The Academy of Sciences and Humanities in Hamburg

The Academy of Sciences and Humanities in Hamburg was founded in 2004. Members of the Academy are scholars of all academic disciplines from northern Germany. One of its goals is to intensify interdisciplinary research and collaboration between universities and scientific institutions. The Academy promotes research on issues important for our future society as well as on fundamental scientific problems. Stimulating the dialogue between scholars and the public is of utmost importance to the Academy.

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Models, Simulations, and the Reduction of Complexity

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?

Schedule

Thursday, March 18th

09:00 Welcome
Prof. Dr. Heimo Reinitzer, President of the Akademie der Wissenschaften in Hamburg

Session I
Chair: Prof. Dr. Reiner Lauterbach (Universität Hamburg)

09:15 Cosmology, the largest possible model?
Prof. Dr. Matthias Bartelmann
(Ruprecht-Karls-Universität Heidelberg)

10:00 Philosophical commentary
Prof. Dr. Andreas Bartels
(Rheinische Friedrich-Wilhelms-Universität Bonn)

10:30 Coffee break

10:45 Patterns in Physical and Biological Systems
Prof. Dr. Martin Golubitsky (The Ohio State University)

11:30 Philosophical commentary
Prof. Dr. Thomas Reydons
(Leibniz Universität Hannover)

12:00 Discussion
Lunch break

Friday, March 19th

Session III
Chair: Prof. Dr. Brigitte Röder (Universität Hamburg)

09:00 The brain formula
Prof. Dr. Peter König (Universität Osnabrück)

09:45 Philosophical commentary
Prof. Dr. Markus Werning
(Heinrich-Heine-Universität Düsseldorf)

10:15 Coffee break

10:30 Evaluating a Computational Model of Eye-Movement Control in Reading
Prof. Dr. Reinhold Kliegl (Universität Potsdam)

11:15 Philosophical commentary
Dr. Martin Hoffmann (Universität Hamburg)

11:45 Discussion
Lunch break