



Hands-on Research on Complex Systems Winter School

http://cdsagenda5.ictp.trieste.it/full_display.php?ida=a0784
Institute for Plasma Research, Gandhinagar, India
6-18 January 2008

Sponsored by The Abdus Salam International Centre for Theoretical Physics (ICTP, Trieste, Italy)
Co-sponsored by Indo-US Science and Technology Forum, Institute for Plasma Research (India),
Mathworks (MATLAB), University of Maryland

TOPICS

Modeling with MATLAB	networks	nonlinear optics	plasmas
pattern formation	granular physics	fluid dynamics	droplets
chemical oscillators	complex fluids	electronic circuits	neurons

SCHOOL DIRECTORS: Rajarshi Roy, Kenneth Showalter, Harry L. Swinney, Abhijit Sen

A two-week-long school will provide an interactive experience with hands-on research involving tabletop experiments with real-time computer data acquisition and associated computational modeling. Lectures and hands-on experiences will focus on complex systems in the physical and life sciences. This research is inherently interdisciplinary, and topics will range from biological networks to spatial patterns in fluids to laser chaos. The school faculty will be eminent scientists who have conducted frontier table-top research published in leading international scientific journals such as *Nature*, *Science*, and *Physical Review Letters*.

While many areas of research now involve large numbers of collaborators using very expensive instrumentation, the *Hands-on School* is focused on frontier research that can be conducted by individuals or small groups using rather modest instrumentation. Examples will be taken from research of the faculty members, who will lecture and lead small groups in laboratory sessions involving running experiments and performing associated mathematical and computational modeling. Data acquisition, data analysis, and computational modeling will be performed in the MATLAB environment, and each participant will be provided with MATLAB software contributed by *Mathworks*.

Lecturers and leaders of the hands-on experiences include:

- G. Bard Ermentrout (University of Pittsburgh), modeling of neurons and muscles
- Y. Couder (Ecole Normale Supérieure, Paris), liquid droplets
- D. Lathrop (University of Maryland), nonlinear fluid interfaces and chaotic networks
- R. Roy (University of Maryland), nonlinear optics and instabilities
- A. Sen (Institute for Plasma Research), nonlinear patterns in plasmas and coupled oscillators
- M. Shattuck (City University of New York), patterns and shocks in sand
- K. Showalter (West Virginia University), synchronization in chemical patterns
- B. Storey (Olin College), mathematical modeling using MATLAB
- H. Swinney (University of Texas), patterns in rotating fluids and fractal viscous fingers
- E. Weeks (Emory University), microscopic and macroscopic dynamics of complex fluids

Special Colloquia:

- G. Ananthakrishna (Indian Institute of Science, Bangalore)
- R. Amritkar (Physical Research Laboratory)
- P. K. Kaw (Institute for Plasma Research)
- J. Kurths (University of Potsdam)
- M. Lakshmanan (Bharatidasan University)
- G. Menon (Institute for Mathematical Sciences, Chennai)
- R. Ramaswamy (Jawaharlal Nehru University, Delhi)
- K. R. Sreenivasan (Abdus Salam International Centre for Theoretical Physics)

Application Deadline: 1 October 2007

LOCATION



Institute for Plasma Research

School Secretary

Elizabeth Brancaccio

Abdus Salam International Centre for
Theoretical Physics

Telephone: +39-040-2240284

Telefax: +39-040-224163

School email: smr1914@ictp.it

ICTP Home Page: <http://www.ictp.it/>

PARTICIPANTS

The School is mainly intended for young scientists and PhD students from developing countries, working in areas such as physics, chemistry, biology, and mathematics. Scientists from developed countries who are interested in international cooperation are also welcome to apply --- the school will be open to scientists from all countries that are members of the United Nations, UNESCO or IAEA. The School will be conducted in English; therefore, participants should have an adequate working knowledge of this language.

Application forms for the School can be found on the Web server of ICTP at:
http://cdsagenda5.ictp.trieste.it/full_display.php?ida=a0784

Applicants should fully complete and (ink) sign the *Request for Participation* form, available from the ICTP WWW server. A PDF or RTF file of the completed *Request for Participation* form and a statement describing how the applicant would benefit from participation in the Hands-on School should be sent by email together with the application form (with subject line *Hands-on Research*) to the Abdus Salam International Centre for Theoretical Physics.

There is no registration fee, and lodging and meals will be provided for all participants by the Institute for Plasma Research (Gandhinagar, India). Support for travel is available for participants who are nationals of developing countries and are currently working in their home country, but every effort should be made by candidates to secure travel support from their home institutions. A statement of need must be made by completing the last page of the application form. All participants are required to take part in all aspects of the school for the entire duration.