

**Center for Fluid Mechanics, Division of Applied Mathematics
Fluids and Thermal Systems, School of Engineering
Joint Seminar Series**

TUESDAY – OCTOBER 29, 2013

3:00pm

Barus & Holley, Room 190

**Naomi Ehrich Leonard
Mechanical and Aerospace Engineering
Princeton University**

**Coordinated Control: Models and Mechanisms from Collective Animal
Behavior**

From bird flocks to fish schools, animal groups exhibit a remarkable ability to manage a variety of challenging tasks that individuals could not manage on their own. Despite limitations on individual-level sensing, computation, and actuation, and with no centralized instruction, animal groups make decisions quickly, accurately, robustly and adaptively in an uncertain and changing environment. I will describe recent development of analytically tractable models and methods for studying the mechanisms of collective migration and collective decision-making in animal groups. A focus is on bifurcation analyses, which systematically elucidate the dependence of collective dynamics on parameters that model the system and the environment. These connections lay the foundations for systematic control design methodologies that endow engineered multi-agent systems with the remarkable features of animal group dynamics.

Naomi Ehrich Leonard is the Edwin S. Wilsey Professor of Mechanical and Aerospace Engineering and an associated faculty member of the Program in Applied and Computational Mathematics at Princeton. She is currently Director of Princeton's Council on Science and Technology and an affiliated faculty member of the Princeton Neuroscience Institute and Program on Quantitative and Computational Biology. Her research and teaching are in control and dynamical systems with current interests in coordinated control for multi-agent systems, mobile sensor networks and ocean sampling, collective animal behavior, and decision dynamics. In 2013 she was elected to the American Academy of Arts and Sciences. She received a John D. and Catherine T. MacArthur Foundation Fellowship in 2004, the Mohammed Dahleh Award in 2005, and an Inaugural Distinguished ECE Alumni Award from the University of Maryland in 2012. She is a Fellow of the IEEE, ASME, SIAM, and IFAC. She received the B.S.E. degree in Mechanical Engineering from Princeton University in 1985 and the M.S. and Ph.D. degrees in Electrical Engineering from the University of Maryland in 1991 and 1994. From 1985 to 1989, she worked as an engineer in the electric power industry.