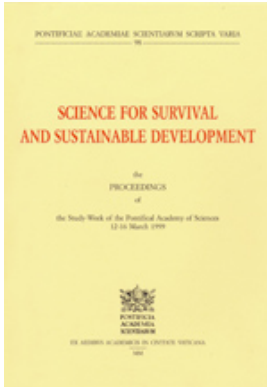




## Science for Survival and Sustainable Development



Study Week 12-16 March 1999

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### The Programme

This study-week will address the question: "What can basic science contribute to the survival and sustainable development of the world?" We will focus on the specific theme: possible applications of modern non-linear dynamics to the prediction and control of critical phenomena ("catastrophes") in nature and society. To this end, we will bring together experts in non-linear dynamics (mathematicians and theoretical physicists) and experts on the specific critical phenomena which are commonly recognized as serious threats to our world. We will also discuss the crucial problem of implementing scientific initiatives in public policy, and the moral, ethical, and spiritual dimensions of such initiatives.

Accordingly, the programme will consist of the following parts:

- *Problems of sustainability: response to threats of the time scale of decades.* Responsible: Prof. P. Raven.
- *Problems of mankind's survival: response to the threat of catastrophes, which may happen at any moment.* Responsible: Prof. G. Puppi, Prof. V. Keilis-Borok.
- *Scenarios of transition to critical phenomena.* Responsible: Prof. N. Cabibbo, Prof. L. Pietronero.
- *Science and public policy.* Responsible: Prof. G. Puppi, Prof. V. Keilis-Borok, Prof. P. Raven.

### Premise

*The problem.* The world is facing major threats caused by the expansion of human activities, among them the deterioration of the environment, the depletion of natural resources, and the destabilization of economies and social order. The long-term threats (in the scale of decades) to the sustainability of our planet, like global warming, are accompanied by the immediate dangers of natural and man-made disasters; our vulnerability to them is greatly magnified with each passing year, and this undermines our ability to maintain a sustainable and productive world into the twenty-first century and beyond. Human society has increasingly recognized such threats. Throughout the world, huge resources, hundreds of billions of U.S. dollars, are being spent annually to counteract them. While these efforts are commendable because they prevent part of the potential damage, on the whole they have reached a kind of stalemate: the destabilizing factors prevail, and the scale of possible catastrophes is rapidly growing. Both history and common sense tell us that basic research is pivotal to breaking such a stalemate. Indeed, since ancient times, basic science has repeatedly rescued humanity, providing "new solutions to old problems". The present study-week will engage in the search for such new possibilities, focusing on the major responsibility of today's scientific community. At the same time, we recognize that scientific initiatives can be useful only if they can be implemented as a public policy and are acceptable to society from moral, ethical and spiritual points of view. These issues are also included in the programme.

*How will this study-week differ* from the escalating multitude of scientific meetings, from technical discussions to global forums, that are already dedicated to these problems? The distinctive features of this study-week will be:

- brainstorming discussion* without any formal limitations;
- *a small number and a high level of participants;*

- a focus on *cutting-edge basic research*;
- a focus on *what can be done*, rather than simply alerting the audience to growing threats.

In combination these features are unique, so that this study-week will not duplicate other meetings devoted to similar subjects, but will complement them.

*Why the Pontifical Academy of Sciences?* Since hardly anybody else has the capacity to set up such an unusual meeting, with a potential for affecting the global agenda, we believe that the Academy has a responsibility to do so.

### **The Theme**

As the specific theme for this study-week, we propose to focus on the applications of modern non-linear dynamics to the prediction and control of critical phenomena. In order to develop that theme, we will bring together:

- experts in general studies of critical phenomena who employ methods developed mainly in mathematics and theoretical physics;

and

- experts on specific critical phenomena ("catastrophes" or "crises") that are encountered in nature and society.

The synergy that has been developed between these fields of expertise has been highly successful in addressing critical phenomena of various kinds. The present study-week will explore new untapped possibilities by which to apply this approach to the areas covered by the programme. The study-week will also discuss the closely related issue of how to implement scientific initiatives at the individual level, and at the level of society as a whole. Implementation would require (i) an appropriate public policy and (ii) consideration of the moral, ethical, and spiritual problems involved in the implementation of initiatives based solely on scientific considerations.

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