

REVIEWS

A. J. D. MEEUSE, Angiosperms — Past and Present. Phylogenetic botany and interpretative floral morphology of the Flowering Plants. Advancing Frontiers of Plant Science, Vol. 11. — Institute for the Advancement of Science and Culture, New Delhi, 1965. 228 pp., 21 figs. Rs 30.

This is a difficult book on account of the very wide range and complexity of its subject-matter, made more difficult by the fact that the author has not taken the trouble to arrange his writing so as to present a clear sequence of ideas; also he often uses needlessly complex sentences, some made more difficult to understand by careless proof-reading. After a first attempt to read the book through, my mind was quite confused; it was only on a second reading, by referring backwards and forwards to different chapters, that I began to have some understanding of its basic ideas. So if in this review I do not do it justice, I feel that the author will be at least in part to blame.

Prof. Meeuse has made an attempt to interpret the floral morphology of flowering plants in terms of a new typology. He objects to the old typology of carpels and the way in which a great range of different floral structures were interpreted in terms of that typology; but he proceeds to provide a new strait-jacket of his own into which all the same structures must be fitted. He condemns the old morphology as 'pre-conceived', and frequently uses this adjective to discredit the ideas of others. But all his own theoretical ideas must have been conceived in his own mind before he could apply them in detail and give expression to them in the present book; they are therefore also pre-conceived. He should think again what he means by this word.

The author's defence of his own strait-jacket, called an anthocorm, is nowhere set out in straightforward terms, but it appears that he regards it as approximating to a hypothetical Bennettitalean-Chlamydospermous structure; he therefore regards his interpretations as 'phylogenetic' and those based on carpel-typology as 'pseudophylogenetic'. But he does not offer any statement as to how his anthocorm resembles any particular fossil; and to find an existing flower that shows some resemblance to an anthocorm he has to go to the genus *Centrolepis* which is vegetatively much reduced and may reasonably be regarded as highly specialized in its floral parts. He also admits that 'the only fossil ancestral group we can boast of' is *Pentoxylales* (p. 78), the resemblance of *Pandanus* to *Pentoxylon* being the only fact that he can produce to substantiate his apparent claim that he is on the road to solving Darwin's 'abominable mystery'. I will revert to *Pandanus* later; but first I must mention the fossil angiosperms and the carpel theory. The idea that the carpel is a modified leaf was of course based on a comparative study of many flowers; it was a perfectly respectable scientific theory, and played its part in the development of an understanding of a natural classification of the flowering plants. The fact that it was first set out in pre-evolutionary terms does not detract from its merit or possible usefulness in considering phylogenetic possibilities. Prof. Meeuse admits that there are many angiosperms in which the carpels do appear to be modified leaves; but one reason why he rejects the idea is that there are no fossils showing such a structure. The mystery of the origin of angiosperms is that they appear suddenly as fossils in Lower Cretaceous rocks in north temperate latitudes, with nothing to indicate how they evolved from presumed gymnospermous ancestors. Prof. Meeuse admits the probability that the early stages of angiosperm evolution took place in the wet tropics (p. 14); I would agree with this, and it seems to me highly improbable that we shall get any definite information about those stages unless fossils are found in regions which had a wet equatorial climate in pre-Cretaceous times. If such fossils were forthcoming, it might be discovered that the search for a prototype of a carpel was not such an unreasonable idea. A very large amount of evolutionary development must have occurred prior to the (presumed) migration of angiosperms from the tropics to the latitudes where the earliest fossils are now found, and I am very doubtful whether, in the present state of our knowledge, it is worth trying to guess how that evolutionary development began. It may well be that Prof. Meeuse's anthocorm idea, based hypothetically on the fossils that are known in north temperate regions, is on the wrong lines.

Prof. Meeuse's anthocorm can be used as starting-point for the evolution of ovaries of two distinct kinds. One kind is derived directly from a single chlamydote (or cupulate) ovule by development of the outer covering as a complete protection for the megasporangium and seed. It appears that there is evidence that some ovaries of *Juglandaceae* and *Urticaceae* can be construed in these terms; Prof. Meeuse calls such structures 'pseudomonomerous ovaries', and states that they are morphologically little different from seeds of *Gnetum* (though differing in the development of the embryo). The second kind of ovary which can evolve from an anthocorm is produced by union of one or more pluriovulate gynoclads with their subtending bracts; this is the typical carpellate ovary, truly angiospermous. In cases where ovaries have many

ovules, they must clearly be interpreted as having this second origin (whether the ovules have or have not an aril in addition to two integuments); but in cases where only one ovule is present in each loculus either origin is possible. It is not at all clear to me how Prof. Meeuse decides which origin is the true one in particular cases of this kind. He complicates the situation by admitting both types of origin within a single order (*Piperales*) or even within a single family (*Pandanaceae*). Such a state of affairs seems highly improbable.

Prof. Meeuse takes some trouble to insist that monocotyledons and dicotyledons are quite distinct groups, and postulates that they came from different pre-angiosperm ancestors. He regards the resemblances in general structure of flowers in the two groups as due to parallel evolution. One statement he makes about monocotyledons, as evidence of their distinctness from decotyledons, must not pass unchallenged. He states that axillary buds are absent from the majority of monocotyledons. He clearly has never looked at the great families of the tropics. I can assure him that in most monocotyledons there is an axillary bud at every node at the base of each new shoot, as also at every node on erect stems of bamboos, pineapples, aroids and probably many other families; this is known to everyone who is concerned with the vegetative propagation of such plants. As I have pointed out elsewhere (*Phytomorphology* 5, 1955, 399—413), the great majority of monocotyledons have a sympodial habit, each new element of the sympodium being a stem which starts at or near ground level and bears roots on its (shorter or longer, erect or horizontal) basal part before producing the erect leaf-bearing part. In the majority of cases this erect leafy part is not strong enough to bear branches (owing to lack of cambium) and branches are lacking; but most monocotyledons branch from the basal part of each new growth. There are a few exceptions to this growth-habit, the most notable being the single-stemmed palms which never produce axillary vegetative branches; but relatives of almost all of them produce branches from the axils of basal leaves, forming clumps of trunks. Stems of monopodial orchids of the *Vanda* alliance are mostly unbranched, but if the tip is cut off such a stem lateral branches at once appear; similarly the leafy parts of the stems of *Dendrobium* normally do not produce axillary branches, but if the normal new growth of the plant from basal buds fails, axillary buds may develop all along the stem, a fact also known to propagators of these plants.

As regards the vegetative similarity between the *Pentoxylales* and *Pandanus*, which appears to be an important part of Prof. Meeuse's case, the resemblance seems to me very superficial. He admits (in Proc. Koninkl. Nederl. Akad. Wetens., Ser. C, 64, 1961, 555) that the resemblance to *Dracaena* is greater; but that resemblance is partly due to secondary growth in thickness of the stem in both, and the structure of the secondary tissues in the two cases is very different. *Pandanus* has a branching habit somewhat similar to *Pentoxylales*, but *Pandanus* lacks secondary thickening, and can only branch because of the great strength of the primary structure of its stems and because the base of the plant is supported by stilt-roots. As I know from my own experience, much-branched Pandans in time become unstable and break up. As regards the leaves of Pandans, they are so very different in structure from those of *Pentoxylales* that I cannot believe that any value can be attached to them as evidence of relationship to the latter.

Pandanus must surely be related to the palms; the Pandan leaf looks like a simplified palm leaf, and the inflorescences of *Pandanus* are in general aspect much like those of *Nipa* (though of course differing in detail). Vaughan has shown (*Journ. Linn. Soc. Bot.* 55, 1953, 1—33) that in Mauritius there are species of *Pandanus* which have rudimentary carpels at the apex of male flowers; he has also shown that the male flowers of species which have single ovaries have six stamens, the male flowers of species which have conrescent ovaries (phalanges) having many stamens. It looks to me as if the rational interpretation of a *Pandanus* flower is to be found as a reduction from a palm flower. One must also consider the case of *Freycinetia* which on Prof. Meeuse's scheme cannot have the same type of ovary he attributes to *Pandanus*.

Prof. Meeuse treats palms and aroids as more closely related than is either group to *Liliiflorae*, and interprets both as if unisexual flowers were primitive. He thus appears to consider the *Arum* group of genera as primitive in *Araceae*, whereas (taking the wet tropics as a point of origin) it seems to me much more likely that the primitive type of inflorescence in the family is that in which the whole spadix is covered with hermaphrodite flowers, with an alliance to *Liliiflorae*, as postulated by Hutchinson; Prof. Meeuse does not mention this idea nor defend his interpretation against it. Palms and aroids are extremely different in vegetative characters, and on this ground alone cannot be nearly allied. The ovary of aroids is interpreted by Prof. Meeuse as carpellate, as is that of *Liliaceae*; but the palm ovary is considered as derived by concrescence of three 'chlamydote ovules', the separate parts of the fruit of *Rhapis* and *Livistona* thus ranking as seeds, as do the fruits of *Piperaceae*. But he does not explain why the palm fruit cannot be derived from a multiovuled (carpellate) condition; and I would regard a hermaphrodite flower, of the kind found in *Livistona*, as the most probable primitive type in the family.

It is to be hoped that Prof. Meeuse will write another book in which the anthocorm theory, with the supporting evidence for its basis, and its implications in practice, are clearly set out, with some thought for the convenience of possible readers and a pruning of polysyllabic phraseology.

H. MEUSEL (ed.) und E. JÄGER & E. WEINERT, Vergleichende Chorologie der Zentraleuropäischen Flora. — Gustav Fischer, Jena, 1965. Folio. Text 583 pp., Atlas 258 pp.

The following is a partial review of this colossal work which is mainly based on about 1000 maps of possibly 2000 taxa, partly families, genera, species, and varieties of Central Europe. However, these ranges extend not unfrequently beyond Eurasia and I feel I should make some critical remarks on extra-Eurasian ranges and their extensions, as there are more errors here than can generally be allowed to works of this magnitude.

The main author (Prof. Meusel, of the Martin Luther Universität, Halle-Wittenberg, D.D.R.) has for widely distributed species attempted to give the entire range which necessitated occasionally to add tropical and southern hemisphere localities. Strangely enough he has also added maps of species or genera which do not occur at all in Central Europe, possibly because he assumed them to belong to or to be related with the Central European 'Sippe' or species group. For example *Salvinia cucullata* Roxb., *Clematis mollissima* (Hall. f.) Eichl., *C. javana* DC.; but the reason for including the genera *Nothofagus*, *Castanopsis*, and *Engelhardia* must be far-fetched.

It would have been better if the author would have restricted himself to the Eurasian distribution; apparently he did not realize sufficiently that this marginal extension brought along the responsibility of accuracy, mastery of other literature, or alternatively disinterested help from informed centres. It is most curious that he did not cite or use any publications of Flora Malesiana *sens. lat.*, Pacific Plant Areas volume one, etc. which are indispensable for this purpose, save Eichler's work on *Ranunculaceae* which was published in German in Germany. Particularly for bipolar taxa, Malesia is a strategic area and contains often the only stepping stone(s) in the tropics, e.g. *Sparganium* (Sumatra, New Guinea), *Trisetum spicatum* (Kinabalu), *Brachypodium silvaticum* (Sumatra, Java, Celebes, Lesser Sunda Is), *Carex canescens* L. (New Guinea), *Carex echinata* Murr. (New Guinea), *Carex maculata* Boot f. (Malaya, Java, Celebes, New Guinea), *Carex fascicularis* Hk. f. (not in Java, only in New Guinea).

Obviously he has also relied on hurried examination of herbarium sheets, because neither *Salvinia cucullata* nor *S. natans* are native in Malesia. *Hydrocharis asiatica* Miq. is mapped only for eastern Asia, but the oldest name for it, accepted already many decades ago, is *H. dubia* (Bl.) Backer, of which a complete map for Malesia was ready for copying from Fl. Mal. vol. 5. The account of *Luzula* was taken from Buchenau (1906) indicating it for Java only; it has never been found there, but occurs in the mountains of the Philippines, on Kinabalu, Celebes, and New Guinea, with 2 species. The map of *Myricaceae* fails to include *Canacomyrica*, of prime value for the ancient distribution of this family. *Lenna minor* L. is dotted for Java; it does not occur there, possibly *L. paucicostata* is meant. I am afraid similar fallacies are found for African and S. American records.

It is hoped that in future volumes such fallacies will be omitted, either by omitting all tropical references or by getting correct information on this marginal sideline from the proper sources.

One final remark: the author's ambitions have gone so far as to give a delimitation of the climatic vegetation zones of the world without argumentation. For those studying tropical vegetation it is most remarkable to find the northern half of Luzon, the Guyanas, Venezuela, Panama, Costa Rica, the Antilles, etc. in the 'boreal subtropical' zone.

En passant, also a new floristic subdivision of Malesia is given in which, besides the three provinces I found myself from a statistic of the ranges of 2300 odd genera, are squeezed three new provinces: northern Philippines, southern Philippines, and Celebes + Moluccas. I am curious to know the scientifically argued basis for this. The one given, that my division was 'supplemented' by two papers on the family *Dipterocarpaceae* (1923) and the genus *Knema* (1961) resp., is obsolete, whilst Van Balgooy's paper (1960) (not 'Dalgovj' as cited) is in complete agreement.

C. G. G. J. VAN STEENIS

W. T. STEARN, Botanical Latin. — Thomas Nelson & Sons, Edinburgh 1966. — 8°, xv + 566 pp., 41 fig. *£* 5.5.

The need for a book on botanical Latin has been felt more urgently since a large number of botanists without a profound knowledge of classical Latin have entered the field of taxonomy in the last decades. Older works on the subject as Bischoff's 'Handbuch', Lindley's 'Glossary', and Backer's 'Verklarend woordenboek' are long out of sale; other modern ones are limited to terminology and vocabulary.

For almost half of its contents Stearn's book consists of a chapter on descriptive terminology (mainly following Lindley) and a (not too extensive) vocabulary of terms in which explanations are given only at random, but there is also a comprehensive illustrated guide to the practice of Latin suiting the taxonomist's needs. The chapter on the historical background of botanical Latin is followed by a concise grammar and a syntax of classical Latin. Examples of 'classical' descriptions for each major group of plants both in botanical Latin and in English are added. The chapters on the formation of names and epithets, on latinized geographical names and habitats, colour terms, symbols and abbreviations, on Greek words and word-elements in botanical Latin are most welcome even to the scholarly taxonomist.

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