The University of Arizona

Chemical and Environmental Engineering Department – Seminar

®"Colloidal Robotics: Engineering Autonomous Function of Active Particles"

Kyle Bishop, PhD
Associate Professor
Department of Chemical Engineering
Columbia University

Monday, November 2, 2020 – 3:00-3:50 PM
Zoom: https://arizona.zoom.us/j/99357350715

Stick around for more Q&A after the seminar

ABSTRACT

Living cells navigate complex environments to perform diverse functions by integrating the capabilities of sensing, computation, and actuation. The pursuit of similar capabilities in synthetic "microrobots" requires strategies for directing self-propulsion in response to environmental cues such as chemical gradients. We show that the 3D shape of a colloidal particle can be used to direct its motion along complex trajectories powered by different energy inputs (electric, acoustic, chemical). We describe how shape-based programming can enable autonomous navigation by coupling particle motions to external stimuli using responsive shape-changing materials. Different material programs can encode a variety of functional behaviors such as stimulus seeking, avoidance, and regulation.

BIOSKETCH

Kyle Bishop received his PhD in Chemical Engineering from Northwestern University under the guidance of Bartosz Grzybowski. Following his PhD, Dr. Bishop was a post-doctoral fellow with George Whitesides at Harvard University. He started his independent career at Penn State University in the Department of Chemical Engineering. In 2016, Dr. Bishop moved to Columbia University, where he is currently an Associate Professor of Chemical Engineering. Dr. Bishop has been recognized by the 3M Non-tenured Faculty award and the NSF CAREER award. His research seeks to discover, understand, and apply new strategies for organizing and directing colloidal matter through self-assembly and self-organization far-from-equilibrium.

Engineering