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Bosch Distinguished Seminar Series

The Nature of Nutrition: A Unifying Framework from Animal Adaptation to Human Obesity

Speaker:

Professor Stephen J. Simpson

Title:

The Nature of Nutrition: A Unifying Framework from Animal Adaptation to Human Obesity

Date:

Tuesday 25 September, 2012

Time:

1.00pm - 2.00pm

Venue:

Education Lecture Theatre 351, Education Building
Manning Road, University of Sydney



Professor Stephen J. Simpson:

Professor Stephen Simpson is an Australian Research Council Laureate Fellow in the School of Biological Sciences and Academic Director of the Charles Perkins Centre for the study of obesity, diabetes and cardiovascular disease at the University of Sydney. Stephen returned to Australia in 2005 as an ARC Federation Fellow after 22 years at Oxford where he was Professor of Entomology and Curator of the University Museum of Natural History. Before that he had undertaken his PhD at the University of London, and his undergraduate degree and Honours at the University of Queensland.

Together with colleague David Raubenheimer, Stephen developed an integrative modelling framework for nutrition (the Geometric Framework), which was devised and tested using insects but has since been applied to a wide range of organisms, from slime moulds to humans, and problems, from aquaculture and conservation biology to the dietary causes of human obesity and ageing. A synthesis of this body of work can be found in *The Nature of Nutrition: a Unifying Framework from Animal Adaptation to Human Obesity*, published in May 2012 by Princeton University Press. In addition to nutritional biology, Stephen's research on locusts has led to an understanding of locust swarming that links chemical events in the brains of individual insects to landscape-scale mass migration.

Stephen has been Visiting Professor at Oxford, a Fellow of the Institute for Advanced Study (Wissenschaftskolleg) in Berlin, Distinguished Visiting Fellow at the University of Arizona, and Guest Professor at the University of Basel. In 2007 he was elected a Fellow of the Australian Academy of Science, in 2008 he was awarded the Eureka Prize for Scientific Research, in 2009 he was named NSW Scientist of the Year, and in 2010 he was named as the Wigglesworth Medallist

by the Royal Entomological Society of London. He is also the presenter of a four-part documentary for ABC TV, Great Southern Land, to be aired in 2012.

Summary: Nutrition touches all aspects of biology – indeed the fundamental, interlinked triumvirate in biology is sex, death and nutrition. But nutrition is complex. Animals require numerous nutrients in particular amounts and ratios to maximise fitness. Nutrients come packaged in various ratios and concentrations in foods, which are scattered throughout the environment in time and space and may contain toxins and other non-nutrient compounds. The animal must match its multidimensional, changing nutritional requirements while minimising the costs of locating, ingesting and processing appropriate foods. We have developed a set of state-space models called the Geometric Framework (GF) to capture the multidimensional nature of nutritional requirements, the relative values of foods in relation to these requirements, the behavioural and post-ingestive responses of animals when feeding on diets of varying composition, and the growth and performance consequences of being restricted to particular dietary regimes. We have also derived the necessary theory for defining fitness in relation to nutrient intake, for describing key nutritional traits and assessing trade-offs between life-history responses. I will begin by introducing the models and then show how they have been used to address problems in life-history theory, immunity, human health, collective nutrition and community ecology. Along the way I will use examples spanning slime moulds to humans.