Soft Living Active and Adaptive Matter

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Phase Behavior and Self-assembly of Active Colloids

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Abstract:

In recent years, a new type of synthetic microparticle has captured the imagination of researchers across the physical and biological sciences. These so-called active colloids convert chemical or environmental free energy into irreversible directed motion. Impressively, the active force generated by the particles can lead to self-propelling speeds of tens of hundreds of microns per second. Active colloids challenge our theoretical understanding of nonequilibrium phenomena and simultaneously represent a potentially innovative approach to directed transport and material design at the microscale. In this talk, I will discuss one of the most striking features of active colloids, which is their rich and complex nonequilibrium phase behavior. Special emphasis will be given to motility-induced phase separation where purely repulsive active colloids undergo a liquid-gas phase transition. This talk will provide a quantitative understanding of this phenomenon by generalizing concepts in classical statistical mechanics and liquid state theory to active systems. This newfound understanding can be leveraged to improve the self-assembly of many complex colloidal structures using active colloids.

Date:
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Time:
9:00 AM-10:15 AM

About the speaker:

Dr. Stewart Mallory is currently an Arnold O. Beckman postdoctoral fellow in the Division of Chemistry and Chemical Engineering at Caltech. His research focuses on the development of nonequilibrium theories for the behavior of soft complex materials, with a particular interest in novel techniques to manipulate and self-assemble matter at the colloidal scale.

Stewart received his B.S. and B.A. in chemistry and mathematics from the University of Hawai'i and completed his Ph.D. in chemical physics at Columbia University as an NSF Graduate Research Fellow.

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