iFAST: The International Forum on Advanced Environmental Sciences and Technology

A series of distinguished seminars by eminent scientists

8 p.m. CDT; 9 p.m. EDT; 1 a.m. GMT (July 1); 9 a.m. Beijing (July 1)

Wednesday, June 30, 2021

Mimi Koehl
University of California, Berkeley
https://ib.berkeley.edu/labs/koehl/

Mimi Koehl is a professor in the Department of Integrative Biology at the University of California, Berkeley. She studies the physics of how organisms interact with the environment using both field and lab studies of their fluid dynamics and the biomechanics of their structure. Her work has focused on how microscopic creatures swim and capture food in turbulent water flow, the hydrodynamic consequences of becoming multicellular, how benthic organisms such as kelp, seagrass and coral affect and utilize ambient water currents and waves, how propagules recruit to surfaces in turbulent water flow or wind, how wave-battered marine organisms avoid being washed away, how organisms glide or parachute in wind and how olfactory antennae catch odors from water or air moving around them. Koehl is a member of the National Academy of Sciences and the American Academy of Arts and Sciences and a Fellow of the American Physical Society. Her awards include a MacArthur genius grant, a Presidential Young Investigator Award, a Guggenheim Fellowship, the John Martin Award from the Association for the Sciences of Limnology and Oceanography, the Borelli Award from the American Society of Biomechanics, the Rachel Carson Award from the American Geophysical Union and the Muybridge Award from the International Society of Biomechanics.

Locomoting in a turbulent environment: Ways to study microscale processes in a large-scale ocean

Fluid mechanics is an important tool for understanding the biology and ecology of marine life. A major challenge in studying how microscopic aquatic organisms function in their natural habitats is integrating the different scales at which critical physical and biological processes occur. How can we make large-scale field measurements and models that include the behaviors and physical features of real organisms? Conversely, how can we design small-scale experiments to measure those biological factors under hydrodynamic conditions that reflect what the organisms actually experience in the large-scale ocean? I will discuss examples of some of the approaches we have used to span different scales in our studies of how the interaction between the locomotion of microscopic organisms and the turbulent, wave-driven water flow around them determines how they move through the environment. We studied how the microscopic larvae of bottom-dwelling marine animals navigate to suitable habitats on the sea floor by combining field flow measurements in marine environments with flume studies, experiments in fluidic devices, experiments with dynamically-scaled physical models and agent-based models of different locomotory strategies in measured turbulent flow fields.

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Organizing Committee Chair: Jizhong Zhou (University of Oklahoma, USA; https://www.ou.edu/ieg) Xueduan Liu (Central South University, China)