Bioinspired Ocean Exploration

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Abstract: The ocean remains largely impenetrable to human observation, especially in comparison to our ability to view the inner workings of cells or peer deep into space. Efforts toward high-resolution ocean measurement have primarily focused on interrogating the ocean with increasing numbers of surface and submarine vehicles. The extent to which this approach can scale is fundamentally limited by the energetic requirements of propulsion—a challenge that was solved millions of years ago by swimming zooplankton. But how do they do it? This talk will describe lab and field experiments focused on understanding the fluid mechanics of efficient locomotion by jellyfish, the most energy-efficient of all animal swimmers. That knowledge is leveraged to develop bio-inspired robotic systems with the potential to enable exploration of the entire ocean. Such data can inform longstanding questions regarding the past, present, and future of the ocean.

Bio: John Dabiri is the Centennial Chair Professor at Caltech, with appointments in the Graduate Aerospace Laboratories (GALCIT) and Mechanical Engineering. His research focuses on unsteady fluid mechanics and flow physics, with particular emphasis on topics relevant to biology, energy, and the environment. Current interests include biological fluid dynamics in the ocean, next-generation wind energy, and development of new experimental methods. Dabiri is a MacArthur Fellow and a Fellow of the American Physical Society as well as the American Institute for Medical and Biological Engineering. Other honors include the Alan T. Waterman Award from the National Science Foundation, the G. Evelyn Hutchinson Award for Aquatic Sciences, the Presidential Early Career Award for Scientists and Engineers (PECASE), the Office of Naval Research Young Investigator Program Award, and being named one of MIT Technology Review’s “35 Innovators Under 35” as well as one of Popular Science’s “Brilliant 10.”

Dabiri serves on President Biden’s Council of Advisors on Science and Technology (PCAST), Energy Secretary Granholm’s Energy Advisory Board (SEAB), the Board of Directors of NVIDIA Corporation, and the Board of Trustees of the Gordon and Betty Moore Foundation. He previously served as Chair of the American Physical Society Division of Fluid Dynamics, as well as a member of the National Academies’ Committee on Science, Technology, and Law; the editorial boards of the Journal of Fluid Mechanics and the Journal of the Royal Society Interface; the U.S. National Committee for Theoretical and Applied Mechanics (USNCTAM); the Defense Science Study Group; and as an Advisor to X at Alphabet (formerly GoogleX).