

CHEMICAL ENGINEERING

SEMINAR SERIES



ROSEANNE FORD

10/3/16

Professor of Chemical Engineering
University of Virginia

Transport Phenomena of Chemotactic Bacteria

ABSTRACT: Chemotaxis describes the ability of motile bacteria to sense chemical gradients in their surroundings and swim toward higher concentrations of chemicals that are beneficial to their survival. The chemotactic response in *Escherichia coli* bacteria is a well-characterized signal transduction mechanism that controls the run-and-tumble swimming behavior of individual cells. The motivation behind our experimental work has been to build on this fundamental knowledge of the underlying mechanisms to develop predictive models for bacterial migration in complex natural systems. Our focus has been on migration of chemotactic bacteria in porous media with application to bioremediation of polluted groundwater systems where chemical and structural heterogeneity influence their transport phenomena. I will present a series of experimental approaches that range from imaging chemotactic bands in microfluidic devices to monitoring dispersion within bench-scale microcosms to tracking the migration of bacteria introduced into a natural groundwater aquifer. Apparent diffusion and dispersion coefficients determined from the experimental observations are used in mathematical models to predict macroscopic-scale transport of bacterial populations. A dimensionless chemotaxis number is proposed to ascertain a priori the conditions under which a chemotactic response will impact bacterial transport relative to other processes such as advection and dispersion.

RECEPTION 3:30 • LECTURE 4:00 – 5:00
PHYSICS ASTRONOMY BLDG. (PAA) A110



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BIOGRAPHY: Roseanne M. Ford is a Professor of Chemical Engineering as well as Civil & Environmental Engineering (by courtesy appointment) at the University of Virginia. She holds a B.S. degree from the University of Delaware and a Ph.D. from the University of Pennsylvania, both in chemical engineering. She spent the spring of 1995 as a Visiting Professor at the University of Tennessee and Oak Ridge National Laboratory. In 2003 she was a visitor at the USGS in Boulder, CO and a Visiting Professor at EPFL in Lausanne, Switzerland. She recently completed a four-year term as department chair and was Associate Vice President for Research and Graduate Studies from 2004-2010. Professor Ford's research focus is on the transport of chemotactic bacteria in porous media and its impact on bioremediation. She was elected a fellow of the American Institute of Medical and Biological Engineering and was awarded the Cavaliers' Distinguished Teaching Professorship, which is the highest teaching award given at UVA.