

UC San Diego

JACOBS SCHOOL OF ENGINEERING  
Aiiso Yufeng Li Family Department of  
Chemical and Nano Engineering

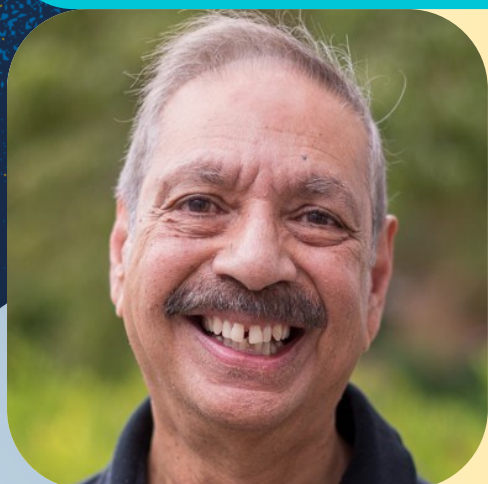
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## DEPARTMENT SEMINAR

Wednesday, October 30th, 2024

11:00 AM - 12:00 PM

SME 248



Dr. Ayusman Sen, PhD

*“Enzyme Motors and Pumps: From Transport to  
Collective Behavior”*

Verne M. Willaman Professor of Chemistry

Professor of Chemical Engineering and Materials Science &  
Engineering

The Pennsylvania State University

**Abstract:** One of the more interesting recent discoveries has been the ability of enzymes to catalytically harness the chemical energy in their environment for mechanical work. Work from our group has shown that enzymes participating in catalytic cascades show surprising emergent behavior, ranging from directional chemotactic motility to dynamic assembly in response to chemical gradients. The resultant organization and collective behavior of interacting active enzymes show remarkable similarities to the biological world. When enzymes are anchored to surfaces, the catalytic reactions can propel the surrounding fluid. We will show that precise sculpting of fluid flow including flow enhancement and flow reversal becomes possible in coupled pump systems depending on the geometric placement of the pumps.

**Bio:** Ayusman Sen is the Verne M. Willaman Professor of Chemistry and Distinguished Professor of Chemical Engineering and Materials Science & Engineering at the Pennsylvania State University. He is Fellow of both the American Association for the Advancement of Science and the Royal Society of Chemistry, and recipient of the Alexander von Humboldt prize and the Medal from the Chemical Research Society of India. His research interests encompass active autonomous systems, synthetic nano and micromotors, micropumps, and systems chemistry. He is the author of over 400 scientific publications and holds 25 patents. Sen’s pastime centers on enological and gastronomical explorations. <https://sites.psu.edu/sengroup/>

**Seminar Host: Joe Wang**