

The Dahlem conference on Mathematics and Social Sciences

A brief report

In December 2008, about forty researchers – from mathematics, the social sciences, and other disciplines – met to think together about the question: „Is There a Mathematics of Social Entities?“.

This was 98th Dahlem-conference, building on a tradition of rather unusual scientific gatherings. While the standard format of academic conferences is based on presentations of single papers that are then briefly discussed until the next presentation follows, here scholars meet to discuss a sequence of connected topics on the basis of several papers that they read beforehand. And they do so for a full week, staying in the same place so as to have plenty of opportunity for informal conversations as well. Time and again, out of these gatherings interesting thoughts, publications, and research activities have evolved.

The question that formed the focus of this conference arose out of practical experiences with the joys and difficulties of cooperation between mathematicians and social sciences, as they arise in fields as diverse as climate research, the study of financial markets, criminology, and others.

The question has far-reaching ramifications, tying in with to two key episodes in what has been called the conversation of humankind. In Ancient Greece, thinkers like Pythagoras, Euclides, and Plato tried to come to terms with the amazing fact that talk about intangible things like numbers, infinite lines and perfect shapes was extremely helpful in building tangible things like musical instruments (where relations between sounds depended on proportions between the length of chords), temples and other buildings (where the properties of rectangular triangles, but also of circles, were pervasive). Much later, in Europe after the Middle Ages, scholars like Newton, Leibniz, and Descartes started an amazing dialogue between two traditions of inquiry that would become known as mathematics and physics. Over the past centuries, these two disciplines have kept challenging and inspiring each other, providing concepts and methods that were indispensable to support the amazing development of modern technologies. In particular, notions of space, time, probability, causality, and more, became intertwined with the world of real numbers, derivatives, differential equations, and computation. With one exception, the social sciences remained peripheral to this development, using bits and pieces of mathematics here and there, but without trying to organize their thoughts around a comprehensive mathematical fabric. The exception was economics, where our contemporary understanding of how markets work was based on the mathematical tools that had been developed in the dialogue with physics. And the question now arises whether in the decades to come the dialogue between the social sciences and mathematics could inspire some of the discoveries that we will need to tackle the challenges of the future.

The conference deliberately focussed on three rather specialized areas of current research:

- A. Modelling Financial Markets,
- B. Modelling Crime, and
- C. Modelling Innovative Regions.

A fourth, cross-cutting theme was added under the heading:

- D. Models, Metaphors, and Visualisation

The first theme couldn't have been more timely, as the financial crisis of 2008 exposed with painful clarity the need for drastic improvements in the art of modelling financial markets.

The weaknesses of current models were analyzed and, more importantly, venues for promising research identified. Three aspects may be highlighted here: the promise of multi-agent modelling approaches, the importance of coordination problems, and the necessity of using numerical techniques to handle models that defy analytical solutions. These issues showed up in the discussions on the other topics as well.

The present note cannot do justice to the wealth of ideas, insights, and conjectures that were shared and improved during the conference. Suffice it to say that several publications, including a comprehensive volume based on the conference, are in preparation, that several research cooperations have already emerged out of it, and that the conversation of this Dahlem conference will definitely continue. In fact, the Dahlem conference could already build on the workshop „Toward the Next Generation of Climate Policy Models“ organized by the European Climate Forum (ECF), November 13-14, 2008, in Berlin. A next workshop on „Agent Based Modelling for Sustainable Development“, organized by ECF together with the Global Systems Dynamics (GSD) EU-research project has been scheduled for April 2-4, 2009, in Venice, and more will follow.

Potsdam, March 31, 2009
Carlo C. Jaeger

Dahlem Konferenzen
Workshop Schedule

Sunday	14.00–18.45	Registration: all participants	
	17.00–18.00	Working Session: <i>This meeting is obligatory for all chairpersons, moderators, and rapporteurs.</i>	
	19.00	Opening Session: <i>It is important that all participants attend this opening session/dinner as it is integral to establishing the group dynamics of the week.</i>	
Monday	9.00	Plenary Discussion:	
	10.00–12.30	Agenda Session (simultaneous sessions) <i>Topics for discussion are debated and prioritized by the discussion groups. Each group finalizes an agenda for the week’s discussion, which is then prepared for distribution after lunch.</i>	
	12.30–14.00	Lunch	
	14.00–15.00	Presentation of the Group Agendas (plenary session) Group 1: D. Colander, Moderator Group 2: H. Berestycki, Moderator Group 3: C. Jaeger, Moderator Group 4: R. Klein, Moderator <i>Moderators present the group agendas. Discussion follows to sort out overlap and/or to rectify possible omissions.</i>	
	15.00–16.30	Groups 1 & 2 meet simultaneously <i>Participants not assigned to a group in session attend discussions on topics of their choice.</i>	
	16.15–16.45	Coffee is available.	
	16.30–18.00	Groups 3 & 4 meet simultaneously <i>Participants not assigned to a group in session attend discussions on topics of their choice.</i>	
	19.00	Dinner and informal discussion	
	Tuesday	9.00–12.30	Groups 1 & 3 meet simultaneously <i>Participants not assigned to a group in session attend discussions on topics of their choice.</i>
		11.15–11.30	Coffee break
12.30–13.30		Lunch	
13.30–17.30		Groups 2 & 4 meet simultaneously <i>Participants not assigned to a group in session attend discussions on topics of their choice.</i>	

Coffee Break (15.45–16.00)

19.00 Dinner

Wednesday

9.00–12.30 **Groups 1 & 4** meet

Participants not assigned to a group in session attend discussions on topics of their choice.

Coffee Break (10.30–10.45)

12.30–13.30 Lunch

13.30–17.00 **Discussion Groups 2 and 3**

Participants not assigned to a group in session attend discussions on topics of their choice.

Coffee Break (15.30–15.45)

19.00 Dinner and informal discussion

Thursday

9.00–12.00 **Report Session** (groups meet to finalize material for their report)

Coffee is available (10.30–10.45)

12.00–13.00 Lunch

Afternoon Rapporteurs write the first draft of the group report.

Free afternoon for all other participants.

Friday

9.00 Distribution of the Reports — Reading Time

Draft reports are available at the workshop registration desk for preparation of the plenary discussion in the afternoon.

12.00–13.30 Lunch

German Press Conference (German-speaking representatives from the workshop will need to represent the individual discussion groups.)

13.30–14.15 Discussion of the Group Reports (plenary session)

Group 1

14.15–15.00 Group 2

15.00–15.15 Coffee break

15.15–16.00 Group 3

16.00–16.45 Group 4

16.45–18.00 **Final Report Session** (simultaneous sessions)

19.00 **Farewell Meeting**

Participants of the Dahlem Conference
„Is There a Mathematics of Social Entities?“

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