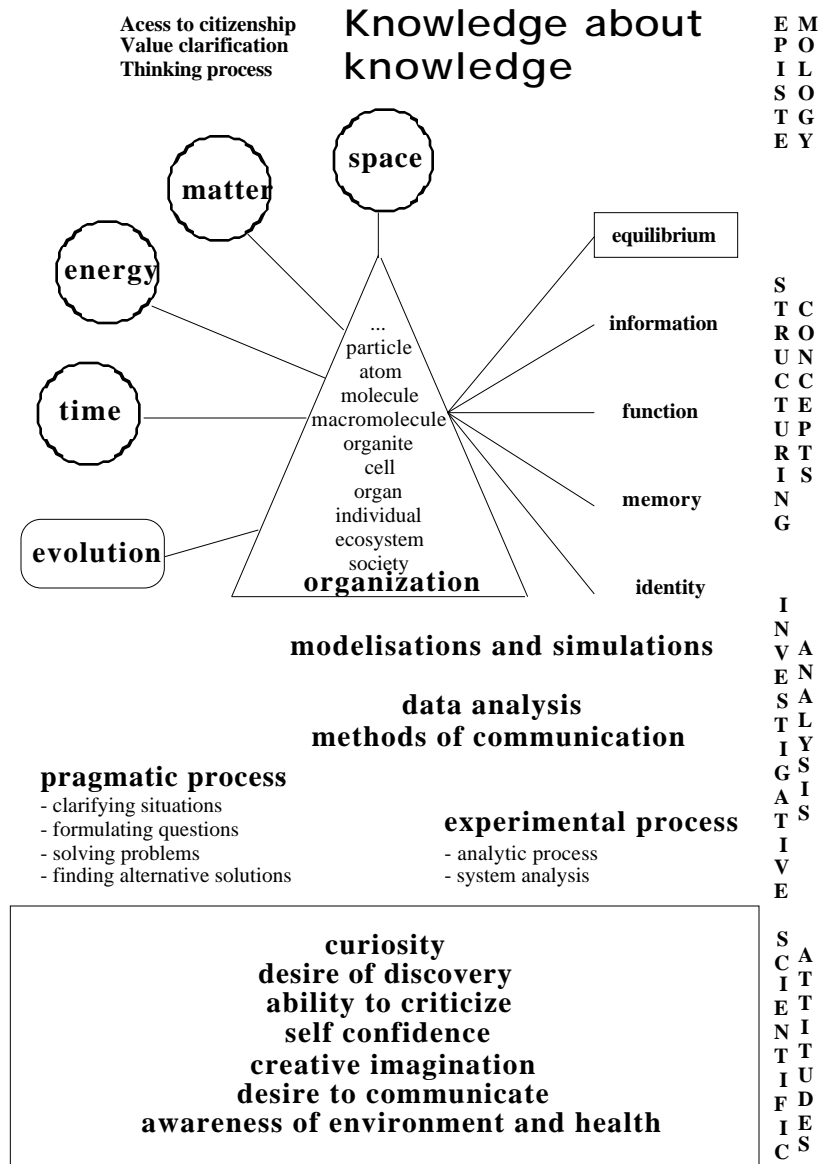
During the last session, Griffith argued that we must “switch” our idea from “teaching on learning.” It isn’t when teachers teach that pupils learn. We, the teachers or mediators, have a lot of other topics to switch in our brain!

But why change? Because we are confronted with important challenges. Both the individual and the society must evolve, because we - the society and the biosphere - have tremendous issues to deal with.

First, the global changes in our production and consumption models. Biology and its technologies play a great role in this respect. We need to develop an ethical reflection on such issues. Second, we are confronted with a demographic problem: next century’s 12 billion Earth inhabitants cannot live the same way as a mere 2 billion... Third, our society is confronted with new diseases, such as the Ebola virus, AIDS, and ‘mad cow disease’ (Crownfeld-Jacob), as well as with nosocomial diseases: it has now become quite common to get infected by fungi or bacteria while in hospital. The widespread use of antibiotics has introduced new mutations in bacteria. Health issues are no longer in the only hands of the specialists. Finally, we are confronted with environmental difficulties, such as the greenhouse effect, or the ozone hole...

So what can we do ? We have to take decisions without mastering all the information. The world has become complex and unpredictable. We must introduce new organizing concepts into our minds, such as regulation, organization, biodiversity, identity, and so on ; but not only. In addition, we have to master new methods, such as systems analysis, model-building, simulation, or pragmatic analysis.

Problem-solving approaches are not sufficient when addressing complex situations. These need to be clarified for problems to be highlighted. This means mastering information as well as clarifying values. The paradigms of daily life must also change, the idea of causality must change with multi-causality and with cybernetic causality, but most of the time it is difficult to pinpoint the causes and effects in issues related to the environment or to our health. We must accept to decide despite lingering uncertainty, we have to solve paradoxical situations. To do so, we need to be learning more, and more; and Biology is a good field for changing ideas.



**Objectives network in Biology Education**