MECHANICAL ENGINEERING DEPARTMENT
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Dynamics of Inertial Particles in Isotropic Turbulence

by

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Wednesday, October 15, 2008
3:15 p.m. — Refreshments before the seminar
3:30 p.m. — Graduate Seminar
Room 1130 Mechanical Engineering

ABSTRACT —The motion of a small particle in a turbulent flow is complicated by the fact that its inertia causes it to be "centrifuged" out of vortical regions of the flow and to collect in the high-strain regions between the vortices. This phenomenon, sometimes called "preferential concentration," affects a broad range of aerosol processes such as particle sedimentation and particle collisions. Preferential concentration has been hypothesized to play an important role in accelerating the evolution of clouds in the atmosphere, and in creating the conditions necessary for planets and the solar system to form from the initially homogeneous matter of the early universe. In this talk, I will present results from direct numerical simulations (DNS) and experimental measurements performed by collaborators at Cornell (Prof. Warhaft's group) and SUNY-Buffalo (Prof. Meng's group). I will discuss some of the challenges associated with making meaningful comparisons between DNS and experiments. I will also show how both empirical perspectives of the phenomenon are informing a new theory of particle clustering. As with most turbulent phenomena, the single greatest challenge is in understanding its scaling with Reynolds number.

BIO — Lance R. Collins received his B.S.E. from Princeton University, his M.S. and Ph.D. degrees rom the University of Pennsylvania. He joined the Sibley School of Mechanical & Aerospace Engineering at Cornell University in the Spring semester of 2002 following eleven years as Assistant Professor, Associate Professor and Professor of Chemical Engineering at The Pennsylvania State University. Since 1999, Professor Collins also held a joint appointment in the Mechanical & Nuclear Engineering Department at Penn State. In 1998 during a sabbatical leave, Professor Collins was a Visiting Scientist at the Laboratoire de Combustion et Systemes Reactifs (a CNRS laboratory in Orleans, FRANCE) and at Los Alamos National Laboratory (Theoretical Fluid Dynamics Group). Professor Collins' research combines simulation and theory to study a variety of turbulent flow processes. His work on mechanisms of droplet breakup in turbulence was recognized with the 1997 Best Paper Award from the American Institute of Chemical Engineers. He currently serves on the editorial board of the International Journal of Multiphase Flow.

Informal Faculty Luncheon: Wednesday, October 15, 2008, 11:45 am. Meet in 1100 ME and walk to lunch with other faculty. Prof. Lance Collins will be able to attend. Host: Prof. Sean C. Garrick