THE BELGIAN COMPLEXITY

COMMUNITY

Complexity from the standpoint of nonlinear dynamics, thermodynamics and statistical mechanics.

A multilevel approach aiming at :

- The search of universal laws underlying the multiple manifestations of complexity from first principles.
- The development of new tools to tackle complexity.
- The mathematical modeling of a wide range of complex systems of current concern, including topics beyond the traditional realm of physical science (engineering, environment, biology, economics) in close synergy with experiment and simulation.
- The identification and exploration of links between the macroscopic, nanoscale and microscopic levels of description ; the deterministic and probabilistic views ; the traditional approach to physical systems and the problematics of prediction and evolution.

Partial list of topics

• Bifurcation and chaos theories
•Emergence,spatio-temporal organization
• Nonequilibrium statistical mechanics
• Microscopic simulation techniques
• Quantum complex systems
• Random matrices, integrable lattices
•Fluctuation theory and stochastic processes, invariant measures
•Materials under stress, heterogeneous catalysis
•Dynamical instability and the predictability of the atmosphere and climate
• Extreme events
• Theoretical and computational biology
•Eco-ethology, collective behavior, multi-agent systems
• Econophysics

Supporting structures and projects

General picture

Nine teams involving about 60 researchers with background in physics, chemistry, mathematics and biology belonging to one federal research Institution and six Universities of the two linguistic communities. Close cooperation, joint activities, marked interdisciplinarity.

Specific project during 1997-2001 : « Structure and dynamics of complex systems », financed by the belgian federal government (~500 000€/yr).

French community of Belgium

Individual fellowships and projects pertaining to fundamental research funded by the Belgian Fund for Scientific Research, following an evaluation procedure under the responsibility of 32 scientific commissions.
Complexity research : mainly part of physics and physical chemistry commissions.

Currently :
• about 20 permanent positions of which several funded directly by FNRS.
• 15 Ph.D. and post-doc positions.
• several research projects for a total of ~400000€.

Interdisciplinary Center for Nonlinear Phenomena and Complex Systems (ULB).
Doctoral school « Nonlinear phenomena and statistical mechanics » (ULB).

Research group « Nonlinear Equations » (UCL).

Materials and Applied Statistical Physics (Ulg).
Contact group « High T superconductors ».

Advanced courses at graduate and post-graduate level.

Current involvement in international activities

Close links with several major European Complexity Centers.

Coordination of a Marie Curie Training Site on « Nonlinear dynamics, statistical mechanics and the modeling of complex systems ».

Founding member of EXYSTENCE (Network of excellence on complex systems).

Participation in several 5th and 6th FP projects (NOE , IP, COST, NEST,..).

Participation in several ESF networks, EPS activities (Statistical and Nonlinear Physics division), ESA projects, NATO cooperative linkage grants, organization of international conferences.