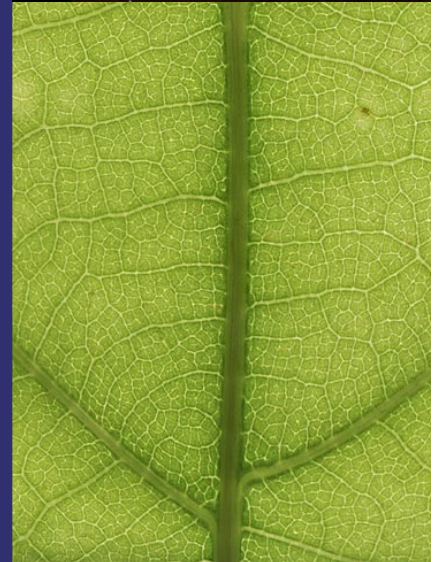
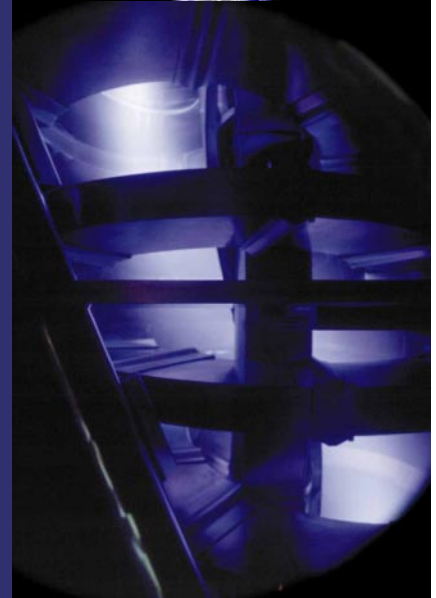


Complex Systems Science

at the Australian National University



Vision

Complex systems science is a collection of methods used to model systems of interacting or interdependent elements that exhibit self-organisation. These systems can be physical, biological or social and can also combine elements of each. A characteristic feature of complex systems is that they can display complicated and unexpected behaviour even when the individual components and the interactions between components are very simple. In the last two decades it has been realized that complex behaviour can be successfully analysed and predicted using mathematical and computational methods. Progress in these enabling sciences together with discipline specific insight will be required to fully develop and exploit complex systems science in practical situations with direct economic benefit. Research in this emerging field will need a long-term commitment over several decades to realize its enormous potential.

Examples where complex systems science has been used include non-equilibrium physical systems, such as plasma and fluid experiments, economic systems, such as financial markets, ecological systems, biological systems - from the dynamics of single celled organisms to the behaviour of the nervous system, networks - from the world wide web to human networks, such as the spreading of epidemics, and large scale geophysical and astrophysical phenomena - from the formation of the galaxies to the dynamics of the Earth's atmosphere and oceans.

Research Strengths

ANU has Australia's strongest concentration of scientists with expertise in aspects of complex systems. These are being drawn together in the ANU Centre for Complex Systems. Collaboration with the CSIRO complex systems core research group is under negotiation. There are approximately 50 staff at ANU working in aspects of complex systems in a diverse range of research groups. Their work covers areas such as:

- dynamical systems and fractals
- bioinformatics - data analysis of the genome-phenome problem
- networks, artificial and natural
- financial markets
- statistical mechanics
- theoretical and applied computer science
- control theory
- visual sciences
- irreversible behaviour in physical systems
- biological and ecological complex systems
- epidemiology - spread of infectious diseases
- non-linear theory and modelling
- computer intensive data analysis
- parallel architecture computation
- complex information systems
- self-organisation in geophysical fluids and fusion plasmas
- self-organisation of the universe (cosmology)
- complex materials
- river catchment behaviour



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