NANYANG TECHNOLOGICAL UNIVERSITY

School of Biological Sciences

Reg. No. 200604393R

Research Theme: Interdisciplinary Biology (Plant Cell Biology, Plant Immunology, Biophysics, Structural Biology)

Research Project Title: **Biomolecular Condensation for Plant Immunity in Microbe–Host Interactions**

Principal Investigator/Supervisor: Professor Yansong MIAO

Co-supervisor/ Collaborator(s) (if any):

Project Description

a) Background:

This interdisciplinary project focuses on how biomolecular condensates organize plant immune signaling during microbe–host interactions.
Plants detect microbes through cell-surface and intracellular immune receptors and must mount defense responses that are rapid, strong, and precisely controlled. Increasing evidence shows that many immune signaling components assemble into membrane nanodomains and biomolecular condensates through multivalent interactions and phase separation, which tune the strength, specificity, and timing of signaling. How these condensates form, mature, and are coordinated across cells, tissues, and the entire plant during infection remains a central open question in plant biology and crop protection.

Building on our expertise in biomolecular condensation, membrane nanodomains, and the plant cytoskeleton, this project will dissect how immune condensates are assembled and regulated in living plant cells challenged by pathogenic and beneficial microbes. We are looking for a highly motivated PhD student to work on this novel and well-designed project, ensuring high-quality training, high-impact outcomes, and scientific publications.

We provide solid scientific training for your future career and aim to nurture the next generation of scientists. The Ph.D. candidate will conduct cutting-edge cell biology imaging, from super-resolution microscopy to meso-scale sensing and from single-molecule tracking to atlas mapping across the entire plant. The candidate will receive extensive training in fluorescent imaging, imaging analysis, plant signaling, structural biology, and protein biophysics, with an interdisciplinary focus on plant cell biology and plant immunology.

Miao lab also provide different high-quality scientific training opportunities, such as international conferences, workshops, exchanges.

For our recent work and publications, please see https://blogs.ntu.edu.sg/miaolab/
For more details of ongoing and new projects, feel free to contact Prof. Miao at yansongm@ntu.edu.sg.

b) Proposed work:

The Ph.D. candidate will (i) visualize the assembly, dynamics, and material properties of immune condensates at the plasma membrane and in the cytoplasm using super-resolution and single-molecule imaging; (ii) apply fluorescent biosensors to follow immune signaling outputs, such as calcium, reactive oxygen species, and protein phosphorylation, at meso-scale resolution during infection; and (iii) map condensate formation from single cells to an atlas across organs and the entire plant, combined with in vitro reconstitution and structural analysis of key immune proteins.

Our top-notch biotechnologies in the lab and long-term collaborations with structural biology, biophysics, plant pathology, and imaging groups will ensure a comprehensive understanding of condensate-mediated plant immunity.

c) Preferred skills:

Enthusiasm for science; A background in molecular biology, cell biology, biochemistry, or a related field; Experience with fluorescence microscopy or molecular cloning is an advantage but not required; Excellent oral and written communication skills; Good collaboration skills.

Supervisor contact:

If you have questions regarding this project, please email the Principal Investigator:

yansongm@ntu.edu.sg

SBS contact and how to apply:

Associate Chair-Biological Sciences (Graduate Studies) : AC-SBS-GS@ntu.edu.sg

Please apply at the following:

Application portal:

https://venus.wis.ntu.edu.sg/GOAL/OnlineApplicationModule/frmOnlineApplication.ASPX