

Conference:
**Models, Simulation and the Reduction of
Complexity**



Hamburg, 18.03.2010 - 19.03.2010

Synopsis

In modern science, complexity is a common feature in models of real world systems. The complexity may be due to various factors: from the sheer size of systems (neurology, climatology), to the high resolution of small scale phenomena in otherwise well understood systems, to the challenge of controlling a system or of designing an optimal shape in engineering. No matter what the origin of such complexity may be, the goal is always to reduce the complexity in a way that makes the problem tractable. Such a reduction can be achieved by improving model assumptions based on first principles, by the elimination of variables, reducing the relevant subsystems etc. In any case such a reduction of complexity has implications for the validity and the precision of the theoretical findings.

The aim of this interdisciplinary conference is to discuss methodological and epistemological problems arising in this context. Eight renowned experts from climate research, cognitive science, cosmology, economics, mathematics, process technology, psychology, and sociology will introduce some of their modelling and simulation projects. Commentaries by philosophers of science will complement these presentations. There will be a focus on methodological parallels and discipline-specific differences between various approaches to modelling and simulating. We will ask: how do different disciplines manage to capture the complexity of a specific scientific phenomenon in a (relatively) simple theoretical model? Are the strategies employed essentially the same in all disciplines? If not, can any disciplines successfully import methodological strategies from other disciplines? What is the relation between a model and a simulation? And how does the availability of large-scale computers change the nature of science?

Organizers: Ulrich Gähde (Universität Hamburg), Stephan Hartmann (Tilburg University), Jörn Henning Wolf (Christian-Albrechts-Universität Kiel)

Keynote Speakers

Matthias Bartelmann (Heidelberg), Martin Golubitsky (The Ohio State University), Uskali Mäki (Helsinki), Julian Reiss (Rotterdam).

Program

Thursday 18.03

09:00 - 09:15	Welcome by Prof. Dr. Heimo Reinitzer, President of the Akademie der Wissenschaften in Hamburg
Session 1	Chair: Reiner Lauterbach
09:15 - 10:00	Matthias Bartelmann: <i>Cosmology, the largest possible model?</i>
10:00 - 10:30	Andreas Bartels: <i>Philosophical commentary</i>
10:30 - 10:45	<i>Coffee break</i>
10:45 - 11:30	Martin Golubitsky: <i>Patterns in Physical and Biological Systems</i>
11:30 - 12:00	Thomas Reydon: <i>Philosophical commentary</i>
12:00	<i>Discussion</i>
<i>Lunchbreak</i>	
Session 2	Chair: Ulrich Gähde
02:30 - 03:15	Dirk Helbing: <i>Understanding the Foundations of Society: Promises of a Multi-Disciplinary Dialogue</i>
03:15 - 03:45	Stephan Hartmann: <i>Philosophical commentary</i>
03:45 - 04:00	<i>Coffee break</i>
04:00 - 04:45	Dr. Uskali Mäki: <i>Economic modelling as theoretical experimentation and surrogate reasoning</i>
04:45 - 05:15	Julian Reiss: <i>Philosophical commentary</i>

Friday 19.03

Session 3

09:00 - 09:45

Chair: Brigitte Röder

Peter KÖnig: *The brain formula*

09:45 - 10:15

Markus Werning: *Philosophical commentary*

10:15 - 10:30

Coffee break

10:30 - 11:15

Reinhold Kliegl: *Evaluating a Computational Model of Eye-Movement Control in Reading*

11:15 - 11:45

Martin Hoffmann: *Philosophical commentary*

11:45

Discussion

Lunchbreak

Session 4

Chair: Edwin Kreuzer

02:15 - 03:00

Wolfgang Marquardt: *Identification of Kinetic Models by Incremental Refinement*

03:00 - 03:30

Robin F. Hendry: *Philosophical commentary*

03:30 - 03:45

Coffee break

03:45 - 04:30

Valerio Lucarini: *Modelling Complexity the Case of Climate Science*

04:30 - 05:00

Georg Betz: *Philosophical commentary*

05:00 - 05:45

Discussion

05:45

Closing remarks