



1st Ph.D. School

MATHEMATICAL MODELING OF COMPLEX SYSTEMS

Patras, July 18 – July 29, 2011

Center for Science Education, Platani, Patras

<http://www.eduscience.gr>

LECTURE PROGRAM

Sponsored by:

ASSYST (Action for the science of complex Systems and Socially intelligent icT), Open University, UK, the University of Patras, Inter-University Network “MABIPHYS” of the University of Patras and and G. Papasotiriou Bookstores

organized by:

**CENTER FOR RESEARCH AND APPLICATIONS OF
NONLINEAR SYSTEMS**

<http://www.math.upatras/~crans>

AND

THE UNIVERSITY OF PATRAS

Scientific Organizing Committee: Prof. Tassos Bountis (Patras, Chairman), Prof. Ko van der Weele (Patras), Prof. Angela de Sanctis (Pescara), Prof. Robert MacKay (Warwick), Prof. Jeff Johnson (Open University, UK)

SUNDAY, 17 JULY

ACHAIA BEACH HOTEL

19:00 – 22:00 *Registration of Participating Students*

MONDAY, 18 JULY

Chairman: T. Bountis

Morning Session: 09:30 – 14:00

09:30 – 9:45 *Opening Remarks*

09:45 – 10:30 *Assumptions and methods in complex systems research*

P. Gaspard (Brussels)

10:30 – 11:30 *Deterministic aspects of non-equilibrium phenomena*

T. Gilbert (Brussels)

11:30 – 12:00 *Coffee Break*

12:00 – 13:00 *Complex Phenomena in Social and Economic Systems I*

D. Helbing (Zürich)

13:00 – 14:00 *Complex Phenomena in Social and Economic Systems II*

D. Helbing (Zürich)

14:00 – 16:00 *Lunch Break*

Afternoon Session: 16:00 – 18:00

16:00 – 17:00 *Methods and concepts from nonlinear dynamics and statistical physics: Exercises*

T. Gilbert (Brussels)

17:00 – 18:00 *Complex Phenomena in Social and Economic Systems III*

D. Helbing (Zürich)

TUESDAY, 19 JULY

Chairman: J. P. Van der Weele

Morning Session: 09:30 – 14:00

09:30 – 10:30 *Complex Patterns in Granular Segregation I*

T. Mullin (Manchester)

10:30 – 11:30 *Complex Patterns in Granular Segregation II*

T. Mullin (Manchester)

11:30 – 12:00 *Coffee Break*

12:00 – 13:00 *Nonlinear Dynamics of Biological Systems I*

E. Mosekilde (Lyngby)

13:00 – 14:00 *Nonlinear Dynamics of Biological Systems II*

E. Mosekilde (Lyngby)

14:00 – 16:00 *Lunch Break*

Afternoon Session: 16:00 – 18:00

16:00 – 17:00 *Nonlinear Dynamics of Biological Systems III*

E. Mosekilde (Lyngby)

17:00 – 18:00 *Nonlinear Dynamics of Biological Systems IV*

E. Mosekilde (Lyngby)

WEDNESDAY, 20 JULY

Chairman: A. Bezeerianos

Morning Session: 09:30 – 14:00

- 09:30 – 10:30 ***Physics of information and emergence of molecular order in non-equilibrium systems***
D. Andrieux (Brussels)
- 10:30 – 11:30 ***Granular pattern formation and the role of the interstitial fluid I***
D. van der Meer (Enschede)
- 11:30 – 12:00 *Coffee Break*
- 12:00 – 13:00 ***Granular pattern formation and the role of the interstitial fluid II***
D. van der Meer (Enschede)
- 13:00 – 14:00 ***Complex Phenomena in Social and Economic Systems IV***
D. Helbing (Zürich)
- 14:00 – 16:00 *Lunch Break*

Afternoon Session: 16:00 – 18:00

- 16:00 – 17:00 ***Complex Phenomena in Social and Economic Systems V***
D. Helbing (Zürich)
- 17:00 – 18:00 ***Complex Phenomena in Social and Economic Systems: Exercises***
D. Helbing (Zürich)
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THURSDAY, 21 JULY

Chairman: E. Mosekilde

Morning Session: 09:30 – 14:00

- 09:30 – 10:30 ***Space-Time Phases and Statistical Properties of Dynamics on Large Networks I***
R. S. MacKay (Coventry)
- 10:30 – 11:30 ***Space-Time Phases and Statistical Properties of Dynamics on Large Networks II***
R. S. MacKay (Coventry)
- 11:30 – 12:00 *Coffee Break*
- 12:00 – 13:00 ***Hypernetworks in the Science of Complex Systems I***
J. Johnson (London)
- 13:00 – 14:00 ***Hypernetworks in the Science of Complex Systems II***
J. Johnson (London)
- 14:00 – 16:00 *Lunch Break*

Afternoon Session: 16:00 – 18:00

- 16:00 – 17:00 ***Space-Time Phases and Statistical Properties of Dynamics on Large Networks III***
R. S. MacKay (Coventry)
- 17:00 – 18:00 ***Hypernetworks in the Science of Complex Systems III: Exercises***
J. Johnson (London)
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FRIDAY, 22 JULY

Chairperson: A. De Sanctis

Morning Session: 9:30 – 14:00

- 09:30 – 10:30 ***Synchronization in Complex Systems I***
J. Kurths (Potsdam-Berlin-Aberdeen)
- 10:30 – 11:30 ***Synchronization in Complex Systems II: Phase Synchronization***
J. Kurths (Potsdam-Berlin-Aberdeen)
- 11:30 – 12:00 *Coffee Break*
- 12:00 – 13:00 ***Synchronization in Complex Systems III: Complex Networks***
J. Kurths (Potsdam-Berlin-Aberdeen)
- 13:00 – 14:00 ***Synchronization in Complex Systems IV: Biological Applications***
J. Kurths (Potsdam-Berlin-Aberdeen)
- 14:00 – 16:00 *Lunch Break*

Afternoon Session: 16:00 – 20:00

- 16:00 – 17:00 ***Synchronization in Complex Systems: Exercises***
J. Kurths (Potsdam-Berlin-Aberdeen)
- 17:00 – 18:00 ***Nonlinear Dynamics of Biological Systems: Exercises***
E. Mosekilde (Lyngby)
- 18:00 – 19:00 ***Discussion and Assignment of Projects***
- 19:00 – 20:00 ***Cultural event: Performance of the Pantanassa Church Choir***
- 21:00 ***Dinner at the “Agnantema” Restaurant, Rion***
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SATURDAY, 23 JULY

Chairman: J. Kurths

Morning Session: 10:00 – 14:30

- 10:00 – 11:00 ***Recent Advances in Neural Engineering I***
A. Bezerianos (Patras)
- 11:00 – 12:00 ***Recent Advances in Neural Engineering II***
A. Bezerianos (Patras)
- 12:00 – 12:30 *Coffee Break*
- 12:30 – 13:30 ***Granular pattern formation and the role of the interstitial fluid III***
D. van der Meer (Enschede)
- 13:30 – 14:30 ***Granular pattern formation and the role of the interstitial fluid IV***
D. van der Meer (Enschede)
- 14:30 *Lunch*
Free Afternoon and Evening
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SUNDAY, 24 JULY

EXCURSION to the Archaeological Museum and the beach
Departure: 10:00

MONDAY, 25 JULY

Chairman: T. Bountis

Morning Session: 09:30 – 14:00

- 09:30 – 10:30 *Space-Time Phases and Statistical Properties of Dynamics on Large Networks IV*
R. S. MacKay (Coventry)
- 10:30 – 11:30 *Space-Time Phases and Statistical Properties of Dynamics on Large Networks V*
R. S. MacKay (Coventry)
- 11:30 – 12:00 *Coffee Break*
- 12:00 – 13:00 *Statistical Properties and Dynamics of Large Networks: Exercises*
R. S. MacKay (Coventry)
- 13:00 – 14:00 *Hypernetworks in the Science of Complex Systems IV*
J. Johnson (London)
- 14:00 – 16:00 *Lunch Break*

Afternoon Session: 16:00 – 18:00

- 16:00 – 17:00 *Particle size segregation and complex pattern formation by granular avalanches I*
N. Gray (Manchester)
- 17:00 – 18:00 *Particle size segregation and complex pattern formation by granular avalanches II*
N. Gray (Manchester)

TUESDAY, 26 JULY

Chairman: C. Mari

Morning Session: 09:30 – 14:00

- 09:30 – 10:30 *Cluster Formation in Dissipative Multi-particle Systems I*
J.P. van der Weele (Patras)
- 10:30 – 11:30 *Cluster Formation in Dissipative Multi-particle Systems II*
J. P. van der Weele (Patras)
- 11:30 – 12:00 *Coffee Break*
- 12:00 – 13:00 *Modeling Financial Markets Using Concepts of Statistical Physics I*
R. N. Mantegna (Palermo)
- 13:00 – 14:00 *Modeling Financial Markets Using Concepts of Statistical Physics II*
R. N. Mantegna (Palermo)
- 14:00 – 16:00 *Lunch Break*

Afternoon Session: 16:00 – 18:00

- 16:00 – 18:00 *Discussion session and assignment of projects*

WEDNESDAY, 27 JULY

Chairperson: Angela de Sanctis

Morning Session: 09:30 – 14:00

- 09:30 – 10:30 *Global System Dynamics I*

- S. Bishop (London)
10:30 – 11:30 ***Global System Dynamics II***
S. Bishop (London)
11:30 – 12:00 *Coffee Break*
12:00 – 13:00 ***Modeling Financial Markets Using Concepts of Statistical Physics III***
R. N. Mantegna (Palermo)
13:00 – 14:00 ***Modeling Financial Markets Using Concepts of Statistical Physics IV***
R. N. Mantegna (Palermo)
14:00 – 16:00 *Lunch Break*

Afternoon Session: 16:00 – 18:00

- 16:00 – 17:00 ***Recent Developments in Modeling Financial Markets***
Carlo Mari and Angela de Sanctis (Pescara)
17:00 – 18:00 ***Discussion and Assignment of Projects***

21:00 *Dinner at the “Agnantema” Restaurant, Rion*

THURSDAY, 28 JULY

Chairman: J. P. van der Weele

Morning Session: 09:30 – 14:00

- 09:30 – 10:30 ***Complex Hamiltonian Dynamics I***
T. Bountis (Patras)
10:30 – 11:30 ***Complex Hamiltonian Dynamics II***
T. Bountis (Patras)
11:30 – 12:00 *Coffee Break*
12:00 – 13:00 ***Modeling Financial Markets Using Concepts of Statistical Physics V***
R. N. Mantegna (Palermo)
13:00 – 14:00 ***Modeling Financial Markets Using Concepts of Statistical Physics: Exercises***
R. N. Mantegna (Palermo)
14:00 – 16:00 *Lunch Break*

Afternoon Session: 16:00 – 18:00

- 16:00 – 17:00 ***Global System Dynamics III***
S. Bishop (London)
17:00 – 18:00 ***Discussion and Assignment of Projects***
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FRIDAY, 29 JULY

Meeting will take place at Achaia Beach Hotel

- 10:00 – 11:00 ***Award of Certificates of Participation***
11:00 – 11:30 ***Plans for 2nd Ph.D. School, 2012 and Farewell***
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