



Science and Sustainability. Impacts of Scientific Knowledge and Technology on Human Society and its Environment



Proceedings of the Plenary Session

25-29 November 2016

Acta 24

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OPENING SESSION

Word of Welcome

Werner Arber

Presentation of the Plenary Session

H.E. Msgr. Marcelo Sánchez Sorondo

Long Term Responsibility

Jürgen Mittelstraß

The Project for Mankind for a Sustainable Development of the World

Antonino Zichichi

Discussion

NEUROSCIENCES AND SCIENTIFIC EDUCATION SESSION

Building a Bridge from Neuroscience to Education

Stanislas Dehaene

Discussion

Educating for Sustainable Development: A Crucial Role for Science Academies

Pierre Leana

Discussion

SPECIAL SESSION • Cosmology on the Occasion of the 50th Anniversary of Msgr. Georges Lemaitre's Death

The Future of Space Exploration and Technology

Martin J. Rees

Discussion

Exploiting Solar System Resources: Opportunities and Issues

Guy Consolmagno

Discussion

The Origin of the Universe

Stephen W. Hawking

The State of Understanding of the Nature and Evolution of the Observable Universe

James P. Peebles

Discussion

The Quantum Universe

Robbert Dijkgraaf

Discussion

What We Learn When We Learn that the Universe is Accelerating

Saul Perlmutter

Discussion

Thousands of New Worlds

Lisa Kaltenegger

Discussion

The Figure and Legacy of Msgr. Lemaître

Thomas Hertog

Discussion

Role of Space Technology for enabling inter-generational equity of natural capital and disaster resilience:
Corollaries of Indian Space Program

Krishnaswamy Kasturirangan

Discussion

Scaling in Particle Physics and Cosmology

Rudolf Muradyan

Discussion

CHEMISTRY SESSION

Atmospheric Chemistry and Sustainability

Mario J. Molina

Discussion

Novel Strategies for Energy Devices Based on Advanced Materials

Chintamani N.R. Rao

Discussion

BIOLOGY SESSION

Sustainable Cohabitation of Living Organisms

Werner Arber

Discussion

New Development in Genome Engineering: Scientific and Ethical Aspects

Nicole Le Douarin

Discussion

New Knowledge on the Causes of Human Congenital Malformations and its Impact on Society

Edward M. De Robertis

Discussion

The Challenges of Complexity in the Life Sciences and Society

Wolf J. Singer

Discussion

My Sixty-Six Years of Medical Research

Michael Sela

Discussion

Impacts of Microbial Studies on Human Society and its Environment

Takashi Gojobori

Discussion

Plastics in the Ocean: A Current Perspective on Their Biodegradation

Rafael Vicun#a

Discussion

General discussion

HUMAN SCIENCES SESSION

Presentation on the Current Status of Organ Donation and Transplantation Around World – With the Dilemma of Organ Trafficking and Transplant Tourism

Francis L. Delmonico

Discussion

The Advancements in the Fight Against Cancer

Salvador Moncada

Discussion

The New Alliance Between Science, Policy and Religion in the Pursuit of Sustainability

Veerabhadran Ramanathan

Discussion

Award Ceremony of the Pius XI Medal to Mariano Sigman

SELF-PRESENTATIONS AND COMMEMORATIONS

Self-Presentations

Francis L. Delmonico, Ce#dric Villani, Salvador E. Moncada, Hans Joachim Schellnhuber

Commemorations

Czes#aw Olech: Mathematics

Walter Thirring: Physics

Alexander Rich: Biophysics

Charles Townes: Physics

Georges M.M. Cottier: Philosophy

Ahmed Zewail: Chemistry/Physics

Raymond Hide: Geophysics

Mambillikalathil G.K. Menon: Physics

Presentation of the Proceedings of the International Colloquium of April 2013 entitled “Sur le chemin de l'Humanité#. Via humanitatis. Les grandes étapes de l'évolution morphologique et culturelle de l'Homme. Émergence de l'être humain”, co-edited by the Pontifical Academy of Sciences and by CNRS Editions. Interventions by the President Werner Arber and Professor Henry de Lumley

SPECIAL SESSION • Energy

Introduction

Theodor Haensch

Energy in Perspective

Stephen Chu

Discussion

On the Future of Energy: The De-carbonisation of Methane

Carlo Rubbia

Discussion

Solar Cells and Solar Energy

Klaus von Klitzing

Discussion

What to Expect from Nuclear Fusion Energy

Sibylle Günter

Discussion

New Prospects for Electrical Batteries

Yi Cui

Discussion

Sustainable Thorium Energy for the World

Jean-Pierre Charles Revol

Discussion

Efficient Use of Electrical Power in the Context of Sustainability

William Phillips

Discussion

General Discussion

PHYSICS SESSION

New Photonic Ways to Control Local Infections in Young Kids – Avoiding the Antibiotic Catastrophe

Vanderlei S. Bagnato

Discussion

Down the Carbon Staircase!

Hans Joachim Schellnhuber

Discussion

SPECIAL SESSION • Food & Nutrition – The Role of Biotechnology in Agriculture

Welcome and Introduction

Ingo Potrykus

The Need for Sustained Improvements in Food and Nutrition of the Poor

Joachim von Braun

Grain Yield Increase – a Role for Genetic Modification?

Peter Beyer

Discussion

Reducing Mineral and Vitamin Deficiencies Through Biofortification: Progress Under HarvestPlus

Howarth Bouis

Discussion

Effects on Biodiversity

Peter Raven

Discussion

Sustained Soil Management – “No Till” – Agriculture

Mariano M. Bosch

Discussion

Socio-Economic Impacts Pro Poor

Matin Qaim

Discussion

The Role of the Public Sector – “New Technologies”

Marc van Montagu

Discussion

The Role of Plant Biotechnology in Human Health. Public Sector Constraints: The Golden Rice Experience

Adrian Dubock

Discussion

The Devastating Effect of Regulation and the Nobel Laureate Campaign in favor of GMOs

Richard J. Roberts

Discussion

Summary

Joachim von Braun

CLOSING SESSION

General Discussion and Final Statement

APPENDIX

La Technoscience et ses défis

Jean-Michel Maldamé