

EPSA 2011

SYMPOSIUM PROPOSAL

SECTION 1. General philosophy of science

SYMPOSIUM TITLE: New Challenges for Philosophy of Science

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OTHER SYMPOSIUM SPEAKERS:

Daniel Andler, Dept. of Philosophy, Université Paris-Sorbonne, and Institut Universitaire de France, Dept. of Cognitive Science, Paris, France, [Daniel.Andler@ens.fr](mailto:Daniel.Andler@ens.fr)

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Olav Gjelsvik, CSMN, University of Oslo, Norway, [olav.gjelsvik@ifikk.uio.no](mailto:olav.gjelsvik@ifikk.uio.no)

CHAIR:

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SYMPOSIUM GENERAL DESCRIPTION:

This symposium is organized from within the ESF Research Networking Programme “The Philosophy of Science in a European Perspective” ([www.pse-esf.org](http://www.pse-esf.org)), which involves scholars from twenty-two European countries working on the philosophy and foundations of the sciences. The Programme aims at enhancing European tradition in the philosophy of science, voicing European research in the field, and promoting exchanges between scholars from all over Europe, acting in strict cooperation with the EPSA. The symposium is planned as one of the PSE activities, whose general guiding-topic in 2011 is “The sciences that philosophy has neglected”.

Since its very beginning and for a few decades philosophy of science mostly focused on the natural sciences, whose scientific status was regarded as rigorous and well-established, and hence capable of setting the parameters for discourse about science. Philosophical investigations largely addressed such topics as the nature of scientific theories and the relationships between observation and theory, taking physical theories as their privileged – although not exclusive – ground of inquiry. However, the original scientific conception of

the world put forward by logical empiricists concerned also a number of other disciplines, such as history, sociology, psychology, pedagogy, biology and economics, and had among its main aims the methodological unification of the sciences and the elaboration of an Encyclopedia of Unified Sciences. In the last few years, philosophy of science has been widening its range of interests and devoting specific attention to emerging disciplines that had been previously neglected, such as medicine, archaeology, cognitive science, artificial intelligence, design studies, engineering, ecology and environmental sciences. This recent trend has been increasingly highlighting the relevance of disciplinary specificities for any reflection on methodological and foundational matters. Given their distinctive features, emerging disciplines call themselves for conceptual and methodological clarification, and hence stimulate and encourage deeper exchanges between the sciences and philosophy of science. This symposium aims at showing how contemporary philosophy of science interacts with some of the above mentioned emerging scientific disciplines, considering the most specific problems it is required to tackle and the toolboxes it employs. It will be stressed how a foundational and methodological analysis of disciplines as medicine, design research, cognitive science, and climate studies, is being pursued, among the rest, through a clarification of crucial concepts such as those of scientific explanation, prediction, reduction, and through studies on multilevel model building. Close attention will be devoted to how theoretical issues and the ways in which they are addressed are intertwined with the distinctive practical exigencies and application purposes of these disciplines. It will be argued that this focus on the most recent and innovative trends in philosophy of science is also going to shed some light on what its future developments and new directions will most likely be.

The symposium is going to start by considering how philosophy of science has become better and better at understanding the actual practice of various scientific disciplines (e.g., brain science, decision science and social science), and how such insights allow to provide methodological suggestions about how these disciplines ought to be practiced. Olav Gjelsvik will put a specific focus on the recent trend working towards a “philosophy of philosophy”, on a par with philosophy of biology, philosophy of mathematics, etc. Some discussions will be elaborated on what is distinctive of philosophical methodology, and on what relationships hold between philosophical methodology and the methodology of the sciences. An account will be given of some philosophical work which clearly portrays the philosophical activity as integrated with other disciplines: we will be thus presented with a picture of philosophy as continuous with the sciences, as dependent on knowledge in a wide range of disciplines, and as potentially highly relevant for the same disciplines.

The second contribution, by Daniel Andler, is meant to analyze philosophical methodology as it emerges from the relations between philosophy and cognitive science, and to do justice to the philosophy of cognitive science. The multiple ways in which philosophy and cognitive science are linked will be considered, and limitations in conceiving of the philosophy of cognitive science will be deeply examined, both from a descriptive and from a normative standpoint. More specifically, it will be argued that a current form of “cognitive philosophy”: i) fails to recognize the perspectival function of philosophy; ii) fails to bring

out the kinship of the field with philosophy of science as a parent discipline; iii) restricts its role to constructive, internal criticism, ruling destructive criticism out of bounds. With the help of comparisons with other branches of philosophy of science, examples will be provided of actual work which fails to fit the narrow construal of cognitive science as “cognitive philosophy”, yet seems to belong to its very core.

Among the emerging sciences, attention will then be devoted to science-based design or, simply, design research, which in modern science plays a role not only in technical sciences, but in almost all academic disciplines, within the natural and the social sciences, and the humanities (e.g. nanotechnology, drug research, revalidation research, speech technology, ...). In the third contribution, by Theo Kuipers, some epistemological and methodological features of design research will be highlighted by distinguishing three levels which enable the comparison with descriptive and explanatory research. In these areas, the level distinction of laws, theories, and research programs is held to provide an illuminating viewpoint; similarly, relevant levels are taken to be the levels of technical norms or rules, structure-function theories, and design research programs. The paper will propose ways to represent the aims and means in specific cases of design research at each level in order to highlight the similarities and differences with cases of descriptive and explanatory research.

Such epistemological issues as description and explanation, as well as prediction and intervention, are being largely addressed also within the philosophy of medicine, which is increasingly involved in the clarification of methodological and conceptual tools employed in the health sciences. In the fourth paper Raffaella Campaner will show how deeper enquiries into the peculiar features and purposes of different disciplinary fields within medicine, carried on from the standpoint of philosophy of science, are contributing to the elaboration of different models. It will be argued that a closer inspection into the actual characters of clinical medicine, bio-molecular research, epidemiology, psychiatry, is playing a decisive role in answering the wide quest for adequate models in various contexts.

Finally, the elaboration of predictive models will be examined with respect to another, very specific emerging discipline, that is climate studies. In the last contribution Roman Frigg will investigate how and why exactly probabilistic predictions break down in climate models, and develop alternative methods to get around the problem. Two questions will be considered: 1) why and how exactly do probabilistic forecasts break down if chaos is paired with model error?; 2) is there another method to make forecasts? The answer to the first question lies in the structural instability that characterizes many chaotic models and in the fact that probabilities are not the right tool to account for uncertainties that occur in climate models. The tentative answer to the second question is that probabilism should be renounced. It will be suggested that probabilistic reasoning should be given up altogether, that models should be employed to calculate non-probabilistic odds for certain events, and that these should be used to guide decision-making.

Through all such multi-faceted reflections the symposium intends to show how philosophy is starting to look more interdisciplinary than most other disciplines without losing anything important to its own identity, and

how the relationship between philosophy and philosophy of science is becoming interesting in a number of new ways.

Symposium papers:

1. “Philosophy as interdisciplinary research” - Olav Gjelsvik
2. “Philosophy of cognitive science as a distinct enterprise” - Daniel Andler
3. “Philosophy of design research” - Theo Kuipers
4. “Philosophy of medicine and model design” - Raffaella Campaner
5. “Decision-making with climate models” - Roman Frigg

## **SYMPOSIUM ABSTRACTS and CVs**

**OLAV GIELSVIK**, CSMN, University of Oslo, Norway

### **Abstract** – “Philosophy as Interdisciplinary Research”

Philosophy of science has over time become better and better at understanding how various disciplines are actually practiced, and such insight are of fundamental importance in order to provide suggestions and methodological advice about how the disciplines ought to be practised. However, this general type of approach has not been extended to philosophy itself. On the other hand, there is a new trend in philosophy, not unconnected with issues in philosophy of science, working towards a 'philosophy of philosophy' on a par with philosophy of biology, philosophy of mathematics etc. There is, furthermore, substantive disagreement herein as to whether philosophy as a discipline is set apart from other disciplines, by for instance basing itself on *intuitions* and having conceptual insights as its aim, or whether there is no such separateness, and perhaps no such aim as pure conceptual insight. Alvin Goldman represents the first line and writes, “One thing that distinguishes philosophical methodology from the methodology of the sciences is its extensive and avowed reliance on intuition.” Herman Cappelen’s new book has its advice in its title: “Philosophy without Intuitions.” In it he claims that Goldman’s claim is a failure both descriptively and normatively.

This talk will be a contribution on Cappelen’s side to this dialectical situation, by providing an account of some philosophical work that very clearly portrays the philosophical activity as in no way isolated from other disciplines but rather integrated into them, and also portrays work in those disciplines as being potentially integrated with issues in philosophy. I shall use one main example to bring this out, and that is the hugely interesting phenomenon on addiction. There is wide agreement that addictive actions typically by their very nature exhibit some impairment in autonomy, but in order to understand this claim, and thereby to understand more fully things like addiction and autonomy, we need work in philosophy and work in a number of other disciplines including brain science, decision science and social science. In some of these

cases brain science and decision science can pull in different directions when it comes to assessing the more controversial philosophical issues about how to see human motivation. It turns out that to make progress in philosophy in understanding of one of the most central philosophical concepts (autonomy or free will) we have to put aside Goldman's thesis above (a thesis which has a wide range of problems connected with it anyway, not least around explaining what intuitions are.) We are left with a picture of philosophy as continuous with the sciences, as depended on knowledge in a wide range of disciplines, and as potentially highly relevant for the same disciplines. On reflection philosophy starts to look more interdisciplinary than most other disciplines without losing anything important to its own identity, and the relationship between philosophy and philosophy of science becomes interesting in new ways.

## **CV**

Full name: Olav Gjelsvik,

Date and place of birth: 30.06.56, Røros, Norway

Marital status: married, one daughter.

Address: Røveien 16B, 0752 Oslo

Present occupation: Professor in Philosophy, University of Oslo

### **Education:**

1972-75: Examen Artium

1975-80: Cand. Mag, University of Oslo

(1981-82: National Service)

1982-83: Visiting Postgraduate Student, Balliol College Oxford

1983-86: Postgraduate student for the degree of Doctor of Philosophy, Balliol College, University of Oxford. Thesis entitled "The Token-Token Identity-Theory and Recent Theories of Reference" submitted Trinity Term 1986.

Graduated from Oxford as Doctor of Philosophy early 1987.

### **Scholarships:**

1982-84: Brynie-Jordan Scholarship at Balliol College

1983-86: Anderson Scholarship, Balliol College

1984-85: British Council Scholarship

1985-86: Overseas Research Scholarship, awarded by the committee of Vice-Chancellors and Principals of the Universities of the United Kingdom

1989-90: Norwegian Research Council Fellowship to do research at the University of California, Berkeley

1989-90: Scholarship from the Norway-America Association to do research at the University of California, Berkeley

1994-95: Scholarship from the Norwegian Research Council to do work in the Addiction Project (Addiction-Rationality and Irrationality, project running from

1993 to 1997, organised by Jon Elster.)

1995:Scholarship from the London School of Economics, University of London, to be a Visting Scholar at The Centre for Philosophy Science.

2001: Scholarship from the Norwegian Research Council to do research at the University of Oxford.

2008 Large 3 year Research project from Norwegian “Research Council, Addiction, Choice and Responsibility.”

**Positions:**

1986-90 Research fellow, Department of Philosophy, University of Oslo

1989-90 Honorary Research Associate, University of California, Berkeley

1991- 94 Associate Professor (Senior Lecturer) in Philosophy, University of Oslo

1994- present Professor of Philosophy, University of Oslo

2000-01 Visiting Fellow and Oliver Smithies Lecturer, Balliol College, Oxford.

2003/4 Director of the international project “Towards a New Understanding of the Mental “at the Centre for Advanced Study, The Norwegian Academy of Science and Letters.

2007- Research Director, Centre for the Study of Mind in Nature, a centre of excellence at the University of Oslo, funded by the Norwegian Research Council.

2010 – Director, Centre for the Study of Mind in Nature, a centre of excellence at the University of Oslo, funded by the Norwegian Research Council.

**Scientific Societies:**

Member/Fellow of The Norwegian Academy of Science and Letters since 2002.

**Offices:**

Many offices at the University of Oslo:

Chairman of the Section of Philosophy, 1991-92.

Chairman, Department of Philosophy, 1997-2000.

Chairman of The Section of Philosophy, 2003 until 2005.

Chairman of Group 3, Norwegian Academy of Science and Letters, 2005-present

**Talks:** Talks at very many conferences and at many European and American Universities through the years.

**DANIEL ANDLER, Université Paris-Sorbonne & IUF, France**

## **Abstract** – “Philosophy of cognitive science as a distinct enterprise”

Philosophy and cognitive science are linked in multiple ways. The simplest connection is partial identity: a part of philosophy coincides with a part of cognitive science. According to philosophical naturalism, this is actually the only, or at least the paradigm connection—philosophy and science are ‘continuous’, they seek both synthetic knowledge regarding aspects of the world, in this case, the ‘mind/brain’. Philosophers of mind, of language, of action are, or should be, according to this view, cognitive scientists, and this is where the philosophers’ contribution to the topic ends, or should end. (Philosophical) naturalists do not deny philosophers, of course, the right to be critical of certain ideas or directions in cognitive science; but again, according to them, this critical function is continuous with the scientists’ own critical role within their field. Nor is the naturalist saying that philosophers working on cognition are exactly *like* the other scientists in the field: they focus on certain issues for which their theoretical, abstract bent and their traditions give them a lead. Still, this form of ‘cognitive philosophy’ is widely seen as filling the bill of philosophy of cognitive science, as witnessed by most encyclopedic articles, chapters or books devoted to the topic.

This view, although partially correct in that it does reflect an important trend among philosophers involved in cognitive science, does not do justice to philosophy of cognitive science. First, it fails to recognize the perspectival function of philosophy, trying to bring out ‘how it all hangs together’, an obligation which philosophy of cognitive science should not shy away from. Second, it fails to bring out the kinship of the field with philosophy of science as parent discipline, and the philosophies of the various sciences as sister disciplines. Finally, it restricts its critical role to constructive, internal criticism, ruling destructive criticism out of bounds.

From both a descriptive and a normative standpoint, these limitations are unwelcome. I will try and bolster my case with the help of comparisons with other branches of philosophy of science, and will provide examples of actual work which fails to fit the narrow construal of philosophy of cognitive science as ‘cognitive philosophy’ yet seems to belong to its very core.

## **CV**

Daniel Andler holds doctoral degrees in mathematics from UC Berkeley and Paris. After specializing in model theory and teaching mathematics in various universities in and around Paris, he moved to positions in philosophy in Lille and then Nanterre. He has been the professor of philosophy of science and epistemology at Université Paris-Sorbonne since 1999. He was for many years co-director and then briefly director of CREA (Centre de recherche en épistémologie appliquée, Ecole polytechnique and CNRS, Paris). In 2000 he founded the Department of Cognitive Studies at Ecole normale supérieure, Paris, and was its head until 2005. In 2007 he was elected to senior membership in the Institut universitaire de France. He now heads “Rationalités contemporaines”, a research group within Paris-Sorbonne. He is in charge of the master’s program in philosophy of science and epistemology at Paris IV, and heads the master’s program in cognitive science co-administered by Ecole normale supérieure, EHESS and Université René Descartes (Paris V).

He was a founding Board member of the European Society for Philosophy and Psychology (ESPP) and the founding President of the Société de philosophie des sciences. He served a four-year term as vice-president of the Division of Logic, Methodology and Philosophy of Science (DLMPS) of the International Union of History and Philosophy of Science.

A philosopher of science, Andler has written mostly on the foundations of cognitive science and its relation to the sciences of man; his work extends now to general and social epistemology. He is also interested in applying philosophy of science and cognitive science to areas of broad human concern, such as science-based policy-making and technology-enhanced education. He is author, co-author or editor of several books, among which *Introduction aux sciences cognitives* (2<sup>nd</sup> edition 2004), *Philosophie des sciences* (2002), and is completing a book on naturalism.

**THEO KUIPERS**, University of Groningen, The Netherlands

**Abstract** – “Philosophy of design research”

“Not so very long ago most philosophers of science maintained that the subject-matter of this volume was uninteresting [...]. It was thought to be uninteresting because technology was taken to be an applied science in which the application itself presented no new philosophical challenges.”

From Anthonie Meijers’ editorial introduction to *Philosophy of Technology and Engineering Sciences*, Vol. 9 of the *Handbook of the Philosophy of Science*, Elsevier, 2009, p.1, 1453 pp.

The message of Meijers is very true, even in the much wider sense of disinterest in design and applied sciences in general. Sure, there have been exceptions, e.g. Von Wright (1963), Simon (1969), Bunge (1985), and in the last two decades there is a growing interest, witness the volume referred to, containing 41 contributions.

In this paper I will focus on science-based design or, simply, design research. Speaking of ‘design sciences’ is misleading because in modern science there is design research in almost all academic disciplines, not only in the technical sciences, but also within the natural and the social sciences and the humanities.

I will highlight some epistemological and methodological features of design research by distinguishing three levels which enable the comparison with descriptive and explanatory research. In the latter areas the level distinction of laws, theories, and research programs provides an illuminating viewpoint (Kuipers, 2007). Similarly, we have the levels of technical norms (Von Wright (1963), Niiniluoto (1993) or technical rules (Banse and Grunwald, 2009), structure-function theories, and design research programs (Kuipers et al., 1992).

According to Niiniluoto (1993), applied research serves epistemic and practical utilities and focuses on the establishment of technical norms, that is, norms of the form (strongest): “If you want *A*, and you believe that you are in a situation *B*, then you ought to do *X*”. He argues that such norms have a truth value and can be supported by basic research.

To actually represent, usually very complex, cases of design research, e.g. drug research, speech technology, nanotechnology, food technology, in such norms one needs additional representational means. As argued in (Kuipers et al., 1992), the aim of (complex) design research can be adequately represented in terms of desired and operational profiles of properties of the products to be made. After adding the crucial distinction between structural and functional profiles, structure-function theories can be formulated, tested, and improved.

Finally, the development of a design research program, assumed to be guided by some core idea, the so-called 'lead', can be described as a sequence of changing profiles, enabling to easily indicate similarities and differences with descriptive and explanatory research, notably their respective kinds of progress. Moreover, the cooperation between a design and one or more other research program can be described as that between a guide program and supply programs (Zandvoort, 1986).

Kuipers, T., Vos, R. and Sie, H., 1992, "Design research programs and the logic of their development", *Erkenntnis*, 37.1, 37-63.

Niiniluoto, I., 1993, "The aim and structure of applied research", *Erkenntnis*, 38.1, 1-21.

## CV

Theo A.F. Kuipers (1947) studied mathematics and philosophy in Eindhoven and Amsterdam. He is emeritus professor of philosophy of science of the University of Groningen. A synthesis of his work on confirmation, empirical progress, and truth approximation, entitled *From Instrumentalism to Constructive Realism*, appeared in 2000, in the *Synthese Library*. A twin synthesis of his work on the structure of theories, research programs, explanation, reduction, design research and computational discovery and evaluation, entitled *Structures in Science*, appeared in 2001, with a chapter on design research programs. In 2002 he published a paper in *Synthese*, entitled, *Beauty, a road to the truth*.

In 2005 there appeared two volumes of *Essays in Debate with Theo Kuipers*, with in total 34 essays related to the two books and the paper, edited by Roberto Festa, Atocha Aliseda and Jeanne Peijnenburg: *Confirmation, Empirical Progress, and Truth Approximation* and *Cognitive Structures in Scientific Inquir*, (*Poznan Studies in the Philosophy of the Sciences and the Humanities*, Vol. 83 and Vol 84. Amsterdam / New York : Rodopi, 2005).

He edited Volume 1 (2007) of the *Handbook of the Philosophy of Science* (Series editors Dov Gabbay, Paul Thagard and John Woods, Elsevier, Amsterdam), entitled *General Philosophy of Science: Focal Issues*, with an introduction on the role and nature of explication in philosophy of science.

Two his most recent publications are:

"Empirical progress and Truth Approximation by the 'Hypothetico-Probabilistic Method'", *Erkenntnis*, 70.3, 2009, 313-330.

"Comparative realism as the best response to antirealism". In *Logic, Methodology and Philosophy of Science*. Proceedings of the Thirteenth International Congress (August 9-15, 2007, Beijing), eds. Clark Glymour, Wang Wei and Dag Westerstahl. King's College Publications, London, 2009, pp. 221-250.

**RAFFAELLA CAMPANER**, University of Bologna, Italy

**Abstract** - "Philosophy of medicine and model design"

Philosophy of medicine has been taking shape as a branch of philosophy of science quite recently – with its most eminent first works being published roughly since the end of the Eighties – and has been increasingly expanded in the last few years, with conferences and journals specifically devoted to philosophical reflections on medicine as a scientific discipline. While at its beginning philosophy of medicine highlighted its specificity especially with respect to bioethics and philosophy of biology, nowadays it is mainly with respect to the so-called "medical humanities" that the peculiar character of its reflections must be stressed. Whereas medical humanities – whose general "humanizing medicine" program is having great success – work at the crossroads between medicine and such disciplines as literature, music, theatre and art, philosophy of medicine is progressing in shedding some light on methodological features and conceptual tools employed in scientific medicine.

This paper is meant to show, in particular, how deeper enquiries into the features and purposes of different disciplinary fields within medicine, carried on from the standpoint of philosophy of science, are contributing to the elaboration of different models. A closer inspection into the actual characters of, for instance, clinical medicine, bio-molecular and pharmacological research, epidemiology and psychiatry, is playing a decisive role in answering the wide quest for adequate descriptive, explanatory and predictive models in various contexts. These are also accompanied by the shaping of different – more or less complex and integrated – models of health and disease, which, in turn, can enhance different aspects of both scientific practice and health policy, and have a strong impact on them. For example, while in clinical medicine the focus is entirely on the patient, seen as a token, and a logic of diagnosis needs to be drawn, in bio-molecular or pharmacological research type level causal inference and methodological issues regarding clinical trials are at stake. Epidemiology, in turn, is increasingly committed to the elaboration of complex interlevel models, including genetic and biological factors, as well as environmental and socio-economic determinants of health and disease, for explanatory and, even more, preventive purposes; furthermore, public health strategies call for the elaboration of models about diffusion and transmission of diseases, accounting for patterns of interactions between individual within populations. Finally, philosophy of psychiatry discusses multilevel interactions between genetic, neurophysiological and socio-economic factors in the arousal of disorders, with an extensive use of observational studies and strong interest for therapeutic strategies proving effective on tokens.

These examples will be employed to show how exchanges between medicine and philosophy of medicine are, on the one hand, leading to a deep and largely sought clarification of various issues in the medical context – such as the possible relations between explaining, predicting, and intervening – and, on the other hand, are calling for further philosophical reflections on such topics as processes, mechanistic models and reduction.

## **CV**

### **Degrees and working experience**

From March 2006: Lecturer in Logic and Philosophy of Science, Dept. of Philosophy, University of Bologna, Italy

September 2002 - February 2006: Research Assistant, Dept. of Philosophy, University of Bologna.

August 2000 - September 2001: Assistant Editor of *The British Journal for the Philosophy of Science*.

July 2000 - July 2002: Post-doctoral fellow, Dept. of Philosophy, University of Bologna.

February 2000: PhD in Philosophy, University of Trieste, Italy. Thesis in Philosophy of science.

September 1998: Master Degree in Philosophy, Dept. of Logic & Metaphysics, University of St. Andrews, UK. Master dissertation in Philosophy of physics.

July 1996: Bachelor degree in Philosophy, University of Trieste. Final grade 110/110 cum laude, dissertation in Philosophy of science.

### **Research interests**

My research has been mainly focusing on scientific explanation and causation. I considered models of explanations in the sciences as elaborated in the last couple of decades, devoting a special attention to the changing attitudes towards lawlike, causal, unificationist, functional and pragmatic elements. With regard to causation, I started focusing on process theories of causation, and then investigated mechanist, manipulative (interventionist and agent-related) and counterfactual accounts. The overall guiding-line of my research on both explanation and causation has been the search of intersections and complementarities between different and apparently diverging views.

The main line of my most recent research has been within philosophy of medicine. I wrote a volume on causation and explanation in philosophy of medicine, which puts forward a pluralistic perspective on the notion of cause based on the analysis of some epistemological aspects of medicine as a scientific field, and of some specific clinical and therapeutic cases (viruses and infective diseases; tumours; HIV-AIDS). I'm currently working on the role and influence of notions such as law, function and cause with respect to diagnosis, explanation of disease, prognosis and therapy, as well as on epidemiological causal models.

### **Selected recent publications**

- “Causal Medical Reasoning. Therapies and Pre-emption”, in M.C. Galavotti, R. Scazzieri, P. Suppes (eds.), *Reasoning, Rationality and Probability*, CSLI, 2007, pp. 253-270.
- “Plurality in Causality” (with M.C. Galavotti), in P. Machamer, G. Wolters (eds.), *Thinking About Causes*, Univ. of Pittsburgh Press, 2007, pp. 178-199.

- “Meccanismi e meccanicismi in medicina”, in P. Giaretta, A. Moretto, et al. (eds.), *Filosofia della medicina*. Il Mulino, 2008, pp. 453-479.
- “Reductionist and Antireductionist Stances in the Health Sciences”, in F. Stadler (ed.), *The Present Situation in the Philosophy of Science*, Springer, 2010, pp. 205-218.
- “Some Remarks on Causality and Invariance” (con M.C. Galavotti), in A. Carsetti (ed.), *Causality, Meaningful Complexity and Embodies Cognition*, Springer, 2010, pp. 211-230.
- “Understanding Mechanisms in the Health Sciences”, *Theoretical Medicine & Bioethics* 32, 5-17, 2011.
- “Causality and Explanation: Issues from Epidemiology”, in S. Hartmann, M. Weber, W. Gonzalez, D. Dieks, T. Uebel (eds.), *Explanation, Prediction, and Confirmation*. Springer, 2011, pp. 125-136 (in press).
- “La causalité des maladies et les déterminants de la santé”, in B. Fantini (ed.), *Histoire de la pensée médicale contemporaine*

**ROMAN FRIGG**, London School of Economics, UK

**Abstract** – “Decision-Making with Climate Models”

There is wide consensus in the scientific community that climate change is real: the climate does change. However, there is controversy over the extent to which anthropogenic greenhouse gas emissions are responsible for this change, over the extent to which reducing emissions would slow down (or even reverse) the increase in average global temperature, and over what the effects of global warming on local weather conditions are (e.g. how would it affect the coast line of Norway?). Having trustworthy answers to these questions is of eminent practical importance and governments turn to climate science for help. Climate science tackles these questions by using state of the art climate models, which are run on the largest computers available. Although the details are complicated, the basic methodology is simple: formulate equations of motion for the system, then put a probability distribution over initial conditions (which accounts for our lack of knowledge of the system's precise initial condition), and then move this distribution forward in time. The result of this calculation is a probability distribution over future events, which is commonly taken as a basis for making decisions.

However, upon closer examination it turns out that these calculations are virtually useless because distributions thus calculated are not decision relevant probabilities. This is because in climate models two problems come together: chaos and model error. Climate models are chaotic (in the sense that nearby initial conditions diverge very quickly) and they are far from perfect mirror images of their target systems (in fact, they involve many strongly counterfactual assumptions). If model error and chaos come together, probabilities in the model can diverge significantly from probabilities in the world and need not reflect at all what is going to happen in the world. This conclusion is supported both by in-principle arguments showing that probabilities are the wrong tool to account for the kinds of uncertainties that occur in climate models,

and by simulations in a simple chaotic system where the mismatch between model-probabilities and the system's behaviour become easily palpable.

This raises two questions. First, why and how exactly do probabilistic forecasts break down if chaos is paired with model error? Second, is there another method to make forecasts? The answer to the first question lies in the structural instability that characterises many chaotic models and the fact (mentioned above) that probabilities are not the right tool to account for uncertainties that occur in climate models. The tentative answer to the second question is that probabilism should be renounced. Models should be used to calculate non-probabilistic odds for certain events, and these should be used to guide decision making. The use of non-probabilistic forecasts and its superiority to probabilistic forecasts is illustrated in the simple system used above.

## CV

**Website:** [www.romanfrigg.org](http://www.romanfrigg.org)

### Current Academic Positions

2010- Reader in Philosophy (=Associate Professor), Department of Philosophy, Logic and Scientific Method, LSE.

2007- Deputy Director of the Centre for Philosophy of Natural and Social Science (CPNSS) at LSE.

### Selected Recent Publications

- *Beyond Mimesis and Nominalism: Representation in Art and Science*, Boston Studies in the Philosophy of Science, Vol. 262, New York and Berlin: Springer 2010, with Matthew Hunter.
- 'Confirmation and Reduction: A Bayesian Account', forthcoming in *Synthese* 179(2), 2011, with Foad Dizadji-Bahmani and Stephan Hartmann.
- 'Fiction in Science', forthcoming in John Woods (ed.): *Fictions and Models: New Essays*, Munich: Philosophia Verlag.
- 'Who's Afraid of Nagelian Reduction', *Erkenntnis* 73, 393–412, 2010, with Foad Dizadji-Bahmani and Stephan Hartmann.
- 'Fact and Fiction in the Neuropsychology of Art', forthcoming in Peter Goldie and Elisabeth Schellekens: *The Aesthetic Mind: Philosophy and Psychology*, Oxford: Oxford University Press.
- 'Everything You Always Wanted to Know About Structural Realism But Were Afraid to Ask', with Ioannis Votsis, forthcoming in *European Journal for Philosophy of Science*.
- 'Entropy – A Guide for the Perplexed', forthcoming in Claus Beisbart and Stephan Hartmann (eds.): *Probability in Physics*, Oxford University Press.
- 'Models and Fiction', *Synthese* 172(2), 2010, p. 251-268.
- 'Determinism and Chance from a Humean Perspective', in Dennis Dieks, Wenceslao Gonzalez, Stephan Hartmann, Marcel Weber, Friedrich Stadler and Thomas Uebel (eds.): *The Present Situation in the Philosophy of Science*. Berlin and New York: Springer, 2010, 351-372, with Carl Hoefer.

- ‘Typicality and the Approach to Equilibrium in Boltzmannian Statistical Mechanics’, forthcoming in *Philosophy of Science* (Supplement) 76, 2009, 997–1008.
- ‘The Philosophy of Simulation: Hot New Issues or Same Old Stew?’, *Synthese* 169(3), 2009, 593–613, with Julian Reiss.
- ‘Probability in Boltzmannian Statistical Mechanics’, in Gerhard Ernst and Andreas Hüttemann (eds.): *Time, Chance and Reduction. Philosophical Aspects of Statistical Mechanics*. Cambridge University Press, 2010, 92-118.
- ‘Why Typicality Does Not Explain the Approach to Equilibrium’, forthcoming in Mauricio Suárez (ed.): *Probabilities, Causes and Propensities in Physics*, Synthese Library, Berlin: Springer.

#### **Selected Recent Talks**

- ‘Who’s Afraid of Nagelian Reduction?’, Third conference of the ESF Research Networking Programme ‘The Philosophy of Science in a European Perspective’ (PSE), London, December 2010.
- ‘Fiction and Scientific Modeling’, Descartes Centre, University of Utrecht, November 2010.
- ‘Why Boltzmann Got it Almost Right After All’, PSA 2010, Montreal, November 2010, with Charlotte Werndl.
- ‘Decision-Making with Climate Models’, Modeling in the Social and Behavioral Sciences, Paris, May 2010, with Seamus Bradley.
- ‘Make-Believe and Scientific Modelling’, Model -Building and Make-Believe, Harvard University, March 2010.
- ‘Fiction and Scientific Modeling’, Caltech, April 2010.
- ‘Models and Fiction’, IHPST Colloquium, University of Toronto, March 2010.