



## the Pontifical Academy of Sciences

### Welcome to Pope Francis

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President Werner Arber

Plenary Session on *Evolving Concepts of Nature*

24-28 October 2014

Casina Pio IV, Vatican City

Your Holiness,

Ladies and Gentlemen:

Thank you for attending this morning the ceremony in which we celebrate having available at our Academy the bust of Pope Benedict XVI. As Cardinal Ratzinger, he had become a member of our Academy and he attended some of our meetings before he was elected Pope. He therefore knew our Academy quite well and we appreciated his steady interest for the work of our Academy. On the occasion of the Synod of Evangelization in October 2012, Pope Benedict XVI invited me, as the President of your Academy, Your Holiness, to come to the Synod and to report for half an hour on the activities of the Pontifical Academy of Sciences, followed by an interesting “question and answer” period. I thereby realized how much the leaders of the Catholic Church appreciate the worldwide impacts of the work of the Academy, and I hope that this will continue in future times.

Your Holiness, your presence with us today shows your strong support for the work of your Academy. We are at present in a Plenary Session in which we are discussing the steady advance of our insights into the secrets of Nature. Modern investigation methods enable us not only to obtain novel knowledge, but also to design technological and medical applications of available knowledge, in particular to the benefit of healthy human life as well as our environment. I do not want to go into more detail this morning. I therefore would like to hand over to you a short Summary of our recent activities with emphasis given to positive, future-oriented approaches towards using scientific knowledge to ensure long-term sustainable development to our civilization.

We thank you and the Catholic Church for the highly appreciated support given to the Sciences and their life-supporting impacts.

*Address handed over as printed text by the PAS President Prof. Werner Arber to the Holy Father*

Your Holiness:

In the name of the Academicians attending this year's Plenary Session of the Pontifical Academy of Sciences, I would like to express to you our deep gratitude in receiving us today for an Audience. We thank you for your interest in our work and I take this occasion to inform you briefly of our activities.

We have chosen as the general topic of this year's Plenary Session: “Evolving Concepts of Nature”. It is largely thanks to novel and more powerful research methodologies that the different scientific disciplines can obtain deeper insights into the universal laws of Nature. This also stimulates interdisciplinary cooperation, rendering research more powerful. This development provides to us novel access to a deeper understanding of structures and functions, both of the living world on our planet and of the cosmic environment. We understand that our planet Earth is only a tiny part of a very large Universe with an extremely high number of solar systems. This has recently opened the question of whether living organisms exist also in other places of the Universe, such as on appropriate exoplanets. Astrophysical studies may hopefully answer this open question in due time.

In recent scientific workshops our Academy discussed scientific information on traces of early life activities of single-cellular microorganisms on our planet Earth already a few thousand million years ago. When some of these bacteria became capable of fixing solar energy by a chemical reaction, the atmosphere of our planet became slowly enriched with molecular oxygen, a byproduct of the reaction. Later, this process became more efficient by photosynthesis of green plants, so that eventually good living conditions for higher animals and for humans became established. Archaeological findings indicate that, resulting from ongoing biological evolution, early examples of human individuals must have lived on planet Earth already about seven million years ago. It is about 10,000 years ago that human tribes started agriculture by domesticating some food plants and some animals. It is mostly in recent centuries that scientific insights into the general laws of Nature became available.

These can serve us today as guidelines for beneficial applications of scientific knowledge, both for the humanity and for its natural environment. On the one hand, this has considerably improved medical care with a positive effect on our life expectancy. On the other hand, numerous technological applications of scientific knowledge highly facilitate our daily activities, including mutual communication.

In a recently held joint Workshop of our Academy and the Pontifical Academy of Social Sciences, we reflected on conditions to ensure long-term sustainable development for humanity and its natural environment. This requires the maintenance of a rich diversity both of life forms and of habitats, including essential resources. Since neither planet Earth nor its carrier capacity are likely to grow in the future millions of years, we are aware that the human population should soon reach a numerically stable equilibrium with its natural environment, avoiding a loss of appropriate habitats for the still available high diversity of living organisms. As shepherds of the appreciated diversities that we consider essential for future development, we are aware of our responsibility in any measures to be taken, whereby we have to fully respect the basic laws of Nature.

On the basis of our fruitful contacts with you, Holy Father, we are aware that you intend to ensure to all human beings a healthy and comfortable lifetime; science-based measures can help to attain this goal. I think a good example of this is our improved knowledge of the nutritional requirements for a healthy life from the time of conception till the time of death. It is known that in some areas of the developing world the main daily food is rice. This diet can appease hunger, but not the so-called hidden hunger due to a serious lack of micronutrients such as vitamin A. Through genetic engineering scientists have succeeded (as reported in a study week of our Academy on transgenic plants in 2009) in producing rice varieties incorporating a vitamin A precursor into the rice grains. Although all biosafety product studies carried out so far with this rice have indicated no danger for the consumer, the product known as *Golden Rice* still isn't accessible to those populations that would urgently need it, although it could prevent aberrant childhood development and the early death of many thousand young children every year.

A science-based support of Church leaders for the introduction of *Golden Rice* in combination with appropriate information on the suffering populations might be of great help. This pioneering scientific development of *Golden Rice* is likely to be followed in the next few decades by the enrichment of a number of other commonly used food plants for other kinds of essential nutrients with widely positive effects for the consumer.

I am glad to report to you on this ongoing development to render our daily diet healthier by naturally available genetic means for the benefit of Mankind.