

Flowering Plants of Indian Institute of Science: A Field Guide. K. Sankara Rao. IISc Press. 2009. Vol. 1, 468 pp.; Vol. 2, 482 pp. Price not mentioned.

It is difficult to forget the visual delight that one experiences when we visit the picturesque campus of the Indian Institute of Science, Bangalore. A mammoth effort to catalogue and capture the flora that create the serene extravaganza resulted in the publication of a two-volume treatise namely *Flowering Plants of Indian Institute of Science: A Field Guide* by K. Sankara Rao. The compilation vividly captures the plants belonging to over 700 taxa that are appropriately categorized as trees, palms, woody climbers, shrubs, herbs, succulents, cacti and orchids in volume I.

The treatise provides a brief description of the diverse flora of the campus besides indicating the exact location of a particular specimen which provides an opportunity to the readers to quickly locate the plant and learn more about the same. Care has been taken by the author to suitably describe the plants indicating the origin, time of flowering besides educating the readers about the economic utility of the plant and its products under the heading 'comments'. Extraction of a strong astringent cutch (katha) from *Acacia catechu*, seeds of coral seed tree as goldsmith's unit weight, oil from *Aleurites moluccana* that can be used as candle are some of the noteworthy examples.

The chapter on Trees in volume I has a description of 102 trees belonging to different families. The chapter also brings to the fore some of the historical, religious, economic significance of some of the trees like Bael, Peepal (religious significance), *Alstonia macrophylla* (first time introduced in India), *Annona squamosa* (brought by Portuguese),

Artocarpus heterophyllus (world's largest edible fruit), *Butea monosperma* (for rearing lac insects), *Drypetes roxburghii* (seeds for good health of children), etc.

The chapter on Palms enlists 17 palms with interesting facts on some of the species. For instance, bipinnate compound leaves in *Caryota urens* (fish-tail palm), bamboo like ringed stems in *Dypsis lutescens* (golden cane palm), dwarf stems in pygmy date palm are noteworthy. The chapter on Woody Climbers has 26 species that highlights some interesting specimens like *Acacia sinuata* (soap-nut acacia) used as a substitute for soap, *Entada rheedei* (calling card vine with highly twisted saw toothed stems).

Sixty three species are documented in a chapter on Shrubs. The chapter enlists highly fragrant, flowering shrubs like *Artabotrys hexapetalus*, *Cestrum diurnum*, *Cestrum nocturnum*, *Gardenia jasminoides* and some interesting species like powder puff (*Calliandra haematocephala*), periwinkle with medicinal uses (*Catharanthus roseus*), bleeding glory bower (*Clerodendrum thomsonae*), Japanese lantern (*Hibiscus schizopetalus*), etc.

A chapter on Herbs dwells on 85 species comprising weeds, medicinal and aromatic plants besides plants with economic and ornamental value. The chapter on Succulents and Cacti enlists 18 species possessing medicinal (*Aloe vera*) and ornamental value (Agave, *Bromelia*, *Bryophyllum*, *Euphorbia*, *Furcraea*, *Kalanchoe* and *Pedilanthus*).

The chapter on Orchids describes 15 species belonging to 13 genera. Among 15 species *Aerides odorata*, *Peristeria elata* produce highly fragrant flowers, whereas the pods of *Vanilla walkeriae* are highly fragrant and yield the natural vanillin that we cherish in confectioneries, desserts and bakery items. Out of 15 genera, four are terrestrial in nature (*Epidendrum*, *Haemaria*, *Paphiopedilum*, *Spathoglottis*), rest are epiphytic orchids. The orchid flowers are unique in their morphology and mimic a number of natural forms like lady's slipper (*Paphiopedilum*), fox tail (*Aerides*, *Rhynchostylis*), spider (*Arachnis*), butterfly (*Epidendrum*), moth (*Phalaenopsis*) and dove (*Peristeria*) which are clearly illustrated with the help of excellent photographs.

The chapter on Trees in volume II describes 110 species that include very interesting species like *Guazuma ulmifo-*

lia, a natural adulterant for *Rudraksh* seeds; *Hibiscus tiliaceus*, the only hibiscus species that grows like a tree; *Khaya senegalensis* with biscuit-baking aroma flowers, *Kigelia africana* with sausage shape fruits, *Majidea zanguebarica* with velvety ornamental grade seeds, *Malpighia glabra* with vitamin A and C rich fruits, *Manilkara zapota* with latex that is used in making chiclets, *Mitragyna parviflora*, the true Kadarb tree, *Santalum album* the only parasitic tree species, *Wrightia tinctoria* with toy making wood and indigo-like dye.

The section on Shrubs documents 62 species belonging to 54 genera. Some unique shrubs such as *Lawsonia inermis* (yields colouring dye for tattooing), *Pimenta dioica* (leaves with allspice aroma), *Ravennia madagascariensis* (water storage in the leaf axils), *Stevia rebaudiana* (the zero calorie sweetener), *Vitex negundo* (mosquito repellent leaves) are worth mentioning.

A dedicated chapter on Trailers and Climbers has description on 40 species belonging to 25 genera. Similarly, the chapter on Herbs contains the details of 62 species of 51 genera; some of which



Calophyllum inophyllum L.



Aristolochia elegans Mart.

possess high medicinal value like *Phyllanthus amarus*, *Solanum nigrum* and *Withania somnifera*.

A dedicated chapter on Grasses, Sedges and Cat tails enlists 22 species belonging to 20 genera. Some of the species possess excellent ornamental value that include *Pennisetum pedicellatum*, *Pennisetum polystachyan* and *Cyperus alternifolius*.

Some of the interesting plants that love water and marshy places are collated in a chapter on Plants of Water and Marsh in which 17 species belonging to 15 genera are described. The anaesthetic effect of the florets (on tongue and mouth) of toothache plant (*Spilanthes oleracea*) is very interesting.

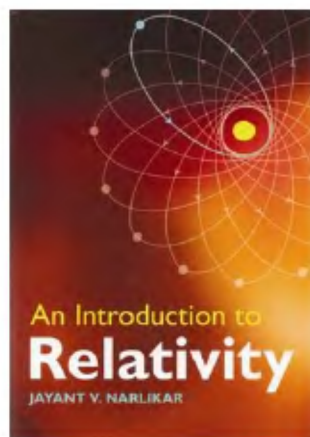
A brief description on Flowering Parasites educates us about the unique survival ability of a group of plants that parasitize trees, shrubs and herbs. The majestic araucaria, cupressus, thujas and cycads are described briefly under non-flowering seed plants. The lower members of the plant kingdom: the algae, fungi, lichens, mosses and ferns are well illustrated notwithstanding their botanical description.

I earnestly request the readers to identify those species listed in a chapter on Yet to be Identified Species and help the author to document the same in their future endeavours. The efforts of the author to analyse the flora in terms of relative abundance of plant groups, predominant plant families and the morphological forms are noteworthy.

With a pocket size layout, the two volume treatise is a valuable guide for researchers, students, garden lovers, garden curators and botanists to identify the plants and understand them. The photographs are impeccable and aid the reader in easy identification of the species. The initiative taken by the Indian Institute of Science to document the flora of their campus needs to be replicated in the major botanical gardens, public and private gardens of fame, green campuses of educational and industrial establishments in the country to document the plant wealth that India possesses.

K. V. PRASAD

*Division of Floriculture and Landscaping,
Indian Agricultural Research Institute,
Pusa,
New Delhi 110 012, India
e-mail: kvprasad66@gmail.com*



An Introduction to Relativity. Jayant Narlikar. Cambridge University Press. 2010. 363 pp. Price: £ 30.

The book under review is, slightly paraphrasing the author's own description, a little enlarged and updated fresh rewrite of his popular 1978 text. As it is perhaps the most recent addition to a growing number of entry-level texts in a field long dominated by advanced classics by Synge, Landau and Lifshitz, Ellis and Hawking, Chandrasekhar, and, more recently, Wald, a comparison with other introductory books may be useful. Taking these up in chronological order of appearance, but without any claim to completeness, *A First Course in General Relativity* by Bernard F. Schutz has gone through 16 editions from 1985 onwards. The treatment of the requisite mathematics of tensors, covariant differentiation and curvature is detailed, but not at the expense of shortchanging the physics. Cosmological models, gravitational radiation, stars and their gravitational collapse, black holes and the Hawking effect are discussed in some detail. Overall, however, in comparison with Narlikar this is a book oriented more towards theory than observational astrophysics issues. As in all the books considered here, D'Inverno's 1992 *Introducing Einstein's Relativity* starts with the special theory of relativity, then goes on to the general theory to discuss geodesic and field equations, followed by their static black hole and wave solutions. Unlike Schutz who brings in forms, D'Inverno treats manifolds entirely by coordinate-based tensorial methods. It is suitable for self-study by students whose mathematical background does not extend beyond advanced calculus. There is a highly compressed but adequate dis-

cussion of cosmological models. On the whole, the emphasis is again more on theory than on a detailed discussion of astrophysical phenomena. *Exploring Black Holes* (2000) by Taylor and Wheeler bypasses the mathematics of forms and tensors and focuses on physical aspects of selected metrics, and in particular, on static and spinning black holes. There is much original material especially on the Kerr metric, presented in typical Wheeleresque style mixing metaphors, mathematics, pictures, insights and queries. Some readers will enjoy this approach, but there are bound to be others who will find it irritating and distracting. *Gravity* (2003) by James Hartle, on the other hand, is a book aiming at a somewhat more advanced student, who is led through geometrical ideas and special relativity to the motion of particles in curved spacetimes, and, subsequently, into a detailed discussion of astrophysical phenomena, gravitational waves, cosmological models, the Big Bang and inflation. It is only in the last one-fifth of the book that the standard mathematical machinery of general relativity and the Einstein field equations are presented. They are then applied to astrophysical systems such as relativistic stars, pulsars, neutron stars and gravitational radiation from binary stars.

Narlikar's 2010 text, combining a detailed treatment of Riemannian geometry with a variety of cosmological and astrophysical applications, is closest to Hartle's in choice of material and pedagogical level. One of their main differences is that Narlikar dispenses with special relativity quickly, and then, setting up the required mathematical framework, introduces Einstein's equations before discussing applications. The advantage of this approach is not only logical order, but economy of presentation. One thus avoids going back and forth, borrowing advanced formulae for use in a specific early context, and re-deriving them more systematically later. This perhaps accounts partially for Narlikar's roughly 350 pages to Hartle's 550 (on the other hand, the advantage of Hartle's self-described 'physics first' approach is that one can cover a large number of topics and perhaps postpone the full theory to a later course). Within this relatively limited size, Narlikar manages to discuss experimental tests of general relativity, gravitational radiation and the proposed experiments to detect it, relativistic