WRIGHT STATE UNIVERSITY

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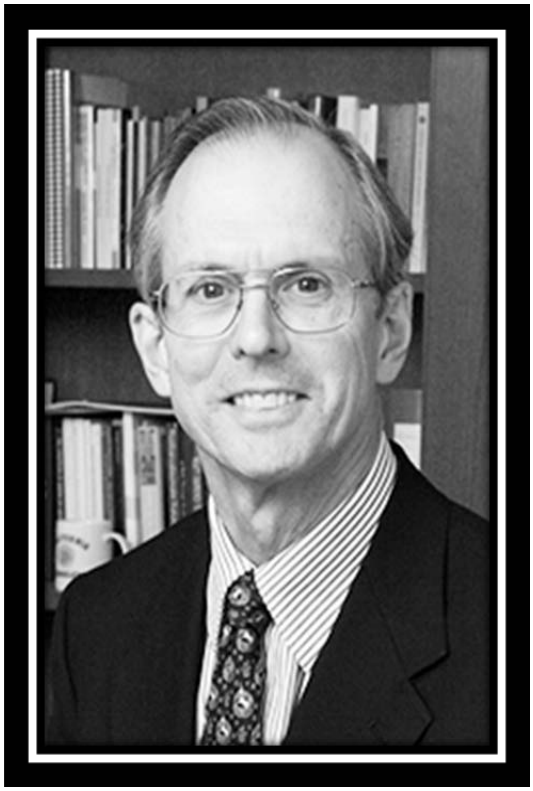
THE SECOND MAZUMDAR LECTURE



Dr. William B. Russel
Dean of the Graduate School of Princeton University

"Patterning Thin Polymer Films Driven via Electric Fields: Instability, Pattern Selection, and Coarsening"

Friday, October 3, 2008

Refreshments and Chat
at 2:15 p.m. in Room 222 of the MM Building

Followed by Dr. Russel's talk
At 3:00 p.m. in Room 286 of Millett Hall

Hosted by Dr. Emily Tian of the Dept. of Mathematics & Statistics

ABSTRACT:

An electric field normal to a thin (50-500 nm) polymer film creates an instability that evolves through competition among electrostatic, interfacial, and hydrodynamic forces. The governing equations are well established, so the complexity centers on the geometry of the interface as a function of time. The fascination lies in the range of periodic patterns at micron or submicron scales that can form spontaneously but more frequently are corrupted in several ways. Our goal has been to understand the factors that control the initial pattern selection and the coarsening process that can erase those patterns, as well as means to either preserve the natural patterns or force different symmetries by imposing spatially periodic electric fields. For this purpose we employ linear and weakly nonlinear stability analyses, full numerical solutions of the governing equations, and techniques from nonlinear dynamics. Experimental results will be called upon to motivate the analyses and demonstrate the limitations.

ABOUT THE SPEAKER:

William B. Russel is the A.W. Marks ’19 Professor in the Department of Chemical Engineering and Dean of the Graduate School at Princeton University. He joined the faculty at Princeton in 1974 after BA and MChE degrees from Rice University, a PhD from Stanford, and a NATO Postdoctoral Fellowship in the Department of Applied Mathematics and Theoretical Physics at Cambridge University. At Princeton he has served as chairman of Chemical Engineering, director of the Princeton Materials Institute, and now dean of the Graduate School. During 2001-03 he was president of the Society of Rheology. He is currently the chair of the Board of the Directors of the Council of Graduate Schools.

His research has focused on the field of complex fluids with primary emphasis on concentrated colloidal dispersions, exploring the effects of hard sphere, electrostatic, depletion, and adhesive interactions on phase behavior and rheological properties. The accomplishments of 36 Ph.D. graduates and a dozen postdoctoral fellows, now moving forward in both industrial and academic careers, comprise the foundation for this body of research, contributing ideas and inspiration as well as dedicated effort.

He is the author or coauthor of two books, the *Dynamics of Colloidal Systems* (U. Wisconsin Press) and *Colloidal Dispersions* (Cambridge University Press with D.A. Saville and W.R. Schowalter), and the 2001 Debye Lectures (Van’t Hoff Laboratory, Utrecht University). Sabbaticals have taken him to the Australian National University, the University of Wisconsin as the Hougen Professor, Bristol University as the Unilever Visiting Professor, Twente University, and Utrecht University as the Debye (Visiting) Professor. Consulting engagements with Rohm and Haas (1984-99), the DuPont Marshall Laboratory (1984-97), the W.R. Grace Washington Research Center (1989), and Essilor (2002-04) have enlightened his academic research.

Honors received include the Bingham Award from the Society of Rheology (1999), the William H. Walker Award from the American Institute of Chemical Engineers (1992), the Award for Colloid and Surface Science from the American Chemical Society (2007), and election to membership in the American Academy of Arts and Sciences (1995) and the National Academy of Engineering (1992).

He and his wife Priscilla, who has taught Spanish in the middle school in Princeton and is now the supervisor of World Languages for the Princeton Regional Schools, have two sons Daniel (BSE Princeton ’99, Ph.D. Stanford ‘07), who is a postdoctoral fellow in a computational biology group at UCSF, and Bailey (BA Princeton ’01, MA NYU ‘04), who spent a year in Malaysia with Princeton in Asia, and now works with as a photographer in New York City. They currently reside in Wyman House, built in 1913 adjacent to the Graduate College at Princeton as the home of the dean.