# Feza Gürsey Institute–Imperial College International Summer School and research workshop on Complexity
# Istanbul 5-10 September 2011

Introductory lectures on central methods by members of the Imperial College Complexity Group followed by a research workshop on current topics

Keywords:
Dynamics, structure, emergence. Master equations, networks, scaling, evolution.

**Introductory lectures**
Gunnar Pruessner: Master, Fokker-Planck and Langevin equations. A tool box for analysing complex systems.
Kim Christensen: Scaling and power laws. A critical discussion of how to analyse power laws by e.g. finite size scaling and their relevance to complex systems.
Tim Evans: Network theory with particular focus on analysis of social networks
Henrik Jeldtoft Jensen: An introduction to typical types of dynamics found in complex systems: Stationary power law distributed avalanche dynamics, non-stationary logarithmically slow relaxational dynamics and stationary equilibrium like fluctuations.

**Invited seminars**
G Baris Bagci: Second law for non-equilibrium steady states in open systems.
A Nihat Berker: Robustness, Beauty, and Fragility in the Random Scale-Free World:
Apollonius Tulips and Critical Percolation Phases.
Alkan Kabakcioglu: Influence of the helical structure in DNA denaturation.
Mustafa Keskin: Correlation, hierarchies, and networks of the main Turkish companies
Anostasios Malakis: Monte Carlo methods for the study of disordered systems.
Muhittin Mungan: Statistical Mechanics and Statistical Inference Methods on Graphs.
Ugur Tirnakli: Appearance of q-Gaussians in low- and high-dimensional dynamical systems.
Cemal Yalabik: Renormalization Group studies of some Non-equilibrium Systems.

**Public Lecture:** Geoffrey West, Santa Fe Institute.
*Size matters; the Complexity, Simplicity, and Unity of Life from Cells & Ecosystems to Cities & Corporations*
Lunch: 12-14 Dinner: 18-19
Conference dinner: Wednesday at an interesting venue in Istanbul.
Arrival Sunday 4 Sep. Departure Sunday 11 Sep 2011

|  | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
|---|---|---|---|---|---|---|
| Morning 9-12 | Pruessner Master eq. etc. | Evans Networks | Pruessner, Christensen, Evans, Jensen Rounding off lectures | Research workshop 4 talks Mungan (40m) + | Research workshop 4 talks Tirnakli + West | Short contributed talks |
| Afternoon 14-17 | Christensen Scaling & power laws | Jensen Dynamics | Excursion along the Bosphorus and visit to Istanbul | Research workshop 4 talks Bagci & Yalabik + | Research workshop 4 talks Kabakcioglu + | Presentations from group work |
| Discussion Groups 17-18 | Group work on thematic topics | Group work on thematic topics | Excursion along the Bosphorus and visit to Istanbul | Group work on thematic topics | Group work on thematic topics | G Baris Bagci: The science of complexity: a philosophical assessment |
| Evening Lecture 20-21 | Evans Netplexity – the complexity of interactions in the real world | Pruessner Any answers? Self Organised Criticality in the third decade after BTW | Conference dinner in Istanbul | Public Lecture Geoffrey West Santa Fe Inst *Size matters* | Christensen Ant Colonies as Complex Systems. | Jensen Analysis of Music Performance |

For more information se below.

## Scope of the school

Complex Systems share some common features. They consist of a large number of interacting components. The interactions give rise to emergent hierarchical structures. The components of the system and properties at systems level typically change with time and complex systems are inherently open and their boundaries often a matter of convention. Thus a huge array of systems surrounding us will be the subject of study for the field of complexity science. A competent scientific investigation must for this reason necessarily take the form of trans-disciplinary endeavours in which scientists from different fields join their insights and methodologies together in order to make progress.

The summer school will emphasise the application of statistical mechanics and network theory to problems not traditionally studied as part of statistical physics. The aim of the meeting is through a set of introductory lectures to familiarise participants with quantitative mathematical methods, which will then be applied to current hot topics in complexity science. To achieve this the meeting will consists of two and a half day of general introductory level lectures at the level of first year graduate courses. This part will be followed by two and a half day of research workshop, including a number of invited seminars plus a set of contributed talks.

To ensure a constructive learning environment invited speakers are expected to stay at the meeting for as long as possible – ideally all six days. The invited speakers and experienced participants will be expected to act as mentors and tutors during the meeting and in particular act as active and supportive members during the group work.

The hope is to attract students and researchers form all over Turkey together with   international participants. The hope is also that funding will be made available for Turkish participants whereas will international participants will be self-funded and fee paying.

## Application

- The school is now closed for new applications.

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