

REVIEWS

A. D. J. MEEUSE, *Fundamentals of Phytomorphology*. — The Ronald Press Company, New York. 1966. 231 pp. \$ 10.

This is the second book by professor Meeuse on the phylogenetic morphology of the reproductive organs of the Higher Cormophytes. It is superior to the first*, not only in the get-up, but also in providing some more information on the principles of the author. The core is disclosed in: 'all we can do is to postulate a phylogenetic genealogy, using all available (palaeobotanical) evidence, and build up the evolutionary sequences in the phylogeny of the organs, the semophyleses, along our framework'. And: 'Typology is to be checked by fossil data'. We meet the method of the New Morphology, as it was started by H. Hamshaw Thomas.

The phylogenetic line depicted leads from the *Progymnospermopsida* Beck through *Cycadopsid Gymnosperms* towards *Angiosperms*. It is impossible to distinguish *Angiosperms* from *Gymnosperms*. They are specialised *Cycadopsid Gymnosperms*, exhibiting polyrheitic angiospermic trends, such as angi-ovuly, double fertilisation, dormant embryo phase, flower types, wood vessels, and aperturate pollen. Some groups have not reached the ultimate level in part of these characters.

A new flower-prototype can be derived by this method from the mixed fronds of *Progymnospermopsida*, among other things by the establishment of a bract-axillary axis relationship. This type is named the anthocorm and is defined as a central axis bearing bracteate gonoclads, the gynoclads with a number of ovuliferous cupules, the androclads with some androsynangia on flat supporting organs. The megasporangia have two integuments, the inner of which probably arose from an invagination of the sporangiophore, the outer from sterilised sporangia. The cupules originated from phylloclad protocauline syntelomes (pinnules of the *Progymnospermopsid* fronds).

Reduced mono-ovulate cupules are manifest in the perianth of bitegmic ovules in *Chlamydospermae*, in the intervular scales of *Cycadeoidales*, in the pistil-wall of *Amentiferae* — which are thus carpellate —, in the arilli of ovules of carpellate *Angiosperms*. No doubt here we have a striking homology, prompted by L. Croizat.

Carpellate pistils with axillary placentation must have originated from a number of gynoclad-bract units at once, the gynoclads forming the placentae, the bracts the ovary wall. Carpels with laminar or parietal placentation, follicles, and also laminose stamens of *Magnoliales*, are the result of a peculiar process, viz. a merging of bract and gonoclad, giving rise to the advanced condition of pseudo-phyllispority. Consequently mono-ovulate pistils are either reduced carpellate formations (*Anemoneae*) or are cupulate ovules (*Amentiferae*).

In this way the gap between *Gymnosperms* and *Angiosperms* can be bridged. During the polyrheitic trend toward angi-ovuly, which is a reaction to the advent of entomophily, the function of pollination is transferred to the outer coverings. This transference can be viewed as not yet completed in the pistil of, e.g., *Engelhardia*, where the inner integument still extends as a tubillus.

After analysing the possible phylogeny of stamens, the author presents the trends which led to the 'conventional', according to his view polyaxial, flower. Finally a review is given of some taxa primitive in the new conceptions.

It seems well possible that after finishing this book the reader is left with some doubt. This may be caused by (1) the sketchy representation of the accepted phylogenetic lines (figs. 5, 6 and 7). This is superficial '*Gestalt-morphology*', (2) the fact that nothing is stated on the implicit reduction of the arilli (cupules) of cupulated ovules that became encased in carpels, (3) the problem of the number of styles terminating some putative cupulate ovules, e.g., in *Cyperaceae*, (4) the too simple remarks on the development and histogenesis of the bract-axillary axis unit, (5) the lack of any anatomical evidence for the derivation of pseudo-phyllispority, (6) the fact that the photograph of *Engelhardia* does not show the required tubillus. These are serious shortcomings.

On the other hand it seems fairly certain that the reader will feel inclined to consider whether the sporophyll-concept of carpels and stamens is not too much ingrained in him. In that case the book serves the

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author's intentions. For 'it is the sporophyll concept which has hampered progress not only in phyto-morphology, but also in taxonomy and palaeobotany'.

This is a provoking book, dealing with an amount of controversial questions, such as the euanthium and pseudanthium hypotheses, telomic concepts, Lam's stachyo- and phyllospory, the gonophyll concept of Melville, homology problems, lines and levels, ancillary evidence from anatomy and teratology, the leaf-concept, the megasporophyll of *Cycas*, and so on.

If it is true that the book of professor Eames is slightly modified orthodox — and it has been thus called in a review by B. L. Burtt —, then the book of Meeuse is the pinnacle of heterodoxy. I think it merits to be read by all students of plant morphology and taxonomy who care for the 'abominable mystery' to be solved. It is true, as Meeuse states, that more freedom of thought is needed in phytomorphology. However, to me it is equally true that this New Morphological approach, to be convincing, must be delivered with higher precision and with more demonstrative force.

W. A. VAN HEEL

FOCKO WEBERLING und **PIETER W. LEENHOUTS**, Systematisch-morphologische Studien an Terebinthales-Familien. Abh. Akad. Wiss. Lit. Mainz, Math.-Naturw. Klasse. 1965, 10, 499—584. DM. 8,60.

This work chiefly deals with *Burseraceae* and some *Simaroubaceae*; shortly treated are the *Meliaceae*, *Anacardiaceae*, *Sapindaceae*, and *Rutaceae*. It is not exactly what it is said to be in the title. The classification and the possible derivation of the groups in the *Burseraceae*, chiefly of *Canarium*, are taken as settled, as they have been worked out by Leenhouts earlier. Weberling then makes a special comparative study of the varying stipules along these lines, making use also of ontogeny and teratology. Moreover Leenhouts contributes some results from the culture of seedlings. He also makes some interesting remarks on pseudo-cotyledons. The outcome is an original work, well-illustrated, and no doubt of interest to all students of groups with stipules.

The conclusion is reached that in this group stipules developed from the lower leaflets of the pinnate leaves; they are called pseudo-stipules. A progressive series can be set up which runs parallel to those of other systematically important characters. The argumentation seems convincing, especially where it is based on intermediate series of full-grown forms of adult material, innovations, and seedlings. However, the possibility of adnation, though shortly mentioned in some cases, may be somewhat underrated in others (e.g. in fig. 14). In my opinion the evidence from ontogeny is less convincing. Fig. 9 of *Canarium asperum* would show the very young pseudo-stipules to be not in continuity with the lowest leaflets, from which they are isolated later. It is clear that more evidence from extremely young stages (e.g. in figs 12 and 13) would have been welcome. The ontogeny of the stipules in blastogenetic stages should also have been studied. However, the authors themselves present a list of details still to be studied!

A second important result is that stipules which cannot be distinguished from true stipules happen to occur in the section *Canarium*, i.e. in a group which has progressed farthest. Therefore these stipules are thought to be homoiologous to true stipules, that is they should be the final result of the tendency toward pseudo-stipule formation. Lam called these stipules metastipules, and the term is adopted by the present authors.

A morphologist will immediately ask whether not all true stipules are formed like metastipules. And indeed, Weberling poses this disturbing question, but since he cannot find any intermediate formations in other taxonomic groups he is as yet not willing to answer in the affirmative. Furthermore, it is remarkable that Weberling appears to be in doubt on the validity of the distinction between 'Oberblatt' and 'Unterblatt'. Leenhouts, in a summary that is dissimilar to the 'Zusammenfassung', puts a systematic touch to the definitions of stipules.

This study proves that the method of checking the morphology of a varying special character in a group with well-known affinities can be very fruitful. Moreover, it shows that the study of seedling development is a source of information too much neglected. The authors made a successful co-production.

W. A. VAN HEEL