



Associate Professor Hugh Tan Tiang Wah giving a tutorial. (Photograph by: Alex Yee).

Preface: Singapore's botanist, Associate Professor Hugh Tan

Hugh T.W. Tan ('Prof. Tan') completed his BSc with Honours in botany from the National University of Singapore (NUS) in 1979. His Honours thesis, 'Organ culture of some orchid hybrids', was supervised by Goh Chong Jin. He went on to obtain his PhD from the NUS in 1986 on the morphology and systematics of the Rubiaceae (coffee family) with special emphasis on the genus *Hedyotis*, supervised by Hsuan Keng and co-supervised by Adisheshappa Nagaraja Rao. He was appointed as a Lecturer at the NUS, promoted to Senior Lecturer in 1992 and then became Associate Professor in 1998. Around the time that the Botany Department and Zoology Department merged into the School of Biological Sciences, he started the Plant Systematics Laboratory (later renamed the Botany Laboratory), thereby ensuring that there would be a place for education and research interest in botany to continue and remain relevant, in a time when curricular changes had led to a much-broadened scope of undergraduate biology education at the NUS and in Singapore. With the establishment of his lab, he expanded into and published on many other areas of botany and the plant sciences, including conservation biology, floristics, aerobiology, plant biogeography, biomechanics, ecology, systematics, population genetics, phytochemistry, phytoremediation, urban greening and urban agriculture.

Prof. Tan is perhaps best known by some for his tireless promotion of the use of native plant species in horticulture and urban landscaping in Singapore. He produced several publications on this topic, including 'A Guide to Growing the Native Plants of Singapore' and 'Growing at Your Doorstep: 35 Native Plants of Singapore'. His efforts contributed in a large way towards an eventual major shift in local urban greening policies. Over the years, he has been consulted by government agencies, private organisations and the University, both in his official capacity and informally, on matters related to greenery, biodiversity impacts from development and the conservation of Singapore's natural heritage.

Prof. Tan was the Deputy Director of the then-Raffles Museum of Biodiversity Research from 2007 to 2013, and had a key role in its transformation to become the Lee Kong Chian Natural History Museum (LKCNHM). In 1986, he took over from Hsuan Keng as Keeper of the NUS Herbarium (SINU), an important repository of some 40,000 algae, fungi, bryophyte and vascular plant specimens collected mostly from Singapore and Peninsular Malaysia by staff and students during class field trips and other field projects, which was housed at the museum then. During his tenure at the museum, he founded two key publications: *Nature in Singapore*, a peer-reviewed online scientific journal focusing on local natural history observations, and an online book series that is today called the LKCNHM E-Books. Under his editorship, these open-access publications have helped to promote citizen science and public interest in the natural history of Singapore, Southeast Asia and the rest of the world.

Producing publications that get people interested in plants and the natural world has been a special focus in Prof. Tan's career. He is the lead author of *The Natural Heritage of Singapore*, the main text of the NUS module of the same name and which is very popular among students. He is a co-editor of *Singapore Biodiversity: An Encyclopedia of the Natural Environment and Sustainable Development*, a seminal reference on the natural history and environment of Singapore, for which he also contributed 108 entries about Singapore plants. A series of guidebooks for the Science Centre Singapore on plants, animals and habitats in Singapore, which he lead-, co-authored or edited, has been very well-received and widely used as teaching material. Over the span of his career, Prof. Tan has authored or edited over 200 books or book chapters and published over 200 scientific journal articles.

As one of the Faculty of Science's best teachers, Prof. Tan has won numerous teaching awards. These include the NUS Faculty of Science Teaching Excellence Award (2010/11, 2009/10); the Ministry of Education Outstanding Mentor Award for the Science Mentorship Programme (2009); the NUS Faculty of Science Honour Roll for Teaching (2003/4, 2004/5); the NUS Excellent Teacher Award (2002/3, 2001/2); the NUS Faculty of Science Teaching Award (2002/3, 2001/2, 2000/1) and the NUS Faculty of Science Meritorious Teaching Award (1999/2000, 1998/1999). Prof. Tan's legacy is especially evident in the numerous local botanists he has taught, supervised and mentored. Some 160 undergraduate research students, nine MSc students and 13 PhD students have passed through his lab. Many of his students have carried on into careers in the horticulture and environmental sectors, as well as in science and the public service.

Prof. Tan has shared that the successes of his students are some of his proudest achievements. He has always shown great interest and concern in his students' lives and career paths. A firm believer in self-improvement, he made it a point to share advice on life skills and tips on working more effectively with his students. As an example, a generation of students will remember how he was a strong proponent of Malcolm Gladwell's 10,000-hour rule (it takes 10,000 hours of practice to achieve mastery of a skill)—a firm encouragement to them about the importance of hard work and dedication. Being able to write well in order to communicate effectively is another area in which he placed great importance. Each thesis season, he would painstakingly go over the drafts of his supervised students with great patience to thoroughly correct and improve language and phrasing, to ensure that his students would be submitting the best versions of their work. In his research and scientific supervision, Prof. Tan often gave his students the freedom and support to pursue research areas of their interest and passions, including some which might initially have seemed like 'crazy ideas'. With his support, his

students were able to delve into a wide range of research topics in botany and the plant sciences with implications for Singapore and the region.

The contributions in this Valedictory Volume represent, in terms of topics, the evolution of Prof. Tan's key research interests over the years, and, in terms of authorship, the range of professions into which his former students and staff have entered.

The first essay, led by none other than the current Chief Executive of the National Parks Board of Singapore (NParks), Kenneth Er, describes the recent decades of floristic discovery, rediscovery and conservation in Singapore. Kenneth undertook an internship in Prof. Tan's laboratory as an undergraduate. The last author of this paper, Adrian Loo, was supervised by Prof. Tan for his Honours and PhD theses and is now a Group Director at the NParks.

The second and third papers are by Prof. Tan's oldest collaborators and early peers. In the second paper, Richard Corlett, a former colleague at the NUS, proposes ten lessons on conserving tropical biodiversity that tiny Singapore has provided to the world. As Lesson 10, he states: "One person can make a difference... My personal list includes... Hugh T.W. Tan... not only because of their own research output, but also for both inspiring and facilitating the research of others, and for then ensuring that the results reached the people who can make use of them." Richard retired in 2021—almost on the same day as Prof. Tan did—from the Centre for Integrative Conservation at the Xishuangbanna Tropical Botanical Garden. In the third paper, Ian Turner reviews Singapore 'types'—specimens collected from Singapore on which the very first descriptions of plant taxa (in this case) were based. Ian was a lecturer at the former Department of Botany of the NUS and closely collaborated with Prof. Tan on floristic, plant ecology and conservation research in Singapore, and in the teaching of courses and supervision of student projects.

The fourth and fifth contributions are about the genus *Timonius* of the Rubiaceae. These are authored by Wong Khoon Meng, another early peer of Prof. Tan's, former Keeper and now Principal Researcher at the Herbarium of the Singapore Botanic Gardens (SING), and Chen Junhao, a former student of Prof. Tan's and now researcher at SING. Junhao had approached Prof. Tan for a research project on plant taxonomy and then embarked on a revision of the *Timonius* of Mount Kinabalu in Sabah, jointly supervised by Khoon Meng. The fourth paper reviews the current state of knowledge on this genus, while the fifth paper describes a new species, *Timonius hughtanii*, which the authors have named after Prof. Tan.

The sixth to eighth papers continue a series of field guides to trees of the Nee Soon catchment. This series arose from a research project on the floristically invaluable Nee Soon freshwater swamp forest, for which Prof. Tan was a Principal Investigator. The lead authors of these articles on *Calophyllum* (Sherry Hung, Seah Wei Wei), Phyllanthaceae (Lam Weng Ngai, Jolyn Loh, Rie Chong) and Sapotaceae (Chan Pin Jia), were all supervised by Prof. Tan for undergraduate and/or PhD projects. The lead author of the next two papers, Ng Xin Yi, was a Research Assistant on one of Prof. Tan's projects, while a co-author of the ninth paper, Ang Wee Foong, and a co-author of the tenth paper, Reuben Lim, were both supervised by Prof. Tan for undergraduate student projects and later worked as his Research Assistants. Together, they run the Native Plant Centre at the NParks, which propagates native species for use in streetscapes and parks, and performs ex situ conservation under the Species Recovery Programme of the NParks. Their search for native plants for conservation continually results in new records and rediscoveries for Singapore, as exemplified by the bamboo *Schizostachyum lengguanii* and the Rubiaceae genus of climbers, *Uncaria*, described in the ninth and 10th papers, respectively. The 11th paper is a checklist of vascular plants of the Bukit Brown area by Jong Ying Wei, who was a student of some modules taught by Prof. Tan, including Tropical Horticulture. Ying Wei and Sherry (sixth paper) both work in the environmental consultancy sector as plant specialists.

The next contribution by Darren Sim, Maxine Mowe and Darren Yeo reviews the state of knowledge on non-native and cryptogenic vascular plants in Singapore's waterways and reservoirs. Darren Sim was co-supervised by Prof. Tan for his undergraduate and PhD projects, while Maxine was a post-doctoral Research Fellow on a project for which Prof. Tan was a co-Principal Investigator, and is now a lecturer at the NUS. Both were also supervised by Darren Yeo, who himself had been a student in courses taught by Prof. Tan, later joining him as a colleague at the Department of Biological Sciences (DBS) where they collaborated in research and teaching. Following this, the essay by Lai Hao Ran, Chong Kwek Yan and Alex Yee summarises findings from a five-year study of the Mandai storm forest. This study is an example of 'one of those crazy ideas' in which Prof. Tan had supported his students. The study formed key parts of Hao Ran's and Alex's PhD theses, respectively co-supervised and supervised by Prof. Tan. Kwek Yan, now an ecologist at the NParks, was also supervised by Prof. Tan for his undergraduate and PhD research and continued to work closely with Prof. Tan during his time as a post-doctoral Research Fellow. Reuben, Xin Yi and Pin Jia then return with an article which presents the results of hand-pollination of *Cycas edentata*, a nationally Critically Endangered cycad species with horticultural value. Next, Teo Siyang and Louise Neo demonstrate a test case of using machine-learning techniques to analyse plant phenology information from crowd-sourced photographs. Siyang was a Research Assistant with Prof. Tan and is now a data scientist, while Louise, now a researcher at SING, completed undergraduate and PhD projects under Prof. Tan's supervision and also worked as his Research Assistant.

In the 16th article, Serena Lee, a manager at SING and past student of Prof. Tan's modules (such as Tropical Terrestrial Ecology), contributes a review of bioluminescent fungi in Singapore. Tan Ming Kai, supervised by Prof. Tan for his PhD research, then reviews the potential for native crickets to be used as part of the strategy for achieving food security in Singapore. The work for Ming Kai's and the next article on the status and conservation of horseshoe crabs in Singapore was conducted with the support of students and staff of Republic Polytechnic. The 19th article by Sam Shu Qin is a study on the motivations and barriers faced by young scientists in Singapore who engage in the public communication of science. The last authors of the 18th and 19th articles were former colleagues of Prof. Tan: Laura Yap was a postgraduate student and full-time teaching assistant at the DBS before joining Republic Polytechnic while Robert Lieu is a lecturer at the DBS.

The final contribution is an urgent call for more attention to be given to plants and fungi in higher education. The author, Amy Choong, was one of Prof. Tan's early students. She later joined the DBS as lecturer and faculty member, and has now taken over the teaching of The Natural Heritage of Singapore, Comparative Botany and Tropical Horticulture.

The epilogue contains excerpts from an interview with Peter Ng, founding and former Head of the LKCNHM, and an old friend and collaborator of Prof. Tan. The 'yin-and-yang' personalities and styles of these two professors—arguably, Singapore's botanist and Singapore's zoologist—revealed through these excerpts, demonstrates the kind of collaboration and working relationships that must be forged to transcend intrinsic tensions within the nature community, such as between academia and public agencies, and between economic development and environmental conservation, in order to find answers to the tough decisions on environmental protection and biodiversity conservation that Singapore faces today and in the future. Finally, this article is written by Ng Ting Hui who took over the editorship of Nature in Singapore from Prof. Tan from 2020 to 2022. Ting Hui had previously been a student of Prof. Tan's modules and a Research Assistant on a project assessing the biodiversity of Singapore's reservoirs for which he was a co-Principal Investigator.

Much has been written about the work of early British botanists in Singapore, many of whom have left behind legacies for future generations in this region to build upon. There has been far less documentation and review of the professional activities, relationships and major contributions of post-colonial botanists, including Hugh Tan, Singapore's very own Singaporean botanist—who have similarly left indelible marks on local natural history and science which will grow increasingly obvious in the years to come. The collection of papers in this special volume document recent progress in Singapore botany and natural history in celebration of the collaborative and productive career of Prof. Tan. We would like to express our deepest gratitude to all of the authors, without whom this would not have been possible.

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