CAL POLY
Physics
BAILEY COLLEGE OF SCIENCE & MATHEMATICS

Synchronization and Self-Assembly of Free Capillary Spinners

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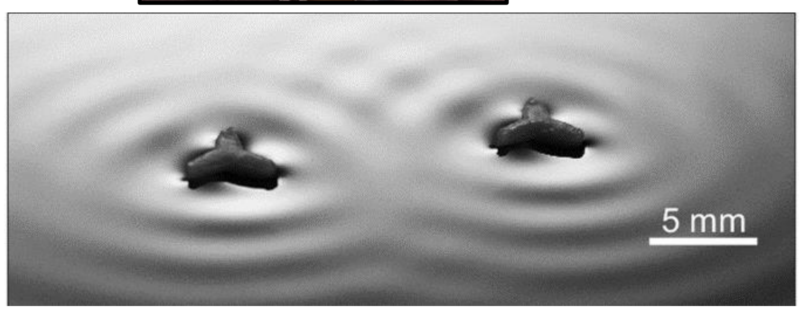
Thursday, April 24, 2025
11:10 am - 12:00 Noon
Building 53, Room 215
Pizza will be served!



Abstract: Self-organization of interacting active particles in space and time has been a topic of interest over the last few decades. Recently, assemblies of millimeter sized chiral particles – so-called spinners - floating on the surface of a vertically shaken fluid have been shown to synchronize because of wave interactions. In this talk I will describe a novel experimental arrangement where freely floating spinners not only synchronize their rotations in time but also organize themselves in space. Their spatial organization is quantized by the wavelength of the surface capillary waves. Intriguingly, coupled spinners also exhibit a global rotation. In the case of pairs, they orbit around each other with a direction that depends on the separation of the spinners, even though there is no obvious centripetal force. A mathematical model based on fluid dynamics can explain most of the observed behavior but has so far not been able to predict the global rotation direction. However, by considering a simple model of wave interference at the spinners, we can qualitatively explain the observations.

Bio: After a thirty-four-year career in the Physics Department at Cal Poly, Dr. Nilgun Sungar retired from teaching in mid 2023. She has, however, continued her experimental study of capillary spinners and her collaboration with scientists from Brown University. Her general research area is in nonlinear dynamics and her earlier theoretical and computational work focused on pattern formation. During the last decade she has worked on hydrodynamic quantum analogs, and with the assistance of undergraduate students set up an experimental system at Cal Poly. In the last few years, she has been studying chiral particles - 'spinners'- floating on the surface of a vertically shaken fluid and their self-assembly and interactions.