Charles Edison Lecture Series

MODELING INVASIVE PROCESSES IN BIOLOGY

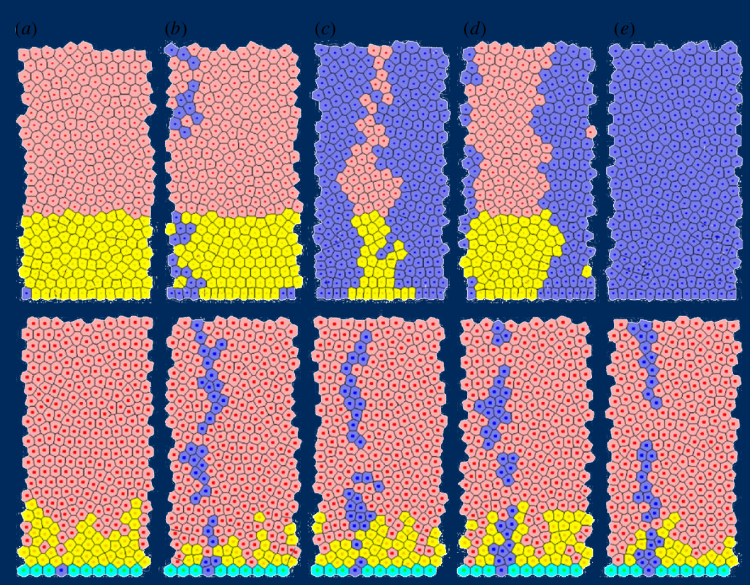
The collective movement of cells in tissue is vital for normal development but also occurs in abnormal development, such as in cancer. We will review three models:

(i) A vertex-based model to describe cell motion in the early mouse embryo
(ii) A individual-based model forneural crest cell invasion
(iii) A model for acid-mediated tumor invasion

In each case we shall use the model to answer important issues concerning biology.

For example, in (i) we shall propose a role for rosette formation. In (ii) we propose that two cell types are necessary for successful invasion. Lastly, in (iii) we shall show how the model suggests possible therapeutic strategies for tumor control.

Results from two simulations of the cell-centre model showing how pinning the cells at the crypt base affects the distribution of cells within a normal crypt.

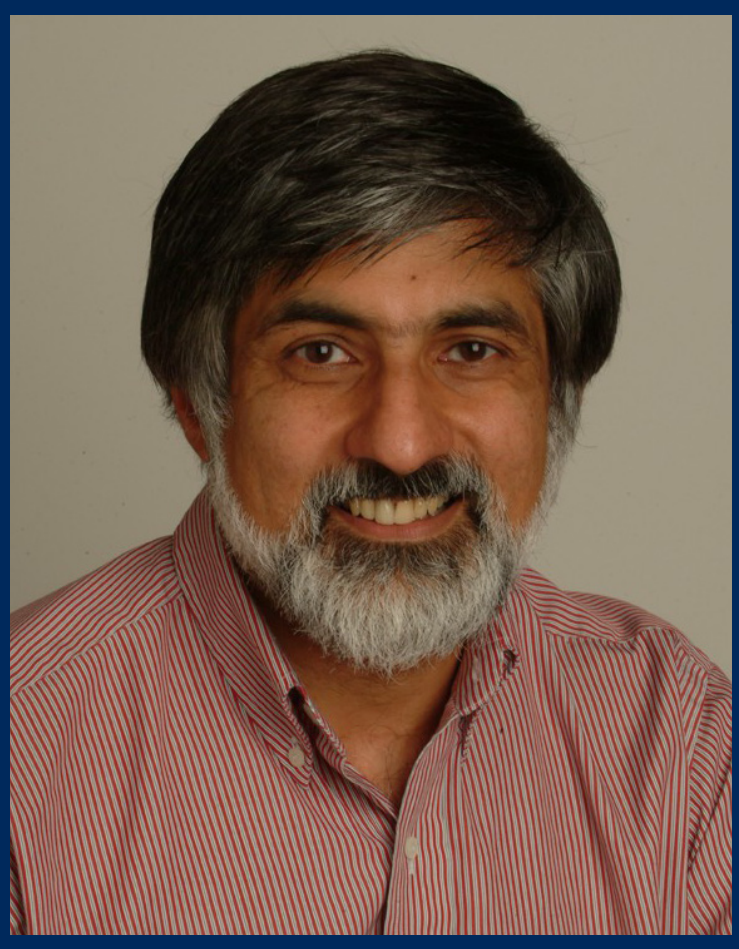


MONDAY, FEBRUARY 18
4:00 P.M.
RACLIN-CARMICHAEL HALL AUDITORIUM

Reception to follow at 5:00 p.m. in the Raclin-Carmichael Atrium

PHILIP K. MAINI *OXFORD UNIVERSITY*

Professor Maini, director of the Centre for Mathematical Biology, Mathematical Institute at Oxford University, UK, is one of the leading mathematical biologists. His current research projects include the modeling of avascular and vascular tumors, normal and abnormal wound healing, and a number of applications of mathematical modeling in pattern formation in early development. He has over 300 publications in the field and is currently Editor-in-Chief of the Bulletin of Mathematical Biology, the official publication of the Society for Mathematical Biology, and Journal of Nonlinear Science. He co-authored a Bellman Prize winning paper (1997), was awarded a Royal Society Leverhulme Trust Senior Research Fellowship for 2001-2 and a Royal Society-Wolfson Research Merit Award (2006-11). In 2009 he was awarded the London Mathematical Society Naylor Prize and Lectureship. In 2012, he was elected as a Fellow of the Society for Industrial and Applied Mathematics (SIAM).



This lecture is also sponsored by the Harper Cancer Research Institute, ACMS Department, and Interdisciplinary Center for the Study of Biocomplexity.

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