

Limits to the Anthropocene. What are the challenges and boundaries of science for the post-normal age?

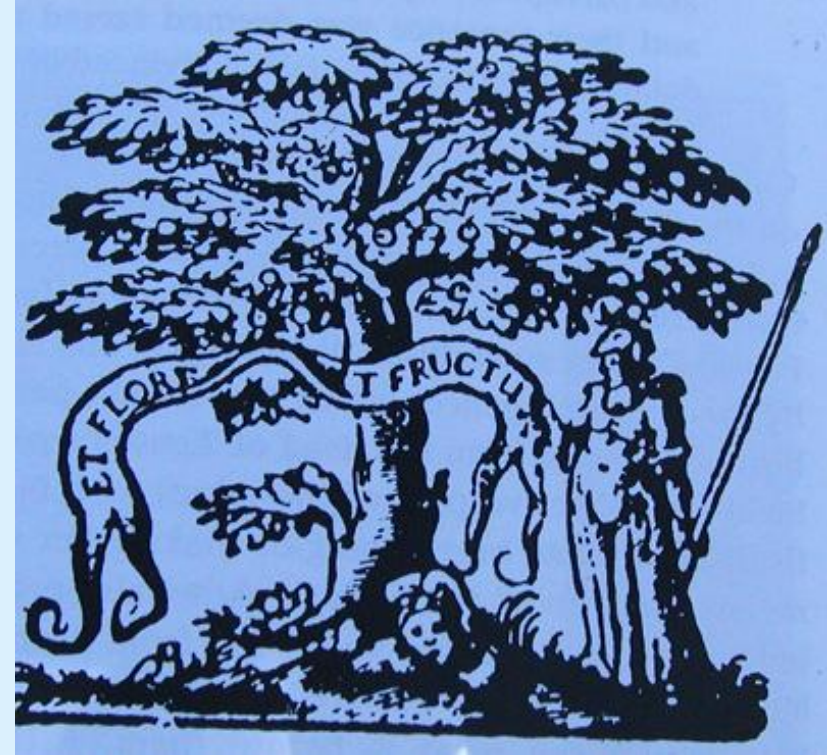
Corinna Lütjhe (corinna.luethje@uni-hamburg.de)

Jürgen Scheffran (juergen.scheffran@zmaw.de)

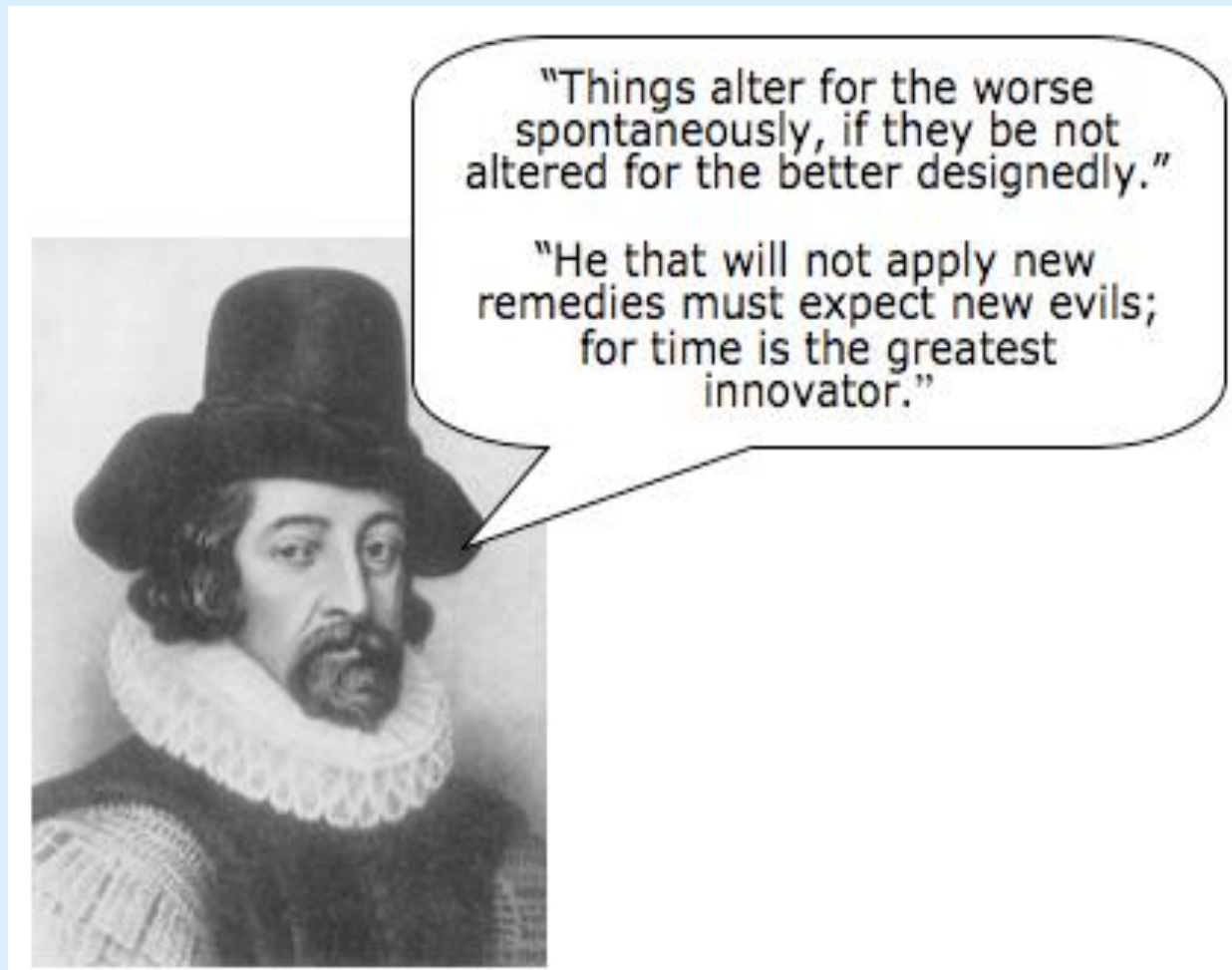
Mike Schäfer (mike.schaefer@zmaw.de)

KlimaCampus Hamburg / Universität Hamburg

Introduction



Pallas Athena Emblem from title page to Bacon's *Nova Atlantis* (1643). Inscription: "Et flore et fructu." Translation: "With both flower and fruit." Source (30/03/2011): <http://www.sirbacon.org/Athenabacon2.jpg>



Source (30/03/2011): <http://atireugram.blogspot.com/2008/01/francis-bacons-solomon-house-new.html>

In 1624 (in Latin) and 1627 (in English) the utopian novel *Nova Atlantis* (*New Atlantis*) was published by Sir Francis Bacon. In this text, the vision of a future world is described, in which humankind is due to human discovery and advances in knowledge in a position to control the environment.

Since that time scientific progress actually had been suggesting human allmightiness. The term „anthropocene“, coined by Paul Crutzen (2000) describes the current geological epoch, beginning with the latter part of the 18th century. From this date on the global effects of human activities have become clearly noticeable. However, the effects of this development are not necessarily positive. Negative effects are visible, for example, in anthropogenic climate change.

Also the latest experiences with disastrous events raise the question of the controllability of natural forces. With respect to the events in Japan humans appear more like a kind of apprentices than masters of the nature.



Fukushima

Source (31/03/2011): www.welt.de

Japan after the tsunami 2011

Source (31/03/2011): www.stern.de



Nuclear power plants in Japan

Source (31/03/2011): www.naanoo.com

Pacific ring of fire

Source (31/02/2011): <http://news.bbc.co.uk>



Hence, not only disasters show the problematic relationship between nature and humankind. Some 40 years ago, the first report of the Club of Rome on "The Limits to Growth" (Meadows et al.) was published in 1972. It contained an understanding of the world as a dynamic and complex system in which human intervention could play a potentially decisive role.

Thinking about the current geological era as the "anthropocene" raises **two major questions:**

- (1) the question about the basic relation between humans and nature as well as its boundaries, and
- (2) the question about the challenges these developments pose for both natural and social sciences.

However, these scientific challenges are rooted in the new understanding of ecosystems as integrated systems of humankind and nature. This thinking of integrated systems poses the question of a new and integrated scientific practice and new scientific structures which leave the disciplinary boundaries behind.

New scientific structures and practices: Science for the post-normal age (Funtowicz/Ravetz 1993)

Based on three interfering processes (Weingart 1997):

- Scientification of politics,
- politicization of science, and
- mediatization of the science-politics-relationship.

Scientific fields:

e.g. technological impact assessment and risk research as well as environmental research and climate research.

Attributes of this scientific fields:

- Complexity,
- uncertainty and interdisciplinarity due to complexity, and
- transdisciplinarity due to a new linkage of science to the political and economical field as well as to the social space.

The advent of post-normal science can be watched in an institutional and organizational change:

- Research is dedicated to application but the implementation of results into society is a controversial issue,
- next to scientific criteria quality has to be proved by economical, political and social criteria,
- knowledge production is no longer the privilege of universities (loss of the monopoly) but broaden to different places like research centers, industrial laboratories, government agencies, think-tanks.

Institutional change of science (e.g. re-combination of disciplinary standards and knowledge) leads to epistemological change. (Nowotny et al., 1995)

Challenges of inter- and transdisciplinary teamwork:

Inventing, implementing and applying this epistemological change into the practice of research.

Problems:

Deeply rooted in disciplinary traditions and boundaries like scientific language, scientific methods, presenting practices, and epistemology.

Examples from the practice of research within the cluster of excellence CiISAP (Integrated Climate System Analysis and Prediction) at the University of Hamburg which is dedicated to interdisciplinary climate research:

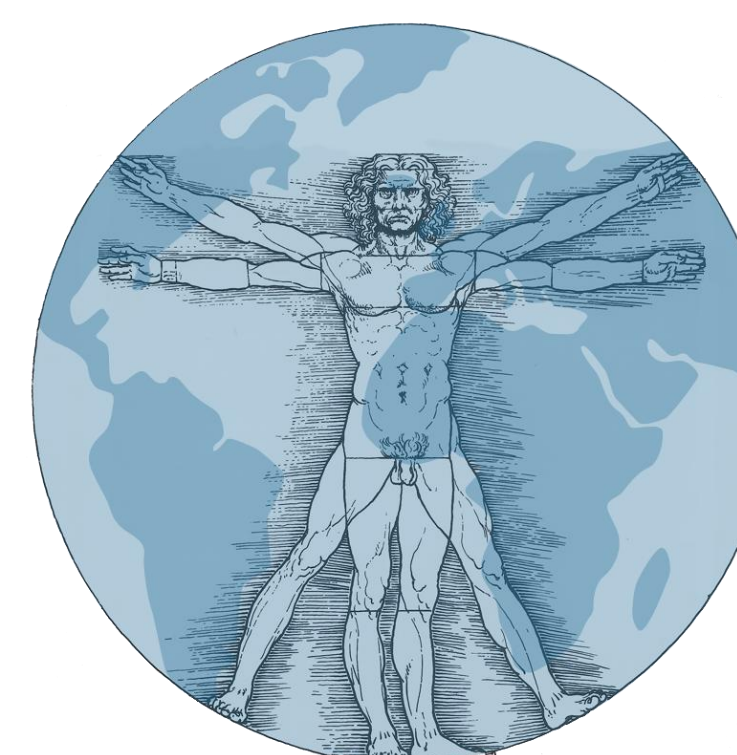
- Interdisciplinary negotiation (symposia and conferences),
- education and teaching (interdisciplinary graduate schools),
- interdisciplinary practice of research (heuristic models and team-building).

(a) Interdisciplinary negotiation

Symposium „Limits to the Anthropocene. What are the boundaries of human intervention into nature?“ (Hamburg, 22.-24.09.2011)

In this symposium the participants will discuss

- the characteristics and effects of human interventions into nature,
- their desired and their undesirable consequences and risks,
- their perception by society,
- their natural, technical, social and moral boundaries, and
- resulting challenges for science and society.



We bring together experts from natural and social sciences as well as economists, environmental activists, and speakers with experiences in politics:

Topics:

- 1: Energy generation and consumption
- 2: Mineral resources – Exploration, exploitation and use
- 3: Land and water use
- 4: Ecosystems and biodiversity
- 5: Geohazards and natural disasters
- 6: Climate change and climate engineering

(b) Education and teaching

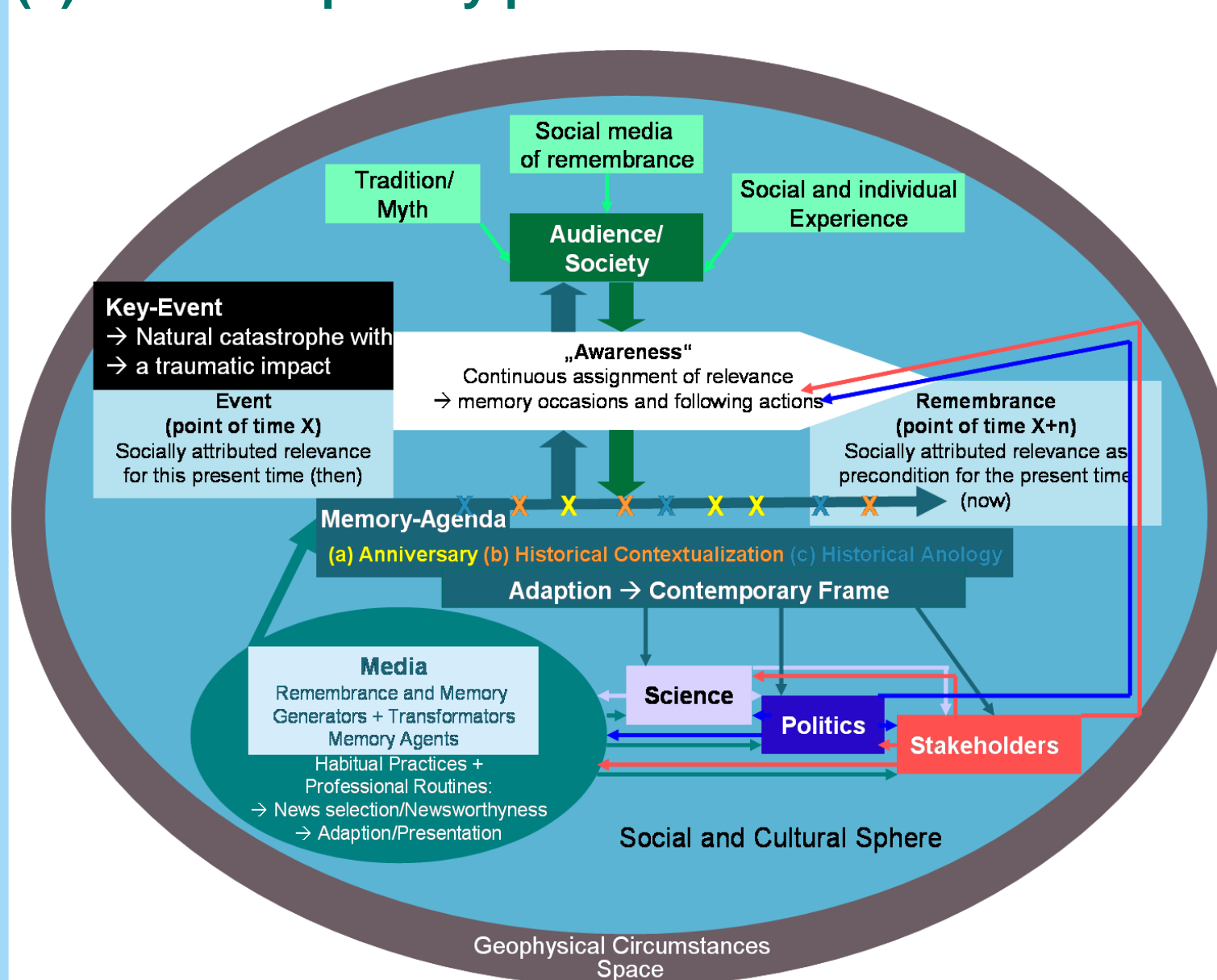
The School of Integrated Climate System Sciences SICSS
Climate change is one of the greatest challenges of our century. To meet it, a new generation of experts is needed who are able to think beyond the bounds of single disciplines. The School of Integrated Climate System Sciences (SICSS) joins climate system sciences such as meteorology, physical oceanography and biogeochemistry in one course of study. The English language program also integrates social and economic sciences as well as peace and conflict research.

The Graduate School IMPRS-ESM

The International Max Planck Research School on Earth System Modelling (IMPRS-ESM) offers an English PhD Program that is committed to promoting young academics (with Diplom/Masters degree) in the field of Earth system science. The IMPRS-ESM provides the setting to gain specific knowledge in Earth system modelling. It offers an interdisciplinary training in the Earth system sciences as well as opportunities for building a personal, international academic network.

www.klimacampus.de

(c) Interdisciplinary practice of research



Heuristic model

developed in the context of the interdisciplinary project „StarG – storm surges as regional geohazards“. Aim of this strictly qualitative model is the visualisation of complex processes and the interplay of diverse (natural and social) factors and agents which are part of a regional geohazard.

References:

- Crutzen, P./Stoermer, E. (2000): The "Anthropocene", in: Global Change Newsletter 41: 17-18.
- Funtowicz, S./Ravetz, J. (1993): The Emergence of Post-Normal Science, in: R. von Schomberg, ed., Science, Politics, and Morality. Scientific Uncertainty and Decisionmaking, Dordrecht, Boston, London: Kluwer Academic Publishers.
- Gibbons, M./Limoges, C./Nowotny, H. (1995): The new Production of Knowledge: The Dynamics of Science and Research in contemporary Societies. London: Sage.
- Meadows, De./Meadows, Do./Zahn, E./Milling, P. (1972): The Limits to Growth. New York: Universe Books.
- Weingart, P. (1997): Neue Formen der Wissensproduktion: Fakt, Fiktion und Mode. IWT-Papier 15.

European Geosciences Union General Assembly 2011

Vienna | Austria | 03 – 08 April 2011