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Dynamics and Cooperative Phenomena in Complex Physical and Biological Media

Results in Brief

Dynamics of complex systems

An innovative research project has brought together several key research institutions to study the dynamics of complex physical and biological systems.

HEALTH


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Complex systems are large biological, physical or social systems in which overall behaviour cannot be predicted using knowledge of the system's individual properties. They are considered to be one of the major challenges in the world of physics today.

The EU-funded DCP-PHYSBIO (Dynamics and cooperative phenomena in complex physical and biological media) project brought together a multidisciplinary team specialising in condensed matter physics, statistical physics, polymer science, mathematics, chemical physics and computer science. Their broad range of expertise included phase transitions and cooperative behaviour, dynamical systems and chemical kinetics.

Team members analysed non-physical systems and those where behaviour depends on the details of the system. In particular, they looked at phase transitions and criticality (the point at which no phase boundaries exist) in complex systems. This was applied to polymer matrices, which were treated as skeletons of the overall system.

The second part of the project focused on dynamics in cells and sub-cellular domains. The work during this time involved statistical modelling of forces and movement. The influence of the inner parts of the substrate was examined in relation to protein binding to specific sites on DNA molecules, for example.

DCP-PHYSBIO emphasised dissemination and resulted in publication of more than 80 papers, three international conferences and four major workshops that all supported research exchanges. The project has promoted international collaboration, and advanced the current state of knowledge on complex systems, a massive area with significant applications in all areas.

Keywords

Dynamics, complex systems, physical, biological, multidisciplinary, international collaboration

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