NUS National University of Singapore | Department of Biological Sciences, Faculty of Science

# ON-SITE BIOLOGY COLLOQUIUM

Friday, 6 Sept 2024 | 4 pm | DBS Conference Room 1, Blk S3 Level 5

Hosted by Assist. Prof Chae Eunyoung

Map to Block S3

# Predicting future biological forms – from structural functions to developmental evolution


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From hairs to worm-like bodies, slender body structures are ubiquitous throughout the Tree of Life. This prevalence may be because such structures can confer a variety of fitness-enhancing functions by interacting with the physical factors in the environment. Small changes in their forms may shift their functions and vice versa; these functional structures are likely to evolve rapidly in the changing climate. A good example is the environmentally sensitive flight of the common dandelion – one of Nature's most iconic flyers. The dandelion pappus increases air drag, although the parachute-like structure contains >90% empty space. Through a fluid dynamical characterization, we revealed a previously unseen flow behaviour likely aiding flight. The pappus is sensitive to the moisture level in the air and closes when wet; this morphing tunes the flight capacity. Through an imaging-based deformation analysis, material characterization, and finite element method mechanical modelling, we gain insights into the mechanisms of the pappus actuator. The dandelion is a pioneer and foundation-building species of an ecosystem that feeds numerous bees and birds. Its dispersal dynamics have deep impacts on ecological geography and agriculture. A future direction will be discussed as to how we could predict and engineer climate-resilient plant forms.


***About the Speaker***

*Naomi is a Reader in the Department of Bioengineering at Imperial College London, where she leads the Biological Form and Function Lab. Employing biomechanical, fabrication-based, and synthetic biology approaches, her lab explores the design principles of biological forms to predict the evolution of organismal development in the changing climate. She received a PhD in Molecular, Cellular, and Developmental Biology from Yale University (USA) for dissecting the molecular mechanisms underlying organ-type-specific cell and tissue differentiation. Since then, her research has become increasingly interdisciplinary at the interface of biology and physical sciences. She expanded into mechanobiology and studied how mechanical signals instruct plant development and growth during her postdocs in Switzerland and France. Since establishing her lab, she has been proving how developmental outcomes influence biological problem-solving and fitness.*