

Day 2: Planet Earth and its Life

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Keynote Lecture

NETWORKS AND THEIR DYNAMICAL IMPLICATIONS IN EPIDEMIOLOGY, ECOLOGY, AND EVOLUTION

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Abstract

The transmission of infection among humans or other animals, the way ecosystems respond to disturbance, and some current approaches to understanding the evolution of cooperation (the most important unsolved problem in evolutionary biology, from Darwin's day to ours) are among many examples of nonlinear dynamical systems whose behaviour depends upon the nature of the network of connections among nodes (that is individuals or groups of humans or other animals). In particular, progress in understanding the rising epidemic of allergies in developed countries is likely to depend on better understanding of how the immune system (a complex network) assembles itself somatically in the first few years of life. Recent and current concern about HIV/AIDS, SARS, and foot and mouth disease among livestock have prompted advances in our understanding of the interplay between network patterns of various kinds and effective control measures. Separate, but ultimately related, work focuses on the relation between "diversity and stability" in food web networks. And, increasingly, exploration of games like Prisoner's Dilemma as metaphors for the evolution of cooperation are turning to the dynamics of the networks connecting the players. My talk aims to be a brief but opinionated overview of all this.

Biography

Sir Robert May (Robert McCredie, Lord May of Oxford), OM AC Kt, holds a Professorship jointly at Oxford University and Imperial College, London and is a Fellow of Merton College, Oxford. He was until recently President of The Royal Society (2000-2005) and, before that, the Chief Scientific Adviser to the UK Government and Head of the UK Office of Science and Technology (1995-2000). He is also, among others, a Trustee of the Nuffield Foundation and of the Cambridge University Gates Trust, and

until recently chaired the Trustees of the Natural History Museum. His career includes a Personal Chair in Physics at Sydney University aged 33, Class of 1877 Professor of Zoology and Chairman of the Research Board at Princeton. He moved to Britain in 1988 and became a Royal Society Research Professor in Oxford. His particular interests include how populations are structured and respond to change, particularly with respect to infectious diseases and biodiversity.

He was awarded a Knighthood in 1996, and appointed a Companion of the Order of Australia in 1998, both for "Services to Science". In 2001 he was one of the first 15 Life Peers created by the "House of Lords Appointments Commission". In 2002, The Queen appointed him to the Order of Merit (the fifth Australian in its 100-year history). His many honours include: the Royal Swedish Academy's Crafoord Prize (equivalent of the Nobel Prize in bioscience and ecology); the Swiss-Italian Balzan Prize (for "seminal contributions to understanding biodiversity"); and the Japanese Blue Planet Prize ("for developing fundamental tools for ecological conservation planning"). He is a Foreign Member of the US National Academy of Sciences; an Overseas Fellow of the Australian Academy of Sciences; an Honorary Fellow of the Royal Academy of Engineering and several other Academies and Learned Societies in the UK, USA and Australia. In 2007 he received the Royal Society's Copley Medal, which is its oldest (1731-) and most prestigious award, given annually for "outstanding achievements in research in any branch of science".