Anomalous diffusion in mucus: signatures of health and disease

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Chauvenet Hall, room 143

The field of passive microrheology is a stunning generalization of the fluctuation-dissipation relation from viscous fluids to complex viscoelastic fluids, where the noisy fluctuations of microbeads are colored and statistics are sub-diffusive and transient. Human lung mucus is a perfect candidate for microrheology because it is almost impossible to get sufficient volumes for macrorheology. In this lecture I will discuss some lung biology, pathology, and ex vivo assays, and the data we have from microrheological techniques. Then I will explore how we have analyzed and modeled the data, and progress that has been made in using anomalous diffusion as a signature of disease and disease progression, and as an indicator of response to drugs. My collaborators from mathematics, statistics, physics and medicine are many and will be acknowledged.

Greg Forest is an applied mathematician whose research interests have migrated from nonlinear waves and inverse spectral solutions of soliton equations to polymeric fluids and liquid crystal hydrodynamics, and for the past 20 years, to lung biology, cell biology, and virology. Forest received his PhD in Mathematics from the University of Arizona under the direction of Dave McLaughlin, then spent 17 years at Ohio State University before moving in 1996 to the University of North Carolina at Chapel Hill to build an applied mathematics program.

Please join us for refreshments at 2:45 p.m.