JOHNS HOPKINS
Center for Environmental & Applied Fluid Mechanics

Weekly CEAFM Seminar: Fall 2012

Date: **Friday, September 21, 2012**

Time: 11:00 AM

Location: Gilman 50 (Marjorie M. Fisher Hall)

Speaker: **Dr. Gregory Bewley** (Max Planck Institute, Germany)

Title: "***Experimental Explorations in Turbulence***"

Abstract

Fluid turbulence is fascinating in part because it is chaotic and therefore seems naturally resistant to organization. I present a series of experiments in turbulence motivated by two issues: the decay rate of freely decaying turbulence and the collision rate of droplets in a turbulent flow. The approach to these issues led, in ways that I will explain, to several discoveries that are interesting in their own right, and which capture generic features of turbulence. For example, small particles in liquid helium stick to a particularly simple kind of vortex, a quantized vortex. This adhesion of the particles to the vortices made observation of quantized vortex dynamics, including vortex reconnection, possible for the first time. A new kind of active grid demonstrates in a wind tunnel that long-range correlations between velocity fluctuations can be dynamically imprinted into turbulence. I will also show how the anisotropy in these correlations is connected to the anisotropy in the amplitudes of the velocity fluctuations. These findings may point a way toward understanding the decay rate of turbulence. Finally, an experiment that mimics cloud conditions shows that droplets experience the so-called "sling effect." The sling effect causes droplets to break free from the turbulence and to fly toward and through each other. This new mechanism by which turbulence can increase the collision rate of the droplets may explain the formation of rain drops in clouds. Yet the original, simple, questions remain unanswered: what is the decay rate of turbulence, and what is the collision rate of droplets in a turbulent flow?