

Orchid Biology: Reviews and Perspectives, X

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Edited by

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Springer

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Dedicated by the editors to

Kee Yoeup Paek

Norris Williams

Edward Yeung

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Manuscripts and Publication Policy

Orchid Biology, Reviews and Perspectives (OB) publishes only reviews, not original research papers. It is also not the policy of *OB* to publish letters to the editor. Although most *OB* chapters are invited, submitted manuscripts are also considered. Authors of such manuscripts are advised, but not required, to contact one of the editors well in advance before starting to write. Manuscripts in a language other than English and/or not in strict adherence with the format used by recent *OB* volumes will be rejected outright. Authors of such manuscripts will be notified that their manuscripts have been rejected, but only if they provided an e-mail address. The manuscripts will not be returned unless accompanied by self-addressed postage prepaid envelopes. All submitted manuscripts which meet the conditions set above will be reviewed by the editors and at least two additional reviewers. Acceptance or rejection will be based on reviewer recommendations. In cases of split opinions acceptance or rejections will be based on the recommendations of the majority of the reviewers.

Persons to Whom this Volume is Dedicated

Kee-yoeup Paek was born on 24 February 1951 in Korea. He received his Ph.D. from the department of horticulture at Kyungbuk National University in 1984. After that he was a postdoctoral fellow at the Plant Physiology Research Group at the University of Calgary from 1985 until 1986. He joined the Department of Horticultural Science, Chungbuk National University in 1982 and became director of the Research Center for the Development of Advanced Horticultural Technology in March, 1996.

Other appointments and activities include:

Invited Professor, Institute of Agricultural Biochemistry, Tsukuba University, Japan, 1989–1990

Project Leader, Orchid Research Group (supported by the Korea Science and Engineering Foundation), 1993

Invited Professor, Department of Horticulture, Chiba University, Japan, 1994



Member, Scientific and Judging Committees, Joint Federation of Oriental Orchids, 1995

Member, Scientific and Judging Committees, Asia Pacific Orchid Conference, 1995–to date

Member, Technology Support Group for Consulting on Export of Agricultural Products Export and Korea Agro Fisheries Trade Cooperation, 2005

Invited Professor, Institute of Plant Physiology, Russian Academy of Science, Moscow, 2006

Chairman of Scientific Committee, 9th Asia Pacific Orchid Conference, 2007

Honors received by Prof. Paek include:

Appreciation Plaque from the Association of Korean Orchid Growers, 2002

Certificate of Appreciation, 8th Asia-Pacific Orchid Conference, Taiwan, 2004

Judging, Korea Orchid Exhibition Committee, 2005

Member, Technology Support Group for Consulting on Export of Agricultural Products Export and Korea Agro Fisheries Trade Cooperation, 2005.

Professor Paek has published widely in scientific journals, symposium volumes, monograph series and magazines – *Eun-Joo Hahn, Research Professor, Research Center for the Development of Advanced Horticultural Technology, Chungbuk National University Cheongju, 361–763, South Korea, ejhahn@chungbuk.ac.kr*

Norris Williams was born in Anniston, Alabama on 31 March 1943. He received his B.S. and M.S. degrees in Biology from the University of Alabama, and his Ph.D. in Biology at the University of Miami under the direction of Calaway Dodson in 1971. Following several postdoctoral positions at the University of Miami, the Smithsonian Institution, and the Fairchild Tropical Garden, he accepted a position as Assistant Professor of Biology at Florida State University in Tallahassee in 1973.

In 1981, he moved to Gainesville, Florida to assume his present position as Keeper of the Herbarium in the Florida Museum of Natural History and Affiliate Professor of Botany at the University of Florida. He and his wife Nancy have two sons who have inherited their father's love of antique MG cars.

As a Ph.D. student under Dodson, Norris travelled extensively in Central America and Ecuador. During that time he absorbed information on orchid biology from Dodson and Robert Dressler, and was often accompanied by fellow graduate students Kiat Tan (formerly Director of Parks in Singapore, now retired), Harold Hills, Ralph Adams, Kathy Gregg and Hans Wiehler.

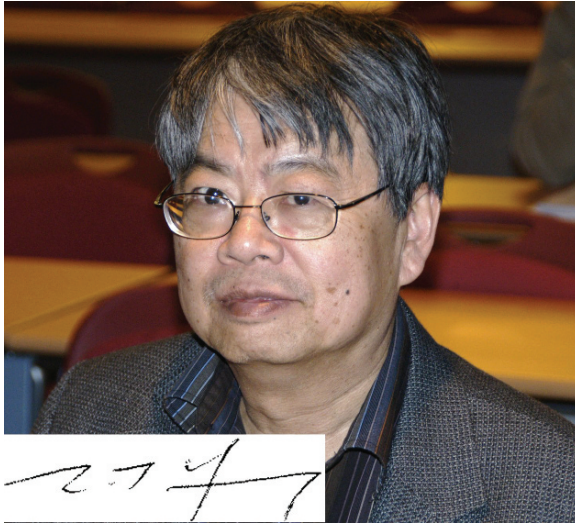
Norris's dissertation was a revision of *Brassia* (Oncidiinae), but his research interests quickly shifted to the pollination biology of orchids pollinated by fragrance-collecting male euglossine bees (a topic first studied by Dodson, Dressler and their students). He expanded the work of the Dodson group, pioneering the use of gas chromatography-mass spectrometry to analyze the floral fragrances of orchids and the glandular secretions of male euglossine bees and laying the foundation for our current understanding of the orchid/bee interaction.



Dr. Williams's other early research interests included orchid anatomy and palynology. In the 1990s, orchid systematics was increasingly influenced by data from DNA sequencing, and Norris's research focus soon shifted back to Oncidiinae, this time utilizing sequence data and phylogenetic analyses. Together with Mark Chase and coworkers, his studies have revolutionized our concepts of evolutionary relationships in the Oncidiinae, one of the largest and most horticulturally important groups of neotropical orchids.

Perhaps Norris's most enduring contribution to orchidology will be his graduate students who have also become leading orchid researchers and teachers. They include John Atwood (formerly of Selby Botanical Gardens), James Ackerman (University of Puerto Rico), Alec Pridgeon (Royal Botanic Gardens, Kew) and Mark Whitten (Florida Museum of Natural History). His research continues to focus on molecular systematics of neotropical orchids, and his active laboratory currently includes Ph.D. students from Costa Rica, Ecuador, Colombia, and the United States – *Mark Whitten, University of Florida, whitten@flmnh.ufl.edu*

Edward C. Yeung was born in Hong Kong on 21 October 1947. He received his B.Sc. (1973) from Guelph University (graduating with distinction), and Ph.D. (1977) from Yale University. After spending one year as a postdoctoral fellow at the University of Ottawa, he joined the Department of Biological Sciences at University of Calgary in July 1978. He was promoted to Associate Professor in 1984 and became a Full Professor six years later. In addition, he also served on the Natural Sciences and Engineering Research Council of Canada (NSERC) committee. The University of Calgary recognized his teaching excellence with the Faculty of Science Teaching Excellence Award in 2002. His primary research interests have been reproduction biology of higher plants, especially the structural and physiological aspects of embryo development. In his early research he used *Epidendrum ibaguense*



as his major plant material. He also used some native Canadian orchid species, such as *Calypto bulbosa* and *Cypripedium passerinum* to study the ovule and embryo development. Later he collaborated with Dr. Zee Sze-Yong (University of Hong Kong) and Dr. Y. Xiu-Lin (South China Institute of Botany) focusing on the embryology of *Cymbidium sinense* and *Phaius tanervilliae*. Recently, he studied seed germination and embryo development on *Cypripedium formosanum*, *Paphiopedilum delenatii*, *Calanthe tricarinata* and *Phalaenopsis amabilis* var. *formosa*. He has had three Ph.D students and five Master's students so far. Dr. Yeung enjoys cooking for friends, students and family, eating, Sake, playing Spider Solitaire and singing Karaoke – Yung Lee, leeyung@hotmail.com

Preface

As stated many times before the purpose of *Orchid Biology, Reviews and Perspectives (OB)* is to present reviews on all aspects of orchids. The aim is not to balance every volume, but to make a balanced and wide ranging presentation of orchids in the series as a whole. The chapters in this, the last volume of the series, range over a number of topics which were not covered before.

Singapore is justly famed for its orchids. They can be seen on arrival (or departure) in its modern, highly efficient and comfortable Changi Airport and on the way from it to town. *Vanda* Miss Joaquim, the first hybrid to come from Singapore became its National Flower. This natural hybrid can be seen on its currency, stamps, and public and private decorations. Many excellent breeders, starting with Prof. Eric Holttum who bred the first man made hybrid (*Spathoglottis* Primrose), produced numerous magnificent hybrids and won countless awards in Singapore and elsewhere. These hybrids served to enrich the country's orchid mystique. In the opening chapter of this volume Dr. Teoh Eng Soon (Western style: Eng Soon Teoh), himself a prize winning orchid breeder, grower and author writes about some of the breeders who contributed to the Singapore orchid fame.

Prof. Hans Fitting was one of the best known plant physiologists of his time. As a young man he studied the effects of pollen on orchid flowers. His studies led him to become the first plant scientist to propose that plants produce hormones. Fitting assumed that pollen exerts its effects on flowers through a hormone which he named *Pollenhormon*. Some suggested that *Pollenhormon* was auxin. Fitting never accept this suggestion. Now it seems that the extract Fitting called *Pollenhormon* was probably a mixture of auxin and other substances. Dr. T. W. Yam and his coauthors describe Fitting's work and draw conclusions which are based on modern plant physiology.

The bible is an important part of the lives of many people. It is regarded as absolute truth by the devout and studied by both believers and non believers. Orchids are not directly mentioned in the Bible, but several biblical plants have been described as being Orchidaceous. Professor Emeritus A. S. Dunn, an animal biologist who has studied both the Bible and the Talmud as an avocation and Professor Emeritus J. Arditti, who asserts repeatedly that he only knows orchids, examine the question of orchids in the bible in their chapter.

Food hairs play an important role in the biology of orchids. In chapter four Dr. K. L. Davis surveys their form and the effects they have on orchid diversification.

Pollen dispersal of orchids has been researched extensively and its consequences have been discussed widely. Prof. E. Pacini's chapter is the first review on the subject.

Orchids have found their way into the arts, letters and even into music. K. E. Quinn discusses orchids in art in Chapter 6.

Vanilla is the only orchid grown as a plantation crop for human consumption. Its cultivation became possible only after the discovery of a hand pollination method. The question of who discovered the method is the subject of Chapter 7 by Professors J. Arditti, A. N. Rao and H. Nair.

Viruses which attack orchids are a major problem because they cause significant financial losses. Effective control of these viruses requires an understanding of their nature. Dr. Ajjikuttira and Prof. Wong provide such understanding in Chapter 8.

Appendixes in this series have always been practical in nature and intended to provide information which can be used directly by readers. The appendix in this volume is a list of more than 2000 books on orchids in several languages.

* * *

The founding editor, Joseph Arditti who guided all ten volumes conceived the idea of this series in during the late 1960s, started to collect and write chapters in the early 1970s and managed to get the first volume published in 1977. For a complete list of chapters and appendixes please consult the closing pages of this volume). Since its inception the statistics for the series are:

volumes, ten (including this one),
 pages, approximately 4,500,
 founding editor, Joseph Arditti,
 co editors, Tiiu Kull (vols. 8, 9, 10), Alec M. Pridgeon (vol. 7), Kenneth
 M. Cameron (vol. 9), Sek Man Wong (vol. 10),
 chapters, 71,
 appendixes, 10,
 authors and contributors, *ca* 88 from 26 countries,
 publishers, 5.

The founding editor retired from the University of California, Irvine, in 2001 and became Professor Emeritus, but continued his involvement with *OB*. He stated in the preface to volume IX that his involvement with the series will end with the present volume. As it turns out this, the tenth volume in the series will also be the last one. This series will be terminated with the present volume. The decision to terminate the series is firm but not irreversible. Anyone interested in continuing the series should contact Prof. Arditti with a detailed plan. All plans will be considered. We thank all those (too many to list) who helped us make this series a success.

Tiiu Kull, Tartu, Estonia
 Joseph Arditti, Irvine, California, USA
 Sek Man Wong, Singapore

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Contributors

Prabha Ajjikutira received her B.Sc. degree in Chemistry and Biology in 1987 and her M.Sc. in Botany, specializing in Microbiology, in 1989, both from Bangalore University, India. She earned an M.Phil in Biotechnology in 1991, studying oleogenesis in sunflower seeds at the Central Food Technological Research Institute, India. After a short teaching stint, she worked as a research scientist in commercial plant tissue culture laboratories. These opportunities developed her interest in research. As a graduate student in the laboratory of Prof. Sek-Man Wong at the National University of Singapore, her Ph.D. thesis focused on orchid-infecting viruses. Graduating in 2004, she worked as a postdoctoral fellow at the Institute of Bioengineering and Nanotechnology, Singapore and the Stem Cell Bank, Singapore Stem Cell Consortium. She recently moved to Canada, where she hopes to continue her research interests. Her e-mail address is: prabhataalks@hotmail.com.

Joseph Arditti was born in Bulgaria in May 1932 and immigrated to the USA in 1954. He received his Ph.D. from the University of Southern California (USC) in Los Angeles, spent his entire career at the University of California, Irvine and retired in 2001 after 35 years of service. He is now Professor Emeritus. His scientific interests center on orchids and he spent many of his summers and sabbatical leaves doing research on these plants at the National University of Singapore (with Professors Avadhani, Hew and Rao), Botanical Gardens in Bogor, Indonesia (with the late Saleh Idris and the late Dr. Djunaedi 'Adjun' Gandawijaja) and the University of Malaya (with Prof. Helen Nair). Professor Arditti founded *Orchid Biology, Reviews and Perspectives* in 1974. The first volume was published in 1977. Now, after 30 years of editing the series he has decided to retire from it. This is the last volume he will edit. Prof. Arditti raised his son, Jonathan (now 24) from the age of 6 years as a single father. Jonathan has followed in his father's footsteps and also graduated from the University of Southern California. He received his B.A. in psychology in May 2008. In Southern California tradition and parlance Jonathan is a second generation USC Trojan, a fact which pleases both father and son enormously. When not at USC Jonathan lives with his father in Irvine, California. Prof. Arditti's e-mail address is jarditti@uci.edu. Jonathan's is arditti@usc.edu.

Popuri Nageswara Avadhani was born in December 1932 in Andhra Pradesh, India. He obtained his Bachelor's (Honors) and Master's degrees from Andhra University

in 1952 and 1953 respectively, majoring in Botany. After that, in 1953, he proceeded to study at Durham University (Kings' college) where he was awarded the Ph.D degree. Following postdoctoral study at McGill University in Canada for 2 years, he joined the University of Malaya in Singapore (now the National University of Singapore), where he taught Plant Physiology for 32 years before retiring. Professor Avadhani also worked very closely with eminent scientists at several laboratories in different parts of the world. His involvement with Botany continues in retirement as a consultant and advisor. His e-mail address is avadhani@pacific.net.sg.

Yong Neng Chow received his doctorate from Queen's University in Belfast for work on tissue culture of *Narcissus*. He carried out post-doctoral research on orchids at the Department of Botany, National University of Singapore before accepting a position as a research scientist in a commercial plant tissue culture establishment in Singapore where he worked for 4 years. Dr Chow was Director of Research and Development at EcoFirst Laboratories, a subsidiary of EcoFirst Consolidated Bhd., in Malaysia where he spearheaded the company's efforts in entering the agro-biotechnology sector in that country. His e-mail address is everboleh@gmail.com.

Kevin. L. Davies is primarily a plant anatomist with interests in pteridology, palaeobotany, zinc toxicity in grasses and in particular, orchids. He graduated in 1978 with an Honors degree in botany from Swansea University (Wales, UK) before embarking on his Master's degree, during which time he was in frequent correspondence with the late Professor Eric Holttum, then associated with the Royal Botanic Gardens, Kew. For a number of years, he was employed at the botany department of the National Museum and Gallery of Wales, Cardiff and soon thereafter, commenced his doctorate at Cardiff University. As a postdoctoral researcher at that same institution, his research involved ultrastructural studies of Silurian and Lower Devonian spores and the anatomy of Eocene wood. In 1992, he and his supervisor, Professor Dianne Edwards, published a paper confirming the vascular status of *Cooksonia*, finally establishing it as the archetypal, vascular land plant (Nature 357: 683–685). Since then, his research has been almost exclusively related to orchids (mainly Maxillariinae, labellar micromorphology and anatomy as well as floral food rewards). In collaboration with Dr. Malgorzata Stpiczyska (Lublin, Poland), the research has been extended to include the ultrastructure of floral nectaries and elaiophores. Recently, Dr Davies established an orchid group at the newly-built National Botanic Garden of Wales and much of his spare time is spent tending his own living orchid collection. He is at the School of Earth, Ocean and Planetary Sciences, Cardiff University, Main Building, Park Place, Cardiff CF10 3YE, UK. His e-mail address is: kevinldavies@btinternet.com,

Arnold S. Dunn received his B.S. from George Washington University in 1950 and doctorate from the University of Pennsylvania in 1955. In 1962 he joined the faculty at the University of Southern California (USC). He retired in 2001, but is still teaching as Professor Emeritus. Dr. Dunn received an award for teaching excellence in 1969, an award for research excellence in 1972, the USC Raubenheimer Award for balanced contributions to teaching, research and administration in 1981, the

Mortarboard National Honor Society Faculty Excellence Award in 1988 and 2001, the Gamma Sigma Alpha National Academic Society Professor of the Year award in 2004, and the USC Lifetime Achievement Award in 2005. A secular biblical and talmudic student as an avocation, Dr. Dunn was awarded an honorary doctorate, Doctor of Humane Letters (Honoris Causa) by Hebrew Union College in 1995. During his research career Prof. Dunn specialized in hormonal mechanisms which regulate metabolism. Despite working with animals Dr. Dunn served as a mentor (1962–1965) for a graduate student in plant physiology at USC by the name of Joseph Arditti. Dr. Dunn's e-mail address is arnolddu@usc.edu.

Choy Sin Hew received his PhD at Queen's University, Canada and was a post-doctoral fellow with Professor Martin Gibbs at Brandeis University in the USA. After that he served as Professor of Botany at the National University of Singapore until his retirement in 2003, specializing in the physiology of tropical orchids. He was awarded the Singapore National Science Award in 1977 for his valuable contributions to orchid research. Professor Hew serves as consultant to several public and private orchid organizations in Singapore and Malaysia. He is also an advisor to the Research Centre for Chinese orchids in Guangdong, China. His e-mail address is choysinew@yahoo.com.sg.

Tiiu Kull received her Ph.D. in botany from the University of Tartu, Estonia in 1997 with a dissertation on population dynamics of *Cypripedium calceolus*. She has been associated with the Institute of Zoology and Botany (now called Institute of Agricultural and Environmental Sciences) during her entire career. Since 1998 she has been head of the department of botany there. In addition to orchid population biology her research interests include reproductive biology of vascular plants and the protection of biodiversity. Most of her 40 scientific papers deal with orchids. Prof. Kull has also participated in the compilation of the *Flora of the Baltic Countries*, *Red Data* books for Baltic region and the *Key-Book* of Estonian plants. She also led projects on Estonian Biodiversity Strategy and Action Plan and Atlas of Vascular Plants. Dr. Kull is a member of a steering committee of European Platform for Biodiversity Research Strategy and she is participating in several Europe wide research consortia. Prof. Kull was the president of the Estonian Orchid Protection Club for 16 years. Her e-mail address is tiiu.kull@emu.ee.

Hubert Kurzweil is a herbarium taxonomist at the Singapore Botanic Gardens and currently involved in a taxonomic study of the genus *Calanthe* (in collaboration with botanists in the UK) as well as in the drafting of the orchid volume of the Flora of Thailand. Originally from Vienna (Austria), where he also grew up and completed his university studies, Dr. Kurzweil spent 20 years in Cape Town (South Africa). While there he studied the floral morphology and ontogeny the sub-Saharan orchids. In the course of this research on Southern African orchids he published extensively on various aspects of the indigenous orchid flora. He also made several contributions to a phylogenetic study of the orchid tribe Deseae. These studies were carried out in collaboration with Prof. P. Linder (currently in Zurich). The work culminated in a joint comprehensive and well-illustrated treatment of the orchids

of South Africa. Dr. Kurweil always had a strong interest in Asian orchids, and undertook several botanical trips to Nepal, India, Sri Lanka, Malaysia, Thailand and Myanmar. His recent move to Singapore at the end of 2005 enables him to pursue this research interest. His e-mail address is Hubert_KURZWEIL@nparks.gov.sg.

Helen Nair was Professor and Head of the Department of Biotechnology, at the Asian Institute of Medicine, Science and Technology, the first private university in northern Malaysia to offer a range of science and technology-based degree programs. She accepted the post in 2001 after serving for 27 years on the Botany Department Faculty at the University of Malaya in Kuala Lumpur, where as Professor she held the Chair of Plant Physiology for six years. Her long-standing interest in orchid biology covers physiology, molecular biology and postharvest handling of cut-flowers. Currently, she is also working on the cryopreservation of orchids as part of a comprehensive orchid biotechnology program. Her husband, James Bonney is a Chartered Accountant. They have two children, Glenn a physician who resides in the UK and Sharm, a lawyer married to a physicist who lives in the Netherlands. Her e-mail addresses are helen.nair@gmail.com and jtb@pc.jaring.my.

Ettore Pacini graduated from the University of Siena, Faculty of Biological and Natural Sciences in November 1967 where he has been working since then. Since January 1984 he has been s “Professore Ordinario.” In November 2006 he became a corresponding member of the Accademia Nazionale dei Lincei. He is author of research papers and reviews on anther tapetum, pollen development, pollination, allergenic pollen, and gametophytic incompatibility. Prof. Pacini has published more than 130 papers and edited 6 books. He also contributed 11 book chapters. His e-mail address is: pacini@unisi.it.

Karen E. Quinn is Kristin and Roger Servison Curator of Paintings, Art of the Americas, Museum of Fine Arts, Boston. She received her Bachelor’s degree at McGill University and her Master’s degree at the University of Pennsylvania. Since joining the MFA in 1987, she has contributed to the exhibitions and catalogues for Weston’s Westons: Portraits and Nudes (1989), The Lure of Italy (1992), and John Singleton Copley in America (1995). She has organized or co-organized the exhibitions Ansel Adams: The Early Years (1991), Weston’s Westons: California and the West (1994), Martin Johnson Heade (1999), Edward Weston: Photography and Modernism (2000), The Lane Collection and American Modernism: Georgia O’Keeffe and her Time (2004–2009), and Rockwell and the Red Sox (2005), and written for their accompanying publications. Ms Quinn also manages the Martin Johnson Heade catalogue raisonné (2nd edition published in 2000). She is an adjunct professor at Middlesex Community College. Most recently she has been researching the working methods of Fitz Henry Lane with colleagues in paintings conservation. Her e-mail address is: kquinn@mfa.or.

Adisheshappa Nagaraja Rao was Born in Channapatna, Karnataka, India, on 12 November 1925. He received his B.Sc. Honors and M.Sc. degrees from Mysore University in India and Ph.D. from Iowa State University in the USA. in 1959. Dr. Rao was a postdoctoral fellow at the University of Manchester in the U. K.

He joined the University of Malaya in Singapore as Lecturer in 1960, rose to the rank of Professor and was Head of the Botany Department from 1967 until his retirement in 1992. After retiring Professor Rao joined the International Plant Genetics Research Institute (IPGRI) and remained there until 2000. At present he is the editor of the Journal of Tropical Medicinal Plants. Prof. Rao is a member of many organizations including Honorary Fellow of the Singapore Institute of Biology; member of Indian Society of Plant Morphologists; Vice President of International Association of Plant Tissue Culturists (IAPTC) for 9 years; Chairman, Governing Boards of SEARCA in the Philippines and Biotropical Institute for South East Asia, Bogor, Indonesia (BIOTROP) Bogor, Indonesia; consultant and committee member, Global Environmental Facility (GEF) of the World Bank; United Nations Environmental Programme (UNEP); United Nations Development Programme (UNDP); United Nations Environmental, Scientific and Cultural Organization (UNESCO) in Paris; International Development Research Council (IDRC) in Canada; International Bamboo and Rattan Organisation (INBAR) and others. He has been the Secretary of the Asian Network of Biological Sciences for 12 years. Professor Rao has published more than 200 research papers, edited and or authored more than 25 books, published in UK, India, Philippines, Indonesia, Malaysia, Singapore, Germany and other countries. He does not have an e-mail address.

Ben Singer was born in 1943 in the Dutch city of Enkhuizen. He became interested in orchids at the age of twelve after receiving a postcard with a picture of a *Cattleya* from his mother. Some years later he left school to pursue the beginning of what would become a successful career in the orchid business. He moved to the city of Aalsmeer to work as an apprentice to G.A. de Jong, the father of the modern Dutch orchid industry. He worked there for 2 years, and at the age of 17 set up his own nursery with the help of his father. He began with one thousand *Cymbidium* plants, and after discovering tissue culture in 1963 he started producing miniature cymbidiums on a large scale. When his competitors caught up with him, he turned his attention to *Paphiopedilum*, in particular *Paphiopedilum lawrenceanum* and *P. ciliolare*. In addition to growing orchids, Singer has put together an impressive collection of orchid books and antiques over the years. In 1979, after growing weary of the orchid business, he sold his nursery. Since then he has remained active within the orchid world, traveling to see orchids in their natural habitats, and attending conferences. Ben and his Mexican wife Eugenia have a daughter named Laelia. His e-mail address is singerorchids@hotmail.com.

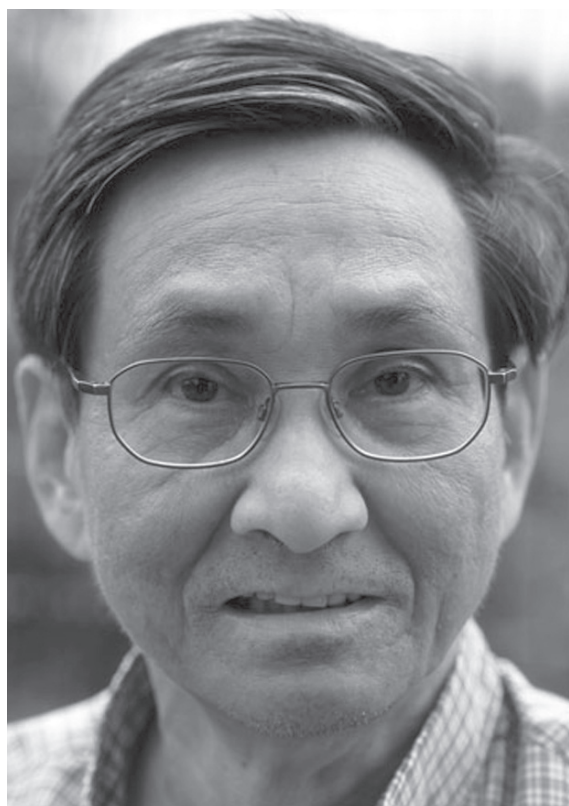
Irina Vasilyevna Tatarenko graduated from Moscow State University in 1986. She received her Ph.D. from the same university in 1991 for work on the orchids of Far Eastern Russia. Between 1991 and 1994 Dr. Tatarenko worked on plants and fungi for the Russian Red Data Book. Since 1994 Dr. Tatarenko has held a position as senior researcher at the Moscow Pedagogical State University. In 2000–2001 she was an invited visiting researcher at Hiroshima University in Japan and carried on cooperation projects on Japanese and Russian floras in 2002–2006. Her Doctor of Science dissertation – “Biomorphology of Russian and Japanese orchids” was completed in 2007. The systematic, distribution, ontogenesis, seasonal development

and mycorrhiza analyses were based on morphology of vegetative and generative organs. Dr. Tatarenko has published a monograph and more than 60 research papers on morphology, demography and mycorrhiza of terrestrial orchids. Her e-mail address is tulotis@yandex.ru.

Eng Soon Teoh (Chinese style Teoh Eng Soon) is an obstetrician-gynecologist who has been in practice for over 40 years. A graduate of the University of Singapore he undertook postdoctoral research in London, Sweden and Miami, Florida. He has published extensively in refereed international medical journals and is the recipient of several awards from the Royal College of Obstetricians and Gynecologists in London for his work on trophoblastic cancer and fetal monitoring. Dr. Teoh is a Fellow of the Royal College of Obstetricians and a Fellow of the American College of Surgeons. Starting to take a serious interest in orchids in 1965, Dr. Teoh read Rebecca Northern's *Home Orchid Growing* for relaxation while he was in London preparing for a higher degree examination. In Miami he studied Williams's *The Orchid Grower's Manual* on the advice of Roy Fields. His interest in *Phalaenopsis* started in Miami. Dr. Teoh did not start growing orchids in earnest until 1970 when he returned to Singapore. He was active in the Orchid Society of Southeast Asia during the 1970s and 1980s, serving as Editor of the *Malayan Orchid Review* (1978–1982), on the Committee, on the Panel of Judges, and as President in 1981/82. In addition Dr. Teoh edited a volume on orchids to Commemorate the Golden Anniversary of OSSEA in 1978. He is the author of *Orchids of Asia* published by Marshall Cavendish (this book has seen three editions 1980, 1989, 2005), and *A Joy Forever (Vanda Miss Joaquim; Singapore's National Flower)* published by Times Editions (1982; revised and reprinted, 1998). Dr. Teoh has been married to Phaik Khuan Teoh since 1963. They have two children, John Tee Teong who works for a property investment firm in Singapore, and Kristine Leok Kheng, a cardiothoracic surgeon in London. Dr. Teoh's e-mail address is teohengsoon@pacific.net.sg.

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Tim Wing Yam (Chinese style: Yam Tim Wing) was born in Hong Kong. He received his doctorate in botany from the University of Hong Kong and spent nearly 3 years as a postdoctoral fellow in Professor Joseph Arditto's laboratory before assuming his current position as a Senior Researcher in Orchidology at the Singapore Botanic Gardens. He is responsible for the orchid breeding and conservation programs at that institution. Dr. Yam has produced many outstanding orchid hybrids, lectures world wide and is the author of many papers in international peer reviewed journals. His e-mail address is Yam_Tim_Wing@NPARKS.gov.sg.



Teoh King Mun

Unsung Heroes of the Singapore-Malaysian
Orchid World (1951–2000)

ENG SOON TEOH

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Introduction

Enough has been said about the scientists, explorers and the pioneering orchid enthusiasts who started collecting orchids in the 19th century, and due respect has been given to the people who started the Malayan Orchid Society which promoted orchids both as a hobby and as an export trade. I am full of admiration for these people and do not begrudge the honors conferred on them (Teoh, 1978). It follows that there should also be better information about the leaders, growers, collectors, breeders and adventurers who sustained the orchid interest in Singapore and Malaysia during the second half of the 20th century. Not everyone appreciates their role and it saddens me to observe how very soon they are forgotten. Without them we would not have the beautiful orchids that now grace our gardens, the thriving orchid societies in the region, and the orchid flower industry in the area. This is a contentious topic because one cannot be absolutely comprehensive, and I admit that my selection in this chapter is personal.

Whampoa

Whampoa (Fig. 1-1), a Cantonese ship-chandler, the wealthiest Singaporean Chinaman of the 19th century, was possibly the first person to grow orchids on a large scale in Singapore. He was a chosen representative of the Chinese residents and a member of the Agro-Horticultural Society. When the British government wanted to establish a new Botanic Garden he was persuaded to exchange the beautiful piece of undulating real estate which is now the present Singapore Botanic Gardens for a piece of low lying flat land at Serangoon Road. Here, Whampoa built a grand home which contained a magnificent Chinese garden. He was familiar with the senior officers in the Royal Navy and a friend of the merchantmen, so it was no surprise that he managed to collect all sorts of plants for his garden. He had *Victoria regia* growing in the pond, a gift from the King of Thailand (Teoh, 2006). Sadly, Whampoa's Chinese garden has fallen victim to progress and there is no record that any of his orchids have managed to survive. Indeed the only orchid from the 19th century to remain in cultivation is a hybrid, Singapore's very own *Vanda* Miss Joaquim, now its national flower. A number of books and articles have been published on this orchid and Miss Agnes Joaquim is well celebrated (Alphonso, 1981; Phoon, 1981; Teoh, 1981, 1982, 2004; Hew, Yam, and Arditti, 2002, 2004; Dalpethado, 2004; Johnson, 2004; Arditti and Hew, 2007).



Fig. 1-1. Whampo.

Ridley

Henry Ridley, then director of the Botanic Gardens registered this hybrid for Miss Joaquim. The director made several collecting trips for orchid species and published a volume on the Malayan species. He was also a great innovator. He campaigned strenuously for the cultivation of *Hevea brasiliensis*, a proposal taken up by Tan Chay Yan who is remembered by the famous *Vanda* hybrid named after him. Ridley is remembered as the “Father of Natural Rubber.” With the rising oil prices natural rubber is enriching the planters who have not replaced their rubber estates with other crops. Thus it is surprising that Henry Ridley never embarked on orchid hybridization when he was shown the hybrid by Agnes Joaquim in 1893.

Holttum

Hybrids constitute the backbone of orchid collections worldwide, and Singapore and Malaysia are no exceptions. Hybridization of orchids became a practical reality in Singapore when Hans Burgeff showed Eric Holttum, director of the Singapore

Botanic Gardens and later Professor of Botany at the university, how to achieve asymbiotic orchid seed germination in 1928 (Holtum, 1978). At that time there were few free flowering plants in the local gardens. Knowing that orchid flowers were long lasting on the plant, and inspired by the floriferousness of the remarkable *Vanda* Miss Joaquim, Holtum's aim was to produce other orchid hybrids that would thrive and flower equally freely in the tropical lowlands. He achieved his first success with *Spathoglottis*. He named the hybrid *Spathoglottis* Primrose (*plicata* × *aurea*). From pollination to flowering took only 2½ years, in part assisted by the rapid ripening of the seed capsule at Penang Hill. Its F1 hybrid *Spathoglottis* Chrysops flowered in 17 months. However, crosses involving other genera which he made in Singapore took much longer to flower. But there were many lucky outcomes which spurred him on. The first of the spider orchids, *Aranda* Deborah flowered 7 years after the seeds were sown. It proved to be a remarkably free flowering hybrid, often carrying up to a dozen sprays with hundreds of flowers on a plant less than a meter tall. Over the course of the next two decades, by trial and error, outstanding stud plants were identified and others eliminated. This information proved to be extremely useful to the breeders who commenced breeding orchids after World War II.

During the Japanese Occupation (1942–1945), the Singapore Botanic Gardens was renamed Syonan-to Botanic Gardens and Professor Hidezo Tanakadate was appointed as Administrative Head. Professor Kwan Koriba and Marquis Tokugawa also played a role in the administration of the Gardens. They were scholars and must be remembered for their indirect contribution to the Singapore orchids. They allowed Holtum and E.H.J. Corner to remain in the Gardens to continue their botanical research. During this period, orchid hybridization continued under the charge of S.P. Livingston who continued to sow seeds by substituting local seaweed for agar. The monthly reports of the Gardens noted the numbers of orchid seedlings unflasked; the number of seedlings moved from the glass house to the main orchid nursery; the number of pollinations undertaken and the number of fruits produced; and the number that contained viable seeds; the nature of the new crosses; and the new orchid hybrids which had flowered (Syunin and Holtum 1945). Among these new hybrids was a cross between *Vanda dearei* and *Vanda sanderiana* which flowered in February 1944: but the War was on, and the Gardens lost out to the famous Hawaiian breeder John Noa who called it *Vanda* Ellen Noa (Yeoh, 1978). Many of the crosses germinated have not been registered and one wonders what happened to the plants. Among these were an interesting cross between *Spathoglottis plicata* and *Calanthe triplicata* (it had been the long cherished hope of Holtum to bring these two genera together) and numerous *Aranthera*. The records state that in September 1944 (Japanese Occupation Year 2604), some unflowered orchid seedlings were discarded: Presumably these were siblings of hybrid plants that flowered sometime ago, a case in point being the hybrid, *Arachnis hookeriana* × *Arachnis flos-aeries* which yielded free flowering progeny only with *Arach. hookeriana* var *luteola* and not with the standard *Arach. hookeriana* var. *alba*. George Alphonso who joined the Gardens in 1940

and Bajuri bin Sappan who came on board in 1937 continued to work there, but they did not seem to have been involved in the orchid program during the Japanese Occupation.

When Holttum was appointed to the chair of botany at the newly founded University of Malaya (located in Singapore) in 1949 the running of the Malayan Orchid Society fell on the local growers who rose to the responsibility. Nevertheless, it should not be forgotten that H.M. Burkill who succeeded as director of the Singapore Botanic Gardens gave his whole hearted support to the shows of the Malayan Orchid Society during his tenure in office and this support was continued by George Alphonso and subsequent directors. Singapore was not so crowded in those days and life still proceeded at a leisurely pace. Orchids were highly prized, and every effort was made to grow them into specimen plants that could be displayed at the flower shows. Beautiful orchid gardens were the pride of the people who could afford them and who had the commitment, skill and patience to bring the plants to flower. Among them were the following:

Lee Kim Hong

Lee Kim Hong (western style: Kim Hong Lee; Fig. 1-2) was a pioneer in the Singapore orchid trade. He dealt in gold bullion and orchids were his hobby. However, he was astute enough to realize that business and orchids could combine in the Singapore of the 1950s. He encouraged the local farmers to strive for export quality so that their flowers would fetch a better price. He was a prolific breeder himself after World War II: Dr. Yeoh Bok Choon (western style: Bok Choon Yeoh) who compiled the *List of Singapore-Malayan Orchid Hybrids up to 1963* said that Lee Kim Hong made more hybrids than anyone else. His name appears in the Hybrid Registry as “breeder” up to 1960, after which it was replaced by Singapore Orchids, the company he co-founded with John Laycock. Together they and their wives established the beautiful Mandai Orchid Garden located at the heart of Singapore. The site was a gentle hillside, located within the water catchments area, near to a reservoir and it had the highest rainfall in Singapore. Amy Ede recalled that Lee Kim Hong did all the work: “Daddy (John Laycock) learnt a lot from him” (Elliott et al., 2005). Lee Kim Hong was a warm, generous and helpful person and up to the 1960s, one could always go up to the Mandai Orchid Gardens to consult him about growing orchids. Among those whom he taught was Madam Ong Siew Hong (western style Siew Hong Ong, Dr. Tan Wee Kiat’s [Kiat Wee Tan] mother) who also mastered the art of hybridization and raising orchids from seed. Dr. Kiat Tan contributed a warm reminiscence of his encounters with Lee Kim Hong while still a youngster in John Elliott’s *Orchid Hybrids of Singapore, 1893–2003*. According to Kiat, Kim Hong was mainly interested in primary hybrids – what characteristics were transmitted when two different looking flowers mix their genes: he was more the curious scientist rather than the gardener. Nevertheless he



Fig. 1-2. Lee Kim Hong (western style: Kim Hong Lee).

grew a variety of garden plants and constructed, in his lifetime, the most beautiful orchid garden in Singapore.

In order to have total control of his breeding program, Lee Kim Hong mastered the process of raising orchids from seed. Singapore Orchids followed their own unique program and seldom ventured to follow the fashions of the day. Among Kim Hong's unique contributions are the delicate *Vandaenopsis* (now renamed *Paravanda*) hybrids, in particular the delicate yellow *Vandaenopsis Prosperitas* (*V. dearei* × *Pps. denevei*), *Vdnps. Patience* (*Pps. denevei* × *V. Rothschildiana*). His name is commemorated in the multigeneric hybrids *Leeara Lissom Lucy* (*Aranda Lucy Laycock* × *Vdps. lissochiloides*) and *Laycockara Lee Kim Hong* (*Arnps. Lee Siew Chin* × *Vdps. lissochiloides*). Dr. Lee Siew Chin (Siew Chin Lee) is the daughter of Lee Kim Hong. All these crosses were originated and registered by Singapore Orchids.

Tan Hoon Siang

Orchid growing among Singapore’s populace took a tremendous setback during the World War II, and it was several years before the Society got back on its feet. To urge the members on, and provide the necessary leadership there was Tan Hoon Siang (Hoon Siang Tan; Fig. 1-3) who was elected president in 1956 (MOR, 1991). He was an ardent grower and breeder and insisted in growing his plants to perfection. His *Aranda lowii* earned one of the few Cultural Commendation Certificates ever granted by the MOS. The family tradition continues and his son, John Tan Jiew Hoe (Jiew Hoe John Tan) is president of the Singapore Gardening Society. John is an expert on begonias, and a staunch supporter of OSSEA.

Tan Hoon Siang’s principal claim to fame lies in having bred the famous *Vanda* Tan Chay Yan (*V. JVB* × *V. dearei*) which won a First Class Certificate (FCC) in 1954 from the Royal Horticultural Society and set a trend for other strap leaf *Vanda* to be bred to the tetraploid *V. Josephine van Brero* (popularly referred to as *JVB*). Subsequently various clones of *V. Tan Chay Yan* received an Award of Merit (AM)



Fig. 1-3. Tan Hoon Siang being presented to H.M. Queen Elizabeth at the Chelsea Flower Show, 1963.

from the Malayan Orchid Society. A rubber planter, Tan Hoon Siang was president of the Malayan Orchid Society when it made its successful bid at Chelsea to host the 4th World Orchid Conference in Singapore. *Vanda* Tan Hoon Siang (*V. JVB* × *V. Somsri Pink*) is a new spectacular bluish pink JVB hybrid named by Hoon Siang's son, John after his father.

Yeoh Bok Choon

Dr. Yeoh Bok Choon (Bok Choon Yeoh; Fig. 1-4) was the State Surgeon for the southern Malaysian state of Johor which is the immediate neighbor of Singapore. The proximity of Johor allowed Bok Choon to attend almost all monthly meetings of the MOS for a period of some 20 years. He was assigned the job of commenting on the plants brought by members for display and a friendly monthly competition. The job suited him perfectly because Bok Choon was an avid orchid grower and promoter. He believed that orchids benefited from occasionally



Fig. 1-4. Dr. Yeoh Bok Choon (Bok Choon Yeoh).