

# Physics Colloquium

Monday, November 23<sup>rd</sup> 4:00 p.m.

## That sinking feeling: Gravity and its role in how life navigates the oceans

Marine plankton exhibit a Diel Vertical Migration with vertical displacement scales from several tens to hundreds of meters. Even at the scale of small phytoplankton and zooplankton (100  $\mu\text{m}$  to a few mm) the interaction of this vertical swimming behavior with hydrodynamics affects large scale distribution of populations in the ocean and is thus an important component of understanding ocean ecology. However, concurrently observing organismal physiology and behavior is challenging due to the vast separation of scales involved. Resolving physiological processes involves sub-cellular (micron) resolution while tracking freely swimming organisms implies vertical displacements of several meters. We present a simple solution to this problem in the form of a “hydrodynamic treadmill” incorporated into a table-top scale-free vertical tracking microscope. We use this method to study the behavior of freely swimming marine plankton, both in lab and on-board a research vessel, revealing a rich space of dynamic behavioral states in marine micro-organism. Time permitting, I will also share our efforts in bringing oceanography to “seatizens” around the world by democratizing tools for science accessible to sailors across the world.



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