Mathematical Models of Biological Morphogenesis

Prof. Alan Garfinkel
Department of Medicine (Cardiology)
University of California, Los Angeles, USA

Date: October 8, 2013 (Tuesday)
Time: 4:00pm (Tea Reception at 3:45pm)
Venue: Room B6619 (MBE Conference Room), AC1

Abstract

In 1952, a revolutionary paper by Alan Turing introduced the idea that morphogenesis, the emergence of spatial structure, can be explained by bifurcations in the solutions to Partial Differential Equations representing the interactions of chemical morphogens reacting and diffusing through space. Turing’s original model produced simple patterns of spots or stripes. Since the discovery of physiological morphogens in the past few decades, even this simple model has had successful applications.

The growing maturity of the applications has now led modelers to more complex scenarios. Developments have included the extension of the original model to include cell density variables, the inclusion of mechanical factors, the extension to 3D spatial domains, and the study of patterns, such as branching structures, that occur far from the linear instability first studied by Turing. We will review examples of these new developments in the field of physiology and pathophysiology, exploring applications of Turing-style modeling to simple spot and stripe patterns, for example, in vascular calcification, and to more advanced morphologies such as branching patterns as seen in the lung and kidney.
About the Speaker

Alan Garfinkel is Professor of Medicine (Cardiology) at UCLA. His undergraduate and graduate degrees were in mathematics and philosophy. After a brief career as a professor of the philosophy of science, he made the transition to become a working scientist. His research uses mathematical modeling to study cardiac arrhythmias and the development of biological morphogenesis. His research has been sponsored by the US National Institutes of Health and the National Science Foundation.

All are welcome!
Enquiry: 3442 8420

MBE Seminar 2013-2014/013