Rotational kinematics of nonspherical inertial particles in turbulence:

Margaret Byron
Mechanical and Nuclear Engineering
Pennsylvania State University

Thursday, August 31st, 2017
Time: 9:00 – 10:00 AM
Location: 358 Willard Blg.
Coffee and donuts will be provided

Abstract: Interactions between suspended particles and turbulent fluid flow are everywhere in the natural and built environment, from sandy ocean floors to smoggy city skies. However, the complexity of these interactions is scale-dependent: very small particles behave as passive tracers, and very large particles may pass through turbulent eddies without being affected by them. For particles at intermediate scales, the ambient flow is spatiotemporally heterogeneous; in turbulence, they are situated in the midst of the range of characteristic length and time scales and therefore experience nonlinear forcing.

This talk will present experimental measurements of intermediate-size, non-spherical, near-neutrally-buoyant particles which are suspended in homogeneous isotropic turbulence. Using novel techniques in refractive-index matching, we obtain simultaneous measurements of suspended particles and the surrounding flowfield, allowing us to directly measure particles’ kinematics and compare them to the surrounding flow. The behavior of these large inertial particles can then be compared to numerically simulated sub-Kolmogorov-scale particles. We will also discuss how inertial particles can serve as models for large aggregates, small underwater vehicles, or the larger plankton.

Biography: Dr. Margaret Byron studies the motion of both passive particles and aquatic organisms in turbulent flow. Her research at the nexus of biology and engineering focuses on the scale-dependent complexity of organism/environment interactions, as well as the transport of inertial particles in turbulence. She recently completed a postdoctoral fellowship at UC Irvine's Department of Ecology and Evolutionary Biology, where she investigated the biomechanics of swimming in cydippid ctenophores. Margaret has a PhD from UC Berkeley in Civil and Environmental Engineering, and a B.S.E. from Princeton University in Mechanical and Aerospace Engineering.