

# Preface

The fourth edition of "Plant Systematics: An Integrated Approach" has been revised and reorganised thoroughly, and significantly updated to incorporate the developments of the last few years. The publication of current edition was forced mainly because of publication of revision of International Code of Nomenclature for Algae, Fungi and Plants (Shenzhen Code, 2018), new version of PhyloCode (Beta version of PhyloCode 5, 2014), updated APweb version 14 (September, 2018 update), revised Angiosperm Phylogeny Group classification APG IV (2016), new Pteridophyte Phylogeny Group Classification PPG I (2016) and accumulation of large amount of information subsequent to the publication of third edition. There has been development of new tools of biotechnology, vigorous utilization of molecular data in understanding phylogeny, and redefining of affinities and arrangements of plant groups. Recent years have also seen disappearance of gaps between numerical and cladistical methodologies, and integration of former into latter for complete understanding of phylogenetic relationships. These trends have largely influenced the combination of numerical and cladistic methods under one chapter, and enlarged discussion on Molecular Systematics, discussing new concepts, tools and recent achievements and need to align these with morphological traits so that plants can be conveniently identified in the field. New chapters on Pteridophytes and Gymnosperms added in third edition have been retained and updated for complete understanding of systematics of vascular plants.

Actual photographs of plants and plant parts enable better understanding of taxonomic information. This practice (of using actual photographs) has been followed in several other recent publications too. The present edition incorporates numerous photographs of plants from diverse families of plants (color in the ebook, B&W in the print version). This has largely been possible with the assistance of my son Manpreet Singh who sponsored my recent visit to California and provided me the opportunity to visit and photograph temperate plants in and around California. The book, as such, contains images of both tropical plants, Himalayan plants, temperate American plants and plants from other parts of the world growing in the Botanical Gardens of University of California and San Francisco Botanical Garden, as also natural forest regions in California. In addition, 305 black & white illustrations help in a better understanding of the plants covered in the book.

The recent decades have seen major changes in schemes of classification of angiosperms. The traditional distinction between dicots and monocots seems to be disappearing, dicots are being split into the basal families and more advanced eudicots, and monocot families interpolated between these two groups of dicots. Whereas Angiosperm Phylogeny Group is attempting to establish monophyletic groups at the most up to the order level, grouped into informal groups, Thorne aims at blending these developments with the traditional Linnaean hierarchy. Both sets of classification have undergone major modifications in the recent years, such as the latest version of Thorne's classification (2007), Takhtajan's classification (revised in 2009), APG III (2009), APG IV (2016) and APweb Version 14 (2017). Attempts are also being made to provide unified Code of nomenclature for all living organisms.

The author has attempted to strike a balance between classical fundamental information and the recent developments in plant systematics. Special attention has been devoted to the information on botanical nomenclature, identification and phylogeny of angiosperms with numerous relevant examples and detailed explanation of important nomenclatural problems. An attempt has been made to present a continuity between orthodox and contemporary identification methods by working on a common example. The methods of identification using computers have been further explored to help better on-line identification. Outputs of computer programs especially used in molecular studies and construction of phylogenetic trees have been included based on actual or hypothetical data. This will acquaint readers with the handling of raw data and working of computer programs.

Internet highways are revolutionizing the exchange of scientific information. Botanical organizations have plunged into this revolution in a big way. Instant information on major classification systems, databases, herbaria, gardens, indices and thousands of illustrations are available to users Worldwide at the touch of a button. Discussion on important aspects of this information highway and useful links have been provided in this book. My interaction with colleagues especially the members of the list 'Taxacom', 'efloraofindia' Facebook groups 'Plant Identification', 'California Native Plant Society' and 'Indian Flora' has been very helpful in resolving some doubts. I am grateful to all members whose information has been valuable on several occasions.

For providing me inspiration for this book, I am indebted to my students, who helped me to improve the material through frequent interactions. I am also indebted to my wife Mrs. K. G. Singh for constantly bearing with my overindulgence with this book and also providing ready help in computer-related activities during the processing of this work. I am also thankful to my son Manpreet Singh and daughter-in-law Komal for our visit to California, where many plants were photographed. My younger son Kanwarpreet Singh & daughter-in-law Harpreet provided help on various occasions. Manpreet and Kanwarpreet also provided important photographic tips.

I wish to record my thanks to all colleagues whose inputs have helped me to improve the information presented here. I also wish to extend my thanks to Dr. Jef Veldkamp for valuable information on nomenclature, Dr. Gertrud Dahlgren for photographs and literature, Dr. P. F. Stevens for literature on APG IV, APweb Version 14 (updated September 2018) and trees from his APweb, Dr. Robert Thorne for making available his 2007 classification, Dr. James Reveal for his help on nomenclatural problems, Dr. Patricia Holmgren for information about major world herbaria, Dr. D. L. Dilcher for photograph, Dr. Julie Barcelona and Harry Wiradinata for photographs of *Rafflesia*, the authorities of New York Botanical Garden, Missouri Botanical Garden, USA, Royal Botanic Gardens Kew and University of California, Santa Cruz, for photographs used in the book. Special thanks to Philip Cantino of Ohio University for making available the Beta Version of PhyloCode 5. Thanks, are also due to all whose contributions are cited in this book.

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