

WORD OF WELCOME

■ WERNER ARBER, PAS PRESIDENT

Good morning! In the name of the Pontifical Academy of Sciences – natural sciences – I am very pleased to welcome all of you here. I consider it quite important that our two Academies treat the interdisciplinary topic of sustainability together, and I hope that we will find a good mutual understanding on the questions to be dealt with. I look forward to reach conclusions that can be communicated first of all to the Vatican, but then also to the outside world, to many attentive people in many countries. By the way, this joint workshop is the first regular meeting that our two Academies organize together.

In the past, our Pontifical Academy of Sciences has already discussed at several occasions questions and concerns relating to sustainability. In March 1999, at the transition to a new millennium, a Study-Week was devoted to *Science for Survival and Sustainable Development*¹ with highly relevant contributions.

In November 2008, our Academy devoted its Plenary Session to the topic *Scientific Insights into the Evolution of the Universe and of Life*.² It is mainly due to the advances of astrophysical knowledge that we know the age of our Universe and that in the course of extremely long time periods solar systems are born and eventually die after a long lifetime. Our solar system, including our planet Earth, exists since about 4,500 million years. Unicellular, anaerobic life on our planet can be assumed to have started about 3,500 million years ago. Some 2,500 million years ago cyanobacteria must have started to carry out photosynthesis, a reaction liberating free O₂ molecules that slowly accumulated in the atmosphere. At much later times, green plants showed up and intensified the production of O₂ by photosynthesis. When the oxygen level in the atmosphere had reached a level of 20% or more (some 540 million years ago), aerobic life became possible which gave rise to the evolution of animals and finally to primates including the human species. The relatively high O₂ level in the atmosphere gave also rise to the formation and maintenance of an ozone layer which protects us from damage by cosmic radiation.

¹ PAS *Scripta Varia* 98, pp. 427, 2000. Available online <http://www.casinapioiv.va/content/accademia/en/publications/scriptavaria/scienceforsurvival.html>

² PAS *Acta* 20, pp. 67 & 620, 2009. Available online <http://www.casinapioiv.va/content/accademia/en/publications/acta/evolution.html>

In a workshop entitled *Via humanitatis* organized by our Academy in cooperation with a group of French scientists in April 2013 (publication of the proceedings pending), it was concluded from archeological investigations that the species *homo sapiens* must have started its evolutionary origin some seven million years ago.

Referring again to astrophysical notions, we can assume that our sun can still spend us energy for another 4,000 million years. But, of course, one cannot predict if life on our planet can still continue to persist and to evolve so long. Various sources for serious disturbances are possible, such as a drastic collision with another large object circulating in the sky.

These considerations lead me to raise the question on the time horizon that we should envisage for a sustainable development on our planet under the impact of our cultural evolution. Should we envisage to maintain reasonable living conditions for humans for another few million years? Or is it more realistic to consider a much shorter time horizon of our cultural evolution in a rich and convenient natural environment?

I am aware that many contemporary humans define sustainability for just a few hundred years, i.e. to insure convenient living conditions for a few generations of their progeny. To my mind, this is not a responsible planning. I therefore propose to envisage a time period of at least 10,000 years. It is about 10,000 years ago that our cultural evolution began when humans started with agriculture, which represents their domestication of animals and of food plants. Up to that time, humans gathered and hunted to insure their daily diet, i.e., as the animals generally gather their daily nutrition. I am aware that a time horizon of 10,000 years for a responsible, sustainable development, is still difficult to plan, but I consider that it is feasible. I rather doubt that we could envisage the future development of appropriate living conditions for one or a few million years ahead. Let us keep in mind that our daily lives depend on a rich biodiversity, on appropriate habitats and on a number of essential inorganic, non-renewable resources, which our cultural evolution should protect and not use up and not destroy. With these expectations I now look forward to fruitful discussions in the next few days.