The University of Hong Kong
School of Biological Sciences

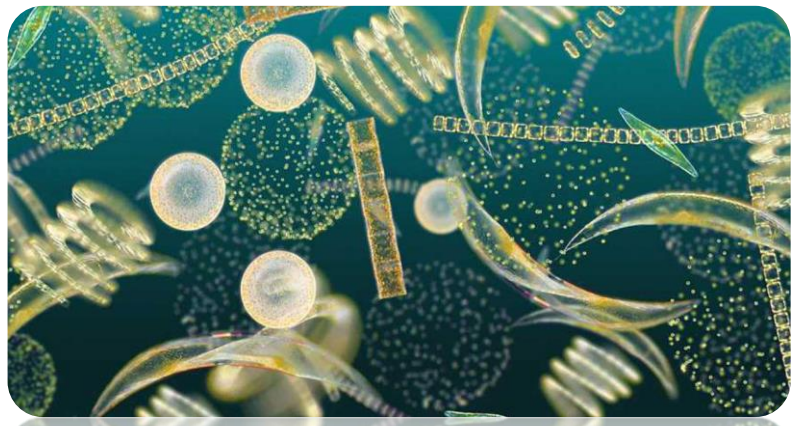
Qualifying Seminar

Understanding mechanisms of phytoplankton acclimation and adaptation to environmental variation

Date: 19 Jan 2021 (Tue.)

Time: 11:00 a.m.

Venue: KBSB 3N01 & Zoom



About the speaker:

Li Zhenzhen is a Ph.D. student from the iBEER lab under the supervision of Dr. Gaitan-Espitia. During Master's at Xiamen University, he studied aspects of environmental physiology on phytoplankton. Using his background experience, he aims to gain a better understanding of the ecological and evolutionary mechanisms involved in phytoplankton acclimation (physiologically) and adaption (genetically) to environmental stress and climate change.

Abstract:

The marine environment is highly variable in time and space. This variability influences the physiology, distribution, ecology, and evolution of marine life. In short-living species such as microscopic phytoplankton organisms, natural variability of environmental conditions in the ocean determines temporal and spatial dynamics in biochemical cycles, trophic food webs, and primary production of aquatic communities. These dynamics are ultimately regulated by the ecological control of phytoplankton growth through bottom-up (e.g., availability of resources) and top-down (e.g., grazers, virus) factors. Changes in these factors can be induced by changes in the magnitude, frequency, and duration of environmental variability altering the ecology and evolution of phytoplankton. In a short timescale (within few generations), these organisms can adjust their physiology, morphology, and life-history through phenotypic plasticity (e.g., thermal plasticity) to cope with sudden environmental changes. However, there are limits to plasticity and thus, longer exposure to changes in environmental variability requires genetic/genomic adjustments (adaptative evolution) to respond to novel selection regimes. Although our general understanding of the physiological and ecological responses of phytoplankton to changes in environmental conditions has improved, the mechanistic understanding of these responses and the associated eco-evolutionary dynamics is still poor. This is particularly evident when considering different environmental drivers that are continuously interacting in synergistic, antagonistic, or additive ways in the ocean.

My Ph.D. research addresses this major knowledge gap in phytoplankton ecology and evolution, aiming to answer two general questions: 1) How do bottom-up and top-down controls influence phenotypic plasticity in phytoplankton?; and 2) How does the interaction of ecological controls modulate the evolutionary processes in these organisms? This research will employ a novel eco-evolutionary framework to assess mechanistic explanations of dynamics and potential phenotypic and genetic shifts of primary producers in future oceans.