401. Wilhelm and Else Heraeus Seminar

Evolution and Physics

Concepts, Models and Applications

Participants

Organizers

Final programme (as pdf) HERE

The presentations of the speakers are available in pdf format.
See List of speakers

Place: Physikzentrum Bad Honnef.

Date: 21.01.2008 – 23.01.2008 (arrival Sunday January 20, departure Thursday January 24)

Organizers: Prof. Marcel Ausloos, Prof. Werner Ebeling, Prof. Janusz Holyst, Faculty of Physics, Dr. Andrea Scharnhorst (contact person, e-mail: andrea.scharnhorst at vks.knaw.nl)

The number of participants to the workshop is limited and an application is needed to attend the workshop. We aim to bring together a group of experts with young scientists from physics and near disciplines. You can apply for the participation of the workshop by sending in a title and abstract for a poster to Andrea Scharnhorst. Please, include in your application contact details as institution, address, telephone etc..

The deadline for applications is December 4, 2007. In the case of a successful application you will be approached by the foundation in December.

The grant of the Heraeus Foundation for this workshop gives us the possibility to offer participants to attend the workshop for only 150,- Euros (which includes conference fee, accommodation and meals; travel is not included). Please notice, that we have only about 35 places available for participants.

Travel information (click here)
The workshop is granted and hosted by the Wilhelm and Else Heraeus Stiftung .

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Outline

Evolutionary thinking is from the very beginning a constitutive part of physics. In 19th century Mayer, Clausius and Helmholtz developed the physical view on the evolution of the universe and Ludwig Boltzmann was the first who connected physics with Darwin´s views on biological evolution. Nowadays, evolutionary concepts are solid constituents across all disciplines of physics, from elementary particle physics, to nuclear physics, biological physics to astrophysics. Several new branches of physics, as nonlinear dynamics, theory of self-organization, chaos theory etc. contributed much to the understanding and modelling of specific evolutionary processes. Recently, complexity theory and in particular complex networks are focussing on evolving emergent structures in very different systems.

Despite early pioneering work and on-going efforts to make use of physics as a heuristic tool to explore structural and dynamic features of complex systems of very different nature there is no specialty, institute or journal called *evolutionary physics*. Inside of the physics community the evolutionary approach became a paradigm which has been appropriated by very different areas. As a result physicists work on more generic and systemic problems of evolution often parallel to their professional duties. In difference to "evolution", notions as "self-organization", "chaos" and lately "complexity" became headings under which also evolutionary aspects have been addressed. We would like to stress that evolution and complexity are closely related, but not the same, the evolutionary point of view is surely unique. Since the paradigm change in physics after the Second World War towards irreversible, non-linear dynamic processes, evolutionary approaches have been discussed widely and extensively in

Evolutionary approaches have been discussed widely and extensively in different fields (for instance related to evolutionary algorithms, parallel processing, biological evolution and statistical physics, evolving networks). But, no conference has tried to bundle different physics views on evolution. The aim of this workshop is to bring together the different discourses scattered in different fields in physics and other disciplines which have been influenced by physical approaches. We are particularly interested in the links between the approaches to evolution in different scientific directions in physics (from the traditional thermodynamic one to the recent network based approaches). In bundling the different activities of physicists working on the topic of evolution the Heraeus Seminar is supposed to play a pioneering role. In the spirit of the well-known Macy Conferences (organized between 1946 and 1953, and leading to the foundation of cybernetics) where that time computer scientists, physicists and others came together to create a system-theoretical framework to understand complex systems, we will exploit and explore the knowledge of physicists on evolution spanning a tree from famous traditions in middle Europe to current global experiences. We will determine the state of the art of evolutionary thinking in physics with the aim to revisited the role of physics in the canon of sciences when trying to understand emergence and innovation.

We propose to collect a group of experts and young scientists from physics and near disciplines. The aim is, to bring together scientists interested in evolutionary approaches based on physics principles, to initiate new ideas and to catalyze collaboration. Moreover, bringing together different traditions of evolutionary thinking in physics and beyond we will make young scientists aware of the long tradition of this concept, its rich facets, and the already explored and not yet explored application areas for this specific view on evolution, emerging from the physics community but influencing also economy, sociology, information sciences, philosophy and history.

List of speakers

Prof. Peter Allen, Complex Systems Research Centre, Cranfield University, UK. [Presentation]

Prof. Marcel Ausloos, Institut de Physique, Université de Liège, Belgium

Prof. Rob Axtell, The Brookings Institution. U.S.A.

Prof. David Blaschke, Institute of Theoretical Physics, University of Wroclaw, Poland [Presentation]

Prof. Katy Börner, School of Library and Information Science, Indiana University, U.S.A. [Presentation]

Prof. Stefan Bornholdt, Complex Systems Lab, University of Bremen

Prof. Christian Van den Broeck, University of Hasselt, Belgium

Prof. S. Cebrat, Department of Genomics, University of Wroclaw, Poland [Presentation]

Prof. Werner Ebeling, Humboldt-University Berlin, Germany

Dr. Rainer Feistel, Baltic Sea Research Institute, Germany [Presentation]

Dr. Piotr Fronczak, Faculty of Physics, Warsaw University of Technology, Poland

Dr. Charles van den Heuvel, Virtual Knowledge Studio, Royal Netherlands Academy of Arts and Sciences, The Netherlands

Prof. Janusz Hołyst, Faculty of Physics, Warsaw University of Technology, Poland [Presentation]

Dr. Renaud Lambiotte, Université catholique de Louvain, Belgium [Presentation]

Prof. Loet Leydesdorff, Amsterdam School of Communications Research, University of Amsterdam, The Netherlands [Presentation]

Prof. Thorsten Pöschel, University of Bayreuth, Germany

Prof. Antonio Politi, Consiglio Nazionale delle Ricerche Istituto dei Sistemi Complessi, Italy

Dr. Araceli Proto, Laboratorio de sistemas complejos, Universidad de Buenas Aires, Argentina [Presentation]

Prof. Paolo Saviotti, Institut National de la Recherche Agronomique (INRA), Grenoble, France [Presentation]

Dr. Andrea Scharnhorst, Virtual Knowledge Studio, Royal Netherlands Academy of Arts and Sciences, The Netherlands [Presentation]

Dr. Johannes J. Schneider, Johannes Gutenberg University Mainz, Germany

Prof. Lutz Schimansky-Geier, Humboldt-University Berlin, Germany [Presentation]

Prof. Peter Schuster, President of the Austrian Academy of Sciences, Vienna, Austria [Presentation]

Prof. Frank Schweitzer, ETH Zurich, Switzerland

Prof. Gerald Silverberg, United Nations University-Maastricht Economic Research Institute of Innovation and Technology, The Netherlands [Presentation]

Prof. D. Stauffer, University of Cologne, Germany [Presentation]

Prof. D. Röß, Chairman of the WE-Heraeus Foundation, Germany

Prof. Mike Thelwall, School of Computing & Information Technology, University of Wolverhampton, UK [Presentation]

Prof. Gérard Weisbuch, Ecole Normale Superieure, Paris, France

Prof. Gerard Weisbuch, Ecole Normale Superieure, Paris, France
[Presentation]