

mention its occurrence up to East Africa (it is depicted so in the map but the account of its distribution fails to mention East Africa). The number of species of *Cycas* is not 20 but about 4 to 5 times that number. The account of *Araucariaceae* should mention three genera *Agathis*, *Araucaria* and the third monotypic genus discovered and named *Wollemia nobilis* in 1995. On page 11 the authors could have mentioned that *Agathis* and *Araucaria* are also among gymnosperms whose pollen do not reach the micropyles of the ovules. The account of archegonia on p. 16 does not mention the unusually large number of archegonial initials in *Microcycas* which may be more than 200 and lie scattered all around the surface of the female gametophyte and into the median cleft. The homoxylous character of typical gymnospermous woods is not mentioned. The use of terms like 'stalk cell' and 'antheridial cell' is not according to modern usage. The names *Coniferophyta* and *Coniferales* are not according to the ICBN 1994 and the group should be called *Pinophyta* and *Pinales*.

The accounts of fossil gymnosperms are inadequate and often inaccurate. The structure of *Lagenostoma* needs to be explained by transections at different levels besides a longisection. About the definition of the terms haplocheilic and synocheilic, as coined by Florin (1931), it has to be emphasized that the ontogeny of the stomata in *Bennettitales* is unknown and the syndetocheilic stomata of this group have to be defined on the basis of the location of the two subsidiaries as pointed out by Pant, 1965. The microsporophyll of *Cycadeoidea* (p. 41) is now interpreted by Delevoryas (1965, 1968) as not opening out. The three kinds of habit in *Cycadeoideales*, herbaceous in *Wielandiella* and *Williamsoniella*, columnar in *Williamsonia* and *Cycadeoidea* and geophilous in *Cycadeoidea* should have been mentioned.

The authors fail to mention that the fossil *Cycadales* were far more diverse than the living ones and their account of fossils is rather poor. The authors' statements about coralloid roots despite the mention of Staff and Ahern (1993) and Halliday and Pate (1976) run contrary to facts and to their statement that little work has been done on this aspect (p. 458). On p. 53 the authors mention that 'According to Johri (1992) "a type

of siphonogamy has been initiated in cycads and they should no longer be regarded as non-siphonogamous"'. The cycads, however, are truly zooidiogamous because their pollen tube is not a channel which conveys the motile ciliated gametes. The pollen tubes produced by their male gametophytes are haustorial organs as stated much earlier by Pant 1973 and even others before him. Forms like cycads and *Ginkgo* should indeed be regarded as bridging the gap between zooidiogamous pteridophytes and more advanced siphonogamous seed plants.

The chapter on *Glossopteridales* depicts *Ottokaria* with its fertile face towards the subtending leaf. Actually Pant and Nautiyal (1984) and others have shown that the sterile face of *Ottokaria* faces the leaf. The stomata of *Nipaniophyllum* are haplocheilic and not syndetocheilic sensu Florin. The term 'bars of Sanio' is now obsolete since it includes two kinds of structures 'crassulae' and 'trabeculae' and the authors should specify them.

Since the book is published in India, its account of the *Cordaitales* could have included an account of leaves of *Noeggerathiosis*. Transections of *Cordaianthus* are important for depicting the arrangement of parts in the individual axillary 'flowers' in the catkins. These are important for understanding the relationships of cordaites and conifers as suggested by Florin.

In the chapter on *Coniferales* (*Pinales*), the names *Pinus insularis* and *P. wallichiana* are now called *P. kesiya* and *P. griffithii* respectively. I must also mention that ICBN now prescribes that species named after persons whose names end in a consonant should end in 'ii' e.g. *merkusi* should be *merkusii* and *armandi* should be *armandii*. However species named after persons whose names end in 'er' or a vowel should end in a single 'i', e.g. *hookeri* and *beddomei* after Hooker and Beddome. In the account of *Podocarpaceae* it was important to mention that *Podocarpus wallichianus* is the only species of *Pinales* which occurs wild south of Himalaya in Peninsular India. A brief mention of *Phyllocladus*, the phylloclade bearing genus was also necessary.

In the account of *Ginkgoales*, fossil ginkgophytes are conspicuous by their poor coverage. The authors do not mention Florin's important work on Ginkgophytes of Franz Joseph Land (1936).

Again in a book published in India by Indian authors it was perhaps important to mention that though living *Araucariaceae* are absent in India, their fossils occur in the Jurassic and Cretaceous beds. On p. 265 *Palissya* is misspelt as *Palissaya*.

I am unable to understand how a strange statement 'The anatomy of stem and root have not been studied' has crept into the account of *Cephalotaxus* (p. 268) since it is well known that the secondary wood of *Cephalotaxus* shows tertiary spirals like those of *Taxus*. Further, Chamberlain (1934) has mentioned that *Cephalotaxus* has resin canals in the pith and cortex.

The *Ephedrales*, *Gnetales* and *Welwitschiales* lack a reliable fossil record and the accounts of the living members of these groups are fairly well written although the leaf of *Welwitschia* should be described as isobilateral and not isolateral.

The importance of many gymnosperms to man lies in their soft wood and they can often be distinguished on the basis of wood characters. Accordingly, the authors could have either dealt with wood chapterwise or included a chapter on the xylotomy of living and fossil gymnosperms. This would have not only added much-needed information on wood characters but also utility to the contents of the book.

Despite the above criticisms, the book should provide fairly useful information to students of gymnosperms, particularly on the embryology, life histories and tissue culture of diverse living gymnosperms.

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Plant diseases that result in crop loss have been economically important the world over. With the advancement in

knowledge, the area of plant protection has been changing, mainly taking into account the impact on the environment. Hence, a comprehensive understanding of the field is essential for planning plant disease management strategies. For effective communication in the field, the review of literature is very essential. In this context, the *Annual Review of Phytopathology* is doing a commendable job in bringing each year the review of subject information connected with pathogen, plant-pathogen interaction and disease management strategies. This is an indispensable tool for researchers, teachers, scientists and policy-makers. Eminent personalities in various fields of plant pathology are invited to contribute their knowledge and expertise in the various fields of plant pathology. Early scientific understanding of the physiology and therapeutics of human diseases resulted in Gaumann proposing concepts and models for plant pathology research in 1950 in the 'textbook' entitled *Principles of Plant Infection* (Crosby Lockwood and Sons Ltd, London). In the post-Gaumann era, substantiating experimental evidences to most of Gaumann's hypothesis are emerging from the comprehensive reviews covered in this volume.

In the historical perspective, the review of Philip Herries Gregory, Frank-Lamson Scribner and Beverley T. Galloway is very appropriate. Air-borne nature of plant pathogens, epidemiology of plant diseases, their control and a need for a separable

field in the scientific faculty to study plant diseases shaped plant pathology research the world over. The cumulative description of their dedication, devotion and approaches to the study of plant diseases can instigate research in this important area of agriculture.

Coevolution of plant pathology with research of other areas has resulted in the modern molecular research for engineered organisms and vaccine production. Hence, reviews of research on *Agrobacterium* T-DNA and plant virus peptide expression are timely. The projections for future perspective useful for human research are excellently defined in the conclusion section of these articles.

Some reviews on the biology of plant pathogens restrict information to particular pathogens. Fungal diseases according to their nature of infection have been characterized as biotrophs, perthophytes or necrotrophs and reviews should have focused type study to examples in relation to the above. Evolutionary biology of *Fusarium oxysporum* is not a typical example of a plant disease and it did not attempt to review decades of work done in India (at Madras University).

The host-pathogen interaction section describes five excellent reviews on signal transduction, systemic acquired resistance, molecular genetic analysis of flax-flax rust interaction, evolution of the *rp1* complex conferring rust resistance in maize and anticipatory breeding for rust resistance in wheat. These project the deve-

lopment of plant pathology to the era when vaccination type of plant protection is possible or induction of resistance can be by introducing gene loci for sustainable agriculture. These reviews have also conceptualized the direction for integrated pest management in plant pathology, the need of which has been focused by J. Jacobsen.

Plant disease management has become an important component of modern agriculture. Under Plant Disease Management section, Knight *et al.* in the review entitled 'Rationale and perspectives on the development of fungicides' have detailed the development of fungicides, especially the need for newer fungicides like natural products and antagonistic organisms for plant protection. This is commendable in the light of the objectives of the world-wide mission on Integrated Pest Management. Hence, this volume of *Annual Review of Phytopathology* will be important to every library and book shelves of plant pathologists and agriculturists. Since it details comprehensively the plant pathology research, it can also be useful as a textbook.

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