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

# BIOLOGY COLLOQUIUM

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**Hosted by Professor Prakash Kumar**

# Control of Stemness and Regenerability in Plants

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Extensive studies have been conducted during the past decades in animal models and humans in order to develop strategies that stimulate the regeneration of damaged tissues or prevent tumor relapse after initial efficient chemotherapy in humans. By contrast, few efforts have been devoted to better understand the regenerative potential in plants, despite the fact that plants generally have higher regenerability than animals.

Inspired by the extraordinary abilities of roots from many plant species to generate various types of organs (such as lateral roots, shoot buds and nodules) post-embryonically, to replace damaged tips, and to survive and recover from unfavorable soil environments, we have chosen to learn from the roots about how plants acquire high regenerability. By inducible conversion of lateral roots to shoots in the *Arabidopsis thaliana* roots, by surgical removal of the root stem cells, and by chemical or physical induction of death of root stem cells and their early progeny, we have deciphered several novel mechanisms that contribute to the regulation of regenerability in the Arabidopsis root at the cell, tissue and organ levels. Most importantly, we have now begun to understand the fundamental and evolutionarily conserved roles of cellular epigenome in the maintenance and/or acquisition of stemness, which is an essential building block of regenerability.

Our future research aims to provide fundamental insights into unifying principles that could help us better explain the regenerative and adaptive potential of plants and animals. Key findings from our research will also facilitate the identification and development of small molecule chemicals and strategies that target the epigenetic machinery to modulate stemness and regenerability in humans.

Artwork by Ann Nee, DBS, NUS