XVI. REVIEWS AND NOTICES

BAKHUIZEN VAN DEN BRINK Jr,R.C., A synoptical key to the genera of the Rubiaceae of Thailand. Thai Forest Bull. (Bot.) 9 (1976) 15-55.

Key of the bracketed type, often leading to flowers as well as fruits, with built-in descriptions of c. 6-12 lines; diagnostic characters are marked. Number of genera 68, incl. 3 introductions and 5 genera not recorded but possibly occurring in Thailand (mostly dependent on delimitation); Craib in 1932-34 has 71. Schumann's system of 1891 is largely upheld, although no subdivision is here given, and some surprising changes in delimitation occur (e.g. in Keenania, Mycetia, Myrioneuron), which means that many new combinations must be floating around on herbarium sheets. Caution is in order where e.g. on p. 49 Mitragyna seems to have a new section Paradina with a supposedly basal placenta, or where Gardenia is authorized L. on p. 35 but authorized L. emend. Bakh.f. on p. 32. A comparison with Thonner's keys reveals that Bakhuizen's key works slower. His generic descriptions are true 'mines of information' - mining requires a lot of backtracking before all characters can be compared. Desirable as it would be to extend a work like this to all Malesia, it would be better to abandon the Backer-way of keying, and instead describe all genera clearly, and prepare a multiple key as worked out by Leenhouts. Some synonyms are given (Notodontia yes, Quiducia and Symphyllarion no), nomina conservanda indicated, no references, no species. Several critical notes are added. — C.E.Ridsdale & M.J.

BLEEKER,P., Explanatory notes to the Land limitation and agricultural land use potential map of Papua New Guinea, 80 p., 8 fig. + 21 photogr. (1975, CSIRO, Box 1666, Canberra, ACT 2601, Australia). Price unknown.

Like the Vegetation Map by Paijmans, and the Land Forms Map by Löffler, this map rounds off the results of the CSIRO Land Surveys, which intensively covered half of the 470,000 sq. km, and extensively the remainder. This 1 : 1,000,000 map is considered an improvement of the 1969 classification by H.A.Haantjens, being more specific, based on a sliding scale, and multi-hazard. Limits of the land are: steepness, here equated with erodibility, poor drainage, flooding, salinity, drought risks, chemical poverty of the soil, pH of the soil, stoniness of the soil. On these criteria, suitability estimates are based from very high to nil in 6 classes. Altogether, the map differentiates into 60 categories, each with surface area suitable for arable crops, tree crops, improved pastures, and flooded rice, in relation to population densities. Land with no limitations is 4960 km2, i.e. slightly

over 1%. But in general, potentials are considerable, in comparison with current use. The photographs are very fine, the sketch maps instructive; at the end the ecological requirements of the main 35 crops are briefly tabulated. Much land is unsuitable; altogether, this publication makes a splendid basis for integrated, responsible development planning. — M.J.

BRUNIG,E.F., Ecological studies in the kerangas forests of Sarawak and Brunei, iv + 237 p., 2 maps, 16 fig., 17 tab. + 6 photogr. (1974, Forest Dept. Kuching, Sarawak, Malaysia). Hard cover, Mal.$ 25.00.

Kerangas: dryland sites too poor for rice cultivation, or swampy and then called kerapah, was best-known from Bako National Park near Kuching, where about 25 subtypes of this sort of vegetation occur, dense yet light forest of thin low trees. Brunig's first paper on the subject is of 1957; the present study covers 57 sample plots all over Sarawak and Brunei. Some areas in the interior recognized as kerangas from air photographs are still unstudied. About one quarter of the book deals with climate soils and geology, another quarter with vegetation, 30 types in all, with a key to the main ones, a third quarter deals with the surveyed sites; the rest is references, diagrams, tables.

Floristics is almost absent as a subject except for two pages and one table giving the occurrence of families. The total number of species on record is 849, far more than the 242 that Anderson found in the peat swamps, with which the kerangas has very many species in common, while both seem derived from the Mixed Dipterocarp Forests (table 12). The most frequent families are Dipterocarpaceae, Coniferae, Myrtaceae, Sapotaceae, Guttiferae, Casuarinaceae, Anacardiaceae, Euphorbiaceae and Leguminosae, in that order. The 7 commonest plant species are Melanorrhoea beccarii, M. inappendiculata, Casuarina nobilis (here called Gymnostoma n.), Cotylelobium burckii, Dipterocarpus borneensis, Shorea albida, Litsea palustris. For a complete annotated plant list the reader is referred to E.F.Brunig, Der Heidewald von Sarawak und Brunei, Mitt. Bundesforschungsanst. Forst Holzwirtsch. 68 (1968), which I have not seen*.

There are interesting observations: owing to small leaf size light penetrates deeply into the crowns enabling epiphytes to occur at man's height; altitude is a poor criterion

* The paper is available from Max Wiedebusch, Domtorstrasse 20, D 2000 Hamburg 36, W.Germany, the two parts together for DM 27,50. The author informed me that the list is somewhat outdated and would need revising, but he himself has no opportunity to do it.

to classify kerangas vegetation; more species occur on Tertiary than on Quaternary formations; no fast-growing ephemeral pioneers belong to these communities; there is an abundance of mycorrhiza; kerangas soils are not always sandy but may contain clay; many species in kerangas contain latex.

While some comparisons are made with poor sandy areas in other continents, the author has not much to tell about kerangas and padangs in E. Sumatra, Bangka and Belitung, and Kalimantan, and he did not list many of the 16 papers cited by Van Steenis in Maleische Vegetatie Schetsen, p. 53 (1935). But ample attention has been paid to the classification of vegetation types, on geology and physiography, canopy morphology and albedo, species composition and dominance. Altogether 30 types are described, I wonder however about the difference between type 524.9 on p. 160, 162, and 163. Also discussed is the (rather poor) potential for forestry and agriculture, and a simple table (15) details the 9 possibilities of optimum land-use for kerangas in relation to productivity, protection value, recreation value, accessibility, and regeneration. There are clear and instructive diagrams, many data, the execution is quite good.

It is however a cumbersome book to read. Many outlandish authors are quoted on marginal affairs, blurring a picture rather than illuminating it. An enormous amount of unexplained scientific words bars the book from local readers. Nowhere did I find the common word Ru Ronang to denote Casuarina nobilis, here as Gymnostoma fashionably split off from that genus. Some passages are lively, but they are rare. There is no index. I would be interested to read about seasonality in flowering and fruiting, and about interaction of plants and the few animals, but found nothing of the kind. Not even T.H. Harrisson & Lord Medway's Notes on the fauna of the Bako National Park (Rep. Trustees Nat. Parks Sarawak 1956, p. 13-17. 1957) nor G.Rothschild's Animals in Bako National Park (Mal. Nat. J. 24, 1970, 163-169) is mentioned. The reader who wants to see some photographs must turn to Whitmore's Tropical Rain Forests of the Far East, or better still to Brunig's An introduction to the vegetation of Bako National Park (Rep. Trustees Nat. Parks Sarawak 1959-60, p. 13-35 + 8 photogr. 1961) which gives a useful Glossary of Malay Plant Names that here is wanting. Also P.S.Ashton's The plants and vegetation of Bako National Park (Mal. Nat. J. 24, 1971, 151-162 + 11 photogr.) is highly readable. D.H.Janzen's ingenious hypothesis on the biology of kerangas (see *p. 2626-2627*) of 1974 is to be remembered for the new light it cast on the subject; the absence of fast-growing pioneers in kerangas seems to fit in well. When all these well-written introductory papers have prepared the reader, he can sharpen his teeth for the present book which can only be read ploddingly. — M.J.

BURLEY,J. & B.T.STYLES (ed.), Tropical trees / Variation, breeding and conservation, xv + 243 p. (1976, Academic Press, 24-28 Oval Road, London NW1 7DX). £ 12.00.

A Linnean Society Symposium, held at Oxford in April 1975. Its background and aims are neatly outlined in the Introduction: to explore the scientific basis of conservation, the rates of exploitation and of regeneration, the use of plantation forestry, the genetic basis of forest management in relation to taxonomic opinion, conservation of ecosystems and in seed banks or gardens. The 24 papers are grouped into 5 categories. All these efforts do not diminish, however, the heterogeneity of the contributions.

Several papers do bring interesting news. Those selected for their importance to Malesian botany are summarized in the Bibliography, under Ashton, Baker, Eldridge, Hedegart, Janzen, Jong, Start, Styles. The paper by Brune & Melchior is recommended for a comparison, supported by many facts, of the Amazonian situation with the Malesian one. The paper by Whitmore has already received comment in the Editorial.

All papers are preceded by a summary, which in most cases is good and substantial. The book is well-printed and bound, and invites reading. This is necessary: a reader will need time to digest and correlate the contributions before he can claim a greater wisdom on this important subject. But it is worth the effort. — M.J.

CORNER,E.J.H., The Seeds of Dicotyledons. Vol. I, 311 p., text, Vol. II, 552 p., 647 mostly compound figures (1976, Cambridge Univ. Press). Estimated price £ 55.00.

A genius has passed unrecognized, by the name of F.Netolitzky. This Rumanian botanist wrote the 'Anatomie der Angiospermen-Samen', which appeared in the series Handbuch der Pflanzenanatomie, volume X, edited by K.Linsbauer, in 1926. Corner continues where Netolitzky left off, and he dedicated The Seeds of Dicotyledons to Netolitzky. Together these two books contain all the knowledge we now have on the morphology and anatomy of the seeds of Angiosperms.

In his preface Corner argues that natural families have characteristic seeds, especially as regards microscopical structure. In chapter 1, on material and methods, a plea is made to all botanists visiting the tropics to preserve flowers and fruits in alcohol or fixative in different stages of seed-development. Corner expresses his preference for studying seeds by means of free-hand sections which are cleared in lactophenol, it is a method more efficient than microtoming.

In chapter 2, on seed form, it is stressed that the form of the seeds depends on the form of the ovule. Therefore seed-studies begin with the ovule. However, in certain cases the shape of the seeds may become different from that of the

ovules, for instance in pachychalazal and perichalazal seeds of Meliaceae, Sapindaceae, Annonaceae. A scheme of these forms is presented.

A third, main, chapter follows on the seed coats. Firstly a set of terms is presented, together with its abbreviations. Tegmen is the outcome of the inner integument in the seed, testa the outcome of the outer integument. The whole is loosely called seed-coat, and is morphologically less important. The outer epidermis of the inner integument for instance is noted as o.e.(i.i.). Very soon the reader feels at ease with this simple efficient set of terms which has a historical background. The factors which make integuments into testa and tegmen are cell division, i.e. multiplication of cell layers, cell differentiation into characteristic tissue layers, and of course cell enlargement, and outgrowths. The most important change is the formation of the main mechanical layer of the seed. The position of the mechanical-lignified, resistant-layer in the seed may differ as it is formed from different layers of the integuments, for instance from the o.e.(o.i.), or i.e.(o.i.), or o.e.(i.i.) etc. Accordingly a list of bitegmic seeds in 8 groups is presented as follows: exotestal, hypodermaetestal, mesotestal, endotestal, exotegmic, mesotegmic, and endotegmic seeds. The exotegmic seeds are divided into those with palisade, and those with elongate cells. It appears that the position of the mechanical layer is of great taxonomic value. For instance Magnoliales are endotestal, Leguminosae exotestal, Violales and Malvales exotegmic etc. The form of the lignified cells is also important. As to the outgrowths of the testa arils are discussed, and these are compared with sarcotestae.

Chapter 4 is devoted to criticism of the extant arrangement of families into orders in view of seed characters. The orders prove largely artificial, although for instance Annonaceae, Laurales, Magnoliales, and Ranales are distinct orders. A list of positive contributions follows this critical evaluation, from which may be cited: Burseraceae belong in Laurales; Connaraceae go with Celastraceae, Flacourtiaceae, Meliaceae etc., not with Dilleniales, Leguminosae, Rosales or Saxifragales; Rutales must be removed from Sapindalean affinity; Vitaceae must be removed from Rhamnales to the affinity of Rutales.

The field of speculation is entered in chapter 5 on seed evolution. As judged by the structure of present seeds, the primitive seed must be medium-sized, anatropous, arillate, multiplicative, with every epidermis of the integuments giving a mechanical tissue, with large nucellus, perisperm and endosperm, and minute embryo. Myristicalean seeds are closest. A derivation of other groups is presented. It is marked either by loss of aril, testa and (or) tegmen, loss of tissue

differentiation, multiplication of cell layers, loss of perisperm and endosperm, or by elaboration of the aril into alate or sarcotestal seeds, a highly multiplicative testa, many vascular bundles, elaboration of the exotestal epidermis. This chapter also contains a detailed confrontation with the idea of Van der Pijl that sarcotestal seeds are primitive rather than arillate seeds. The Durian theory emerges victoriously, of course. There is a paragraph on unitegmic seeds. They are supposed to have relation with pachychalazal seeds, but I fail to understand. As to the systematic evaluation the later work of Philipson must be preferred.

The bulk of the book is formed by the detailed descriptions of the seeds of 233 families, of which 102 families have illustrations. All relevant earlier facts are included. The descriptions are given in a consistent pattern, every one of them starting with the ovule. References are given, not those contained in Netolitzky already. A systematic comparison follows. In the larger families separate genera are considered. The descriptions have external morphological as well as anatomical, histological, and cellular details. The source of the material studies is mentioned mostly. The line-drawings are simple, efficient, and clear. Special emphasis is on Bombacaceae, Celastraceae, Clusiaceae, Connaraceae, Euphorbiaceae, Flacourtiaceae, Leguminosae, Monimiaceae, Myristicaceae, Sapindaceae, Theaceae, Sterculiaceae, and Vitaceae. The index to generic names refers to the descriptive part, but only slightly covers the introductory chapters.

An impressive mass of details, no doubt gathered during a lifetime's devotion to tropical seeds, is compiled, systematically arranged, compared, mastered, and most efficiently produced. The facts given for the, supposedly primitive, Myristicaceous seeds are partly incorrect in my opinion. Of course one may doubt the view underlying this work, which is part of the Durian theory (see chapter 5). However, who is going to present a more convincing theory, more convincingly? — W.A.van Heel.

FERGUSON,I.K. & J.MULLER (ed.), The evolutionary significance of the exine, xii + 591 p. (1976, Academic Press, 24-28 Oval Road, London NW1 7DX, England), bound, price £ 28.00.

Symposium of the Linnean Society, September 1974; the number of papers is 24; the group photograph on p. 574 shows 68 of the 90 participants. Did the absentees succumb under the load of so much solid information crammed into 3 days together with an exhibition, a reception and a dinner? It certainly must have been a good going. Scanning Electron Microscopy made its mark on nearly all papers. Palynology has not become easier for it. Not a few authors devote a paragraph to terminology (see p. 252-259, and 330-333, but also 463 and 482),

and 'semitectate' on p. 256 to a layman's eye seems to equal 'partial' on p. 232. In the Dichapetalaceae (a modest 120 sp. in 3 genera), Punt is able to distinguish 29 pollen types, resulting from 17 phylogenetic trends; in two genera of Anacardiaceae with 28 sp. combined, Baksi (see Bibliography) discovered 9 pollen types. It is interesting then to read J.Heslop-Harrison's account of the physiological processes in relation to the Adaptive significance of the exine (p. 27-37) supplemented by J.R.Rowley's Dynamic changes in pollen wall morphology (p. 39-65), based on life observations, and to realize the complexity of the whole subject. And that after things looked so simple at the hands of W.G.Chaloner (p. 1-14) who puts the advent of 12 types of spore exines neatly in order from Silurian to Cretaceous.

There are a number of more descriptive papers dealing with taxa in Liliaceae; Waltheria (neotropic Sterculiaceae), Tripogandra (ditto Commelinaceae) both in relation to dimorphism; liverworts, Mniaceae (musci), fern allies; Annonaceae, Onagraceae, Umbelliferae, Labiatae, and Xanthorrhoeaceae; some based on species, others on pollen types. Broader in scope are the memoirs by M.J.Hideux & I.K.Ferguson on Saxifragaceae sensu lato (p. 327-377), by J.W.Walter on primitive angiosperms (see Bibliography), and by Muller & Leenhouts on Sapindaceae (see Bibliography); all these attempt to clarify the phylogeny of these groups in the light of their electronic beams.

To what extent do they succeed? On account of these small grains, Walter indulges in some system-making for whole groups. As for the Saxifragaceae, "there is an apparent absence of any clear, logical, hierarchical system of 'pollen types' which corresponds with recognised macromorphological groups. In consequence the family must be considered a very difficult one" (p. 350). Also Van Campo, at the end of her "extraordinarily thought-provoking, splendid summary of the configurations of germinal apertures" (p. 565, in Dahl's summing up), warns that "here as everywhere else we are confronted with the problems of relationship, convergence, parallelism, and also with the nomothetical aspects and all the other aspects of phylogenetical theories" (p. 134). Chaloner, too, notes that "our recognition of the occurrence of this parallel evolution raises more problems than it solves" (p. 11). Muller & Leenhouts fared better: they could largely confirm Radlkofer's system but upside down. For their and the two other papers of directly bearing on Malesia by Baksi and Walter, see the Bibliography.

The book has been splendidly produced. Captions and reference lists are extensive. Each paper is preceded by a summary and contents; the 4 French papers have an English summary as well, and at the end Dahl gives a fine overview. — M.J.

Flora of Taiwan, volume 2 (1976) 722 p., pl. 196-456.

It is a pleasure to see the second volume of this work, the first of the Dicots (Myricaceae-Cruciferae). The treatment is preceded by a clear practical key to the families of Dicots. Unfortunately it is not as easy surveyable as could be expected, in part due to the fact that the numbering of the leads is not consecutive, obviously to keep numbers low, but I find it a distinct disadvantage. It should have been done as in Flora Malesiana. In the first line of lead 1 there is some error; it reads: "Perianth absent, or of a single whorl regarded as the calyx". But under this heading one finds for example Euphorbiaceae, Flacourtiaceae, and Lauraceae. In the latter family the perianth consists of 2 distinct whorls, and this can also happen in the two other families. Possibly it is meant that there is no distinct 'calyx and corolla' (as contrasted in the second half of lead 1), but as it stands it is misleading and wrong. Family circumscription is fortunately mostly traditional, but Leeaceae are kept apart from Vitaceae and for some reason or other Nymphaeaceae are split, with Euryalaceae and Nelumbonaceae as separate families. Also disposition of genera is largely traditional; Saurauia is inserted in Actinidiaceae and rather to my surprise Champereia in Santalaceae. In Fagaceae Soepadmo's system is not followed; Limlia, Cyclobalanopsis and Pasania figure as distinct genera. Treatments are mostly in agreement with good modern revisions; an exception is Balanophoraceae where Hansen's basic work of 1972 has obviously been missed. Also to my surprise the works of Danser on Loranthaceae are hardly applied, and it is not clear why Bifaria is kept separate from Korthalsella and Aspidixia from Viscum. Also why Viscum liquidambaricolum has been sunk in V. articulatum; it is a perfectly good species, even though characters may be difficult to observe in dried specimens. In general the keys to the species are clear, but it seems sometimes provisional, e.g. in Asarum where 2 species are keyed out merely on the colour of the leaves. Schima is said to comprise 20 species, in contrast to the monograph by Bloembergen where only one variable racially segregated species is recognized. The book contains several descriptions of new species, some new combinations and new names. — van Steenis; see also *p. 2623-2625.*

GUNN,C.R. & J.V.DENNIS, World Guide to tropical drift seeds and fruits, illustrated by P.J.Paradine, xi + 240 p., 93 fig., map (1976, A Demeter Press Book, Quadrangle, The New York Times Book Co.), 8°, US$ 17.50.

On the flap it reads that this guide has been prepared for those who find pleasure in beachcombing and whose curiosity has been aroused by finding a stranded tropical seed or fruit, as well as for the professional botanist.

It was obviously composed mostly round the large collection of 'sea-beans' of Mr. Gunn. After a brief introduction on buoyancy, dispersal, history, transport currents and collecting beaches, a catalogue follows of treated genera and species, many descriptions being accompanied by a plate of seeds and fruits drawn from different angles and in section. This catalogue is preceded by a practical key for identification. In an appendix two lists are given, one by genera and one by families, a brief glossary, a bibliography, and an index.

The book is definitely semi-popular: by an amateur for amateurs, and must have merits in this field, although the drawings are rather coarse and captions provide minimum information.

I cannot see that the book is of much scientific interest for professional botanists. The title 'World Guide' is totally misleading, as the book offers only the more common large-seeded or -fruited trees and lianas and contains moreover all sorts of drifting diaspores which have no bearing on the littoral flora (Citrus, Trapa, Mangifera, Myristica, Ricinus, etc.). Probably not more then 25-30% of the tropical beach flora is represented. In the appendix some species have been entered which are otherwise not treated (Dodonaea, Excoecaria, Colubrina etc.). They have obviously been taken from literature sources, by which some errors crept in: Tacca pinnatifida is a synonym of T. leontopetaloides; the Cycas is not C. circinalis but C. rumphii; Lactaria salubris Rumph. (sic); fig. 3B unidentified is a ball of fibres of Posidonia. — van Steenis.

HATUSIMA,S., Flora of the Ryukyus (including Amami Islands, Okinawa Islands, and Sakishima Archipelago) (added and corrected), 1002 p., 62 col.photogr., 27 pl. (black and white photogr.), 6 maps, 84 personal photogr. (1975, Publ. by Inst. of Biol. Educ. Okinawa), in Japanese language, Y. 28.600, c. US$ 110.00.

This is the second edition of the Flora which appeared in 1971. The colour plates were changed and some corrections were made in the text, but the additions which were added in the first edition are not worked in the text but appear just reprinted. A second Supplement of additions and corrections (p. 867-923) is added. This contains inter alia descriptions of some new species, amongst which is surprisingly a new genus of Burmanniaceae: Saionia; of these Latin descriptions will follow in 1976. Annonaceae is a new family record for the Ryukyus. — van Steenis.

HANKS,S.L. & D.E.FAIRBROTHERS, Palynotaxonomic investigation of Fagus L. and Nothofagus Bl.: light microscopy, scanning electron microscopy and computer analyses, p. 1-141, 47 pl., in Heywood, Botanical Systematics (1976), see Bibliography.

The authors attempt to extract taxonomical information from pollen data with a variety of sophisticated techniques and largely fail because:

1) The light microscopical data are based for some species on glycerin jelly mounts of varying ages, for others on silicon oil mounts. The resulting variability obscures most of the very small interspecific differences which may be present. Instead of employing statistical methods to eliminate this variability, the authors should have made an all-out effort to obtain comparable pollen samples and applied a rigidly uniform preparation and mounting method. The Rijksherbarium in Leiden would only have been too willing to supply material.

2) The intraspecific variability is not tested.

3) The basic morphologic difference between the Fagus pollen type on one hand and the three Nothofagus types on the other is more obscured than enhanced in the statistical analysis. The computer cannot, of course, be blamed for this, but the authors have apparently failed to see the pollen types as functioning units, adapted in different ways, with resulting diverging morphological characters.

4) It is to be regretted that a detailed structural study with transmission electronical methods was not included in the project. The few structural details mentioned are based entirely on a limited number of scanning electron micrographs of fractured exines, which show a very poor resolution. It is certainly not possible to distinguish here endexine from foot layer, let alone, measure their respective thickness to an accuracy of 1/1000 μm, as the authors have done.

Thus, it comes as no surprise that the correlation of this poorly organized amount of pollen morphological information with well established macromorphological, wood anatomical and ecological data produces mostly meaningless results.

The authors' interpretation of the evolutionary relationship between Fagus and Nothofagus pollen apparently rests on a statement by Davis and Heywood that "lesser complexity" and "thinner exine" are specialized characters, which leads them to the conclusion that Fagus has the less specialized pollen type. However, it could equally well be argued that the Fagus and Nothofagus pollen types, which are very distinct and show little evidence of affinity, are both equally specialized, but in a different direction from an unknown ancestral type. Anyway, such generalized statements, without any detailed discussion of functional aspects, are rather unsatisfactory.

In this connection it is strange that the authors do not refer to the excellent discussion by Harris (N.Z. J. Sc.& Techn. B 37, 1956) of these problems.

Claims are also made that the results indicate past migration routes. Although the authors take the fossil evidence into account, they are considerably handicapped by the lack of evidence on place of origin of Fagaceae. They also accept the Tertiary records of Nothofagus pollen from the Northern Hemisphere as genuine and indicating the presence of the genus, without realizing that some are misidentifications, while others represent long distance pollen dispersal. This last possibility they claim to have refuted in the introduction, failing to mention the reliable data to the contrary in literature.

A minor but irksome point is that no collection numbers of the material studied are cited, although Herbarium of origin is stated. The abundant photomicrographs are, perhaps, the most valuable part of this study, which otherwise cannot yet be taken as the decisive monograph for which taxonomists, interested in the relationship between Fagus and Nothofagus, are waiting. — J.Muller.

HEINSDIJK,D., Forest assessment, 349 p. (not 359 as announced) (1976, Pudoc, Box 4, Wageningen, The Netherlands), offset, cloth, Dfl. 60.

"Forest assessment is the evaluation of forest lands and stands, and their general management, taking into account all uses to which they are put. For such assessment, one must consider history, topography, climate soil, production, economics of timber, ecology and nature conservation, and social functions including recreation". So far the announcement. The text covers 268 p., the 1800 references 76 p., the index 4 p. A great variety of facts has excellently been strung together in well readable English, marred by silly errors in the typing; otherwise the production is good, paper and binding firm.

This book on the aims of forestry and its role in the management of natural resources and human society, is not for specialists but for workers in other disciplines. It reveals forestry as a world of considerable complexity, through the General Outlines of Forest Assessment; Historical review; Mapping and maps; Climate; Soil; Forest site classification; Forest inventory; Economic aspects; to Decision making. The Outline was written as a general survey, enlivened with odd facts which do not fit into the other chapters. For instance, on p. 31: "in 1957 the USA Forest Service put the distance between family camps at 30 metres and since 1960 the US Park Service allowed 4 to 7 camps per acre. An official of the US Park Service recently stated: 'we know exactly how many elk a park can handle ecologically, but not how many people'". The

range of facts is amazing, their presentation well-proportioned, the reasoning clear, and versatile, and there can be no doubt that the author has well succeeded in his goal; that's what makes his book also interesting to botanists. They will see their attention drawn to quite a few good sources, not all of them the best, however, like no. 1491 taken from a Dutch selection of Readers Digest, or no. 868 which gives a small paper by A.W.Küchler while omitting his classic Vegetation Mapping. Handbooks are not favoured over other publications, which is a pity, and References are not made to pages, but most publications are small. By virtue of its world-wide coverage in small size, it rather stresses the resemblances than the differences between temperate and tropical forests and the ways to exploit them. Pine, eucalypts, and other fastgrowing trees, are much in the foreground of the author's view of the tropical forest scene. Some expected subjects are not discussed: how to supply tropical townspeople with firewood, ERTS-photography, and minor forest products are treated scantily.

The botany side of the book is not strong. From paragraph 8.2, the role of taxonomy and forest Herbaria can scarcely be guessed. Through a simple telephone call to Flora Malesiana headquarters the author could have learnt that an estimate for Indonesia of 30.000-40.000 tree species (p. 174) is far too high and should be placed in the order of 5000-6000. That the Lauraceae are notoriously difficult to identify may be true, but that "often even a genus name cannot be given on complete herbarium material" (p. 174) is not, if the author means by complete 'provided with flowers and fruits'. And perhaps a word or two might have been inserted on the value of slash characters, more valuable than working with vernacular names, of which the author still seems to have some expectations. There is no index to botanical names, either.

Far more remarkable, however, is the author's ambiguity toward conservation. On the one hand, he has a deep sympathy for it, though considerably irritated by 'naturalists' who want all trees to die a natural death, and he explains the disadvantages of 'over-mature' forests. On the other hand, "foresters remain managers of a part of the biosphere that also has to be used for the material well-being of society" (p. 263). Therein, they suffer from misunderstandings on the part of a public of 'naturalists' who, "lacking sufficient practical insight, will always advise a hands-off policy" (p. 255). "It will be necessary to convince this public that building up and guiding the forest can be accomplished only by incidentally destroying parts of it" (p. 218). Of course, "natural growing conditions to be maintained for the preservation of nature, its flora and its fauna, can be attained only by protection, by setting aside all productive and com-

mercial considerations" (p. 156). But this is as close as Heinsdijk comes to the abyss between forestry and conservation.

The impression I receive is that foresters see it as their task to manage the world's forests, as economically as possible, of course. Theirs is the old adagium that one must obey nature in order to subject her. They claim the forests for man, and accordingly 'improve' them, by replanting, thinning, fertilizing, introducing, hybridizing, opening them up for tourism, in short, by simplifying them, ecologically. All forestry activity is bound to lead, gradually but definitely to a reduction of all unprotected species that are not weeds, not so much in the temperate region where species are few, as in the tropics where the primary forests are the main repositories of biological diversity. What the forester lacks is respect for the biological diversity in its own right, which is the cornerstone of conservation. I think this is why those naturalists criticize the forester, probably, through lack of knowledge, wrong in detail, but essentially just. They come up for the right of each species of plant and animal to exist and to survive, indefinitely on this earth. The plants and animals may be of future use to mankind; the virgin forest may be needed as a gene pool - a potential unmentioned by Heinsdijk. To the contrary: "From the total forest-swamp area of 6,600,000 ha in Finland, in 1958 1,205,000 ha was drained and it is expected that within 30 to 50 years all swamps will have been treated, resulting in a 20% increase of their wood production capacity. Something analogous is expected for the 6,400,000 ha swamp forest along the Atlantic coast and the Mexican Gulf of the USA, of which in 1960 about 400,000 ha had already been drained and where already in 1955 all know-how and equipment was available to proceed" (p. 144).

One day we may be thankful for the untouched, species-rich forests left, if any. Saving them, and keeping the foresters out, stems from this respect for nature, unmanaged, let the foresters grow wood, there where "cutting earlier means liquidation of capital, cutting later without improvement of fibre quality leads to a less efficient use of capital" (p. 223). And let the naturalists, expertly, see to it that not a single species is imperilled. The line between forestry and conservation must be aptly drawn. — M.J.

HNATIUK,R.J., J.M.B.SMITH & D.N.McVEAN, The climate of Mt Wilhelm, xii + 76 p., 17 fig. (1976, Australian National University Press, P.O.Box 4, Canberra ACT 2600, Australia), offset, paper cover, price A$ 5 plus postage.

In 1965 (not 1966 as stated in the preface, p. v) the Australian National University established a field station at the edge of Lake Aunde (Pindaunde) at 3480 m on Mt Wilhelm

(5°40' S; 145°1' E) with 4510 m the highest mountain in Papua New Guinea. Several research workers have made use of this facility resulting in a number of papers, the most important of which are: a study of the alpine vegetation by Wade and McVean (1969), a checklist of the species by Johns & Stevens (1971), an account of vegetation history by Hope (1973) and on the origin and ecology of the non-arboreal vegetation by Smith (1974). Mt Wilhelm has now become one of the best known and documented tropical mountains. The paper presents an account of the climate in Pindaunde valley (SE. slope) and the summit crest based upon observations between 1965-1972 at 8 meteorological sites, the lowest at 3215 m and the highest at 4400 m. The observations have never been made during 12 consecutive months although the research station has been occupied for several months each year.

There are chapters on precipitation, runoff and evapotranspiration, radiation and temperature and comparisons with other tropical mountains. In appendices temperature and rainfall summaries of Mt Wilhelm are given for the observation period, based on records taken at the main station at 3480 m. The total annual precipitation of c. 3450 mm agrees well with figures for Mt Pangrango (Java) and Mt Kinabalu (Borneo). Rainfall is seasonal, but the number of rainy days during the 4 consecutive dryest months, June-September, is still 84 (70 for Pangrango).

The climatic regime in other valleys may be slightly different, Imbukum valley on the N. slope is said to be probably wetter than Pindaunde valley. — M.M.J.van Balgooy.

HOPE,G.S., e.a. (ed.), The equatorial glaciers of New Guinea/ Results of the 1971-1973 Australian Universities' expeditions to Irian Jaya: survey, glaciology, meteorology, biology and palaeoenvironments, xii + 244 p., many fig. + many photogr. + 3 maps (1976, Balkema, Box 1675, Rotterdam, The Netherlands), offset, bound, price Dfl. 39,50 = $ 14.80 = £ 8.50.

The glaciers are on the Carstensz Mountains, now Mt Jaya, although the summit (4884 m) retains the name Carstensz Pyramid. Of other name changes (p. xii) we note: Nassau Range = Sudirman Range, Snow Mts = Merauke Range, Mt Juliana = Mt Mandala, Mt Wilhelmina = Mt Trikora; Mt Idenburg = Ngga Pilimsit, G. Enngea.

In 1936, J.J.Dozy of the Colijn Expedition discovered a whole mountain of 2½% copper ore; in 1967 Freeport Indonesia initiated exploitation. There may be 33 million tons, estimated at 3 billion dollar. At 3580 m the ore is mined and passed down by an aerial tramway to a mill at 2400 m, from where the crushed ore is washed down a 126 km long pipeline to the coast where it is dried and shipped for melting in Japan and West Germany. A 105-km all-weather road goes up to

the 'Ertsberg' which is c. 5 km from Carstensz. Thus the two expeditions went up. Hope the botanist attended only the first. In 35 localities (mapped) he collected 310 vascular plants (complete in CANB, duplicates in BO, L, and LAE), 200 bryophytes, 60 lichens. He also made sociological squares for vegetation-comparative work, of which he here gives an account. His previous experience was on Mt Wilhelm; on this he bases some comparisons.

The studied area is largely limestone sedimented in the early Tertiary 40 million years ago, and uplifted in the late Pleistocene, only a few million years ago. The present five glaciers, together 6.9 sq. km in area, some 40 m thick, going down to 4260 m, are but a remnant of former glaciation and still are retreating fast from their estimated 19.3 sq. km about 1850 which resulted from the latest advance. Their maximum area ever is estimated at 863 sq. km (p. 174). Fresh moraine deposits are colonized by Epilobium detznerianum within a few months (p. 149), eventually to develop into a Tetramolopium klossii-Rhacomitrium heath in about 30 years, a community allegedly not before described in New Guinea (p. 148).

The vegetation was studied and the results tabulated, in terms of location and extent, habitat, physiognomy and cover, fringes and seres, relationships with Mt Wilhelm. Some items: the most marked break in forest types is between montane and subalpine; quite wet peats can be colonized by forest, particularly where ground water moves; the highest timberline of tall closed shrubland was seen at 4170 m (p. 127) like in the E. Star Mts but higher than on Wilhelmina, this may be connected with human visits, rare on Mt Jaya, frequent on Mt Wilhelmina; the porous limestone accommodates tree growth on almost vertical cliffs; Vaccinium dominans, abundant on Wilhelmina, was not found here, nor was the Casuarina woodland known from Mt Doorman; open to dense groves of Cyathea cf. pseudomuelleri are one of the most extensive vegetation types; a white lichen, Stereocaulon pseudomassartianum forms fields 5 cm deep on a fresh granite gravel fan; limestone fans are colonized by another unnamed lichen, within 30 years of exposure (in all, 33 lichen taxa are recorded); hard cushion bog is widespread between 3400 and 4100 m, the cushions c. 5-30 cm Ø, 5-10 cm high, c. 7 sp. are involved, the author apparently did not know about such and larger cushions on Mt Leuser in N. Sumatra; Carex gaudichaudiana forms a pioneer network on bare peat and fluid muds; bryophytes abound in these very equable everwet conditions, 57 Moss and 33 Hepatics taxa are listed, Ferns and Allies there are 33; similarities with eastern New Guinea mountains are rather subalpine than alpine; Hope estimates that on average the peaks differ c. 20% in floristic composition; altogether, 23 vegetation

types are distinguished and their altitudinal ranges between 3000 and 4700 m tabulated; although the soil for the plants is either limestone (derived) with pH 9.5-10.5, or rather acid peat, the primary factor in vegetation distribution is altitude.

The cumulative list of the flora above 3200 m, composed of all hitherto collected species of rather certain identity (Kloss 1936, Wissel 1937, Cooper 1971, Raynal 1973 and the ANU-series material), contains 23 Cyperaceae (5 presumed new), 25 Gramineae (2), 24 Compositae (6), 27 Ericaceae (1), there may be novelties also in Orchidaceae (7), Boraginaceae (1), Caryophyllaceae (3), Elaeocarpaceae (1), Gentianaceae (1), Labiatae (1), Myrsinaceae (2), Ranunculaceae (2), Rosaceae (1), Urticaceae (2). The total number of vascular species is c. 218; in addition, 50 species are listed from 2400-3000 m.

The ice surface and small pools in it support ecosystems dealt with in chapter 6 (the first true ice communities studied for the tropics), of Chlorophyta (7 sp.) and Cyanophyta (Nostoc fuscescens, 2 vars.). Since these glaciers are the most isolated ice areas in the world, past and present, their relationship is of interest. Mesotaenium berggrenii is northern, but its common associate Ancyclonema nordenskjoldii was missing. The others are southern, mainly Antarctic. Birds (26 sp. were recorded, 16 resident, 7 migratory, 3 from lower altitudes) being supposed not to have dispersed these algae, long-distance dispersal seems likelier but a considerable time span would be involved anyway.

The book concentrates on the glaciation of the area with all its aspects (topography, climate, geology, geomorphology) and also tries to reconstruct the past, from c. 13,500 years ago, when the ice came down to 3620 m, on Mt Scorpio even to 3450 m. The ice flow bared the core of the Ertsberg; oscillations in the ice extent occurred during the last 3500 years. No zoologist nor anthropologist accompanied the expedition; yet most interesting things were found in these fields, accounted for in chapters 10 and 11. Study of a rock shelter at 3996 m revealed human traces 5,500 years old. Pandanus cf. giulinanettii seed husks suggest that people were after this plant as an important food reserve. Nearby, an increase in Cyathea spores 10,500 years ago indicates that them the forest was already opened up, probably to make space for hunting when in a warming climate forest choked the lower valleys.

Reading the book with its many new facts was a delightful experience; the unattractive typography is compensated by a clear style. — M.J.

HORIKAWA,Y., Atlas of the Japanese Flora. II. An introduction to plant sociology of East Asia, 8 + 501-82 + xii p., maps 501-862 (1976, Publ. Gakken & Co. Tokyo), folio 39 x 25 cm, clothbound, price Y. 35.000. (In English.)

Of this magnificent plant geographical work I gave an extensive review in Flora Malesiana Bulletin *no. 27* (1974) *2214-2216*. This second volume is set up along the same line and maintains the same high standard, so that I can refer for details to the earlier review. The maps offer a choice from various families. Frequently also dots occur in Micronesia, the Ryukyus, and China which make the maps instructive. For the tropical botanist it is interesting to see how far species of the temperate element creep down southward, and reversely how tropical plants worm their way to higher latitude. There are quite a number of such tropical species in the present volume with which Japanese botany must be congratulated.

Unfortunately the author died during 1976 but we hope his work will be continued. — van Steenis.

KARTAWINATA,K., Report on the state of knowledge on tropical forest ecosystems in Indonesia, 85 p. (1974, Herbarium Bogoriense, Jl. Juanda, Bogor, Indonesia), stencilled, price unknown.

This excellent digest opens with some basic figures for Indonesia 1972. Forest area in thousands of sq. km and percentages: Java and Madura 28 and 2.36%, Sumatra 284 and 23.23 %, Kalimantan 414 and 33.91%, Celebes 99 and 8.19%, Moluccas 60 and 4.90%, Lesser Sunda Islands 20 and 1.66%, West New Guinea 315 and 25.76%. The total of 1222 includes surprisingly 160 of alang-alang; the other figures are: primary forest 860, secondary forest 230, swamp forest 130, peat swamp forest 15, tidal forest 10, deciduous forest 10, coastal forest 10.

All Vegetation types are briefly discussed. A chapter on Functioning of the ecosystem deals briefly with regeneration, primary productivity, and fauna. Under Water balance comes climate, erosion, soil properties, and cycling of nutrients. Under Disturbed forest ecosystems, the floristic composition of blukar is set forth, and growth rates are indicated. In connection with Man, population problems, health and hazards, adaptation and resettlement are discussed, as well as social factors, followed by Patterns of use of tropical forest ecosystems, in relation to conservation, selective logging (some results of mechanical logging in East Kalimantan: fallen and/ or broken down 28.6%, broken crown 5.2%, bark damage 1.7%, both damaged bark and broken crown 0.7%, overgrown by climbers 13.6%, undamaged 50.2%; soil damage by tractors 28% of the land area). Shifting cultivation and other man-made ecosystems are discussed and so are minor forest products (104,756 tons); economic potential of all islands is roughly compared for the main timbers in m3/ha. Forest policy for natural and artificial forest is set forth, with exploitation

method. As gaps in knowledge are indicated: 1) reliable inventory of forest land and timber volume, 2) comparative studies of management systems, 3) floristic exploration, 4) ecological exploration, 5) effects of man, 6) ecosystem processes like nutrient cycling, 7) genetic resources, 8) interaction between man and forest.

Nearly 200 references are given, equally well-distributed over pre-war and post-war, Dutch, English, and Indonesian. And the many facts and figures in the text, as well as the balanced presentation, show that Dr. Kuswata has acquired a rare familiarity with the subject and its background. By neatly packing this much information into this concise report, he has provided a sound basis for thinking on exploitation and conservation purposes alike. A list of 48 Indonesian experts occurs at the end. The paper is a must for everyone who wants to be informed on the state of affairs concerning Indonesian forestry and its many problems. — M.J.

PAIJMANS,K. (ed.), New Guinea vegetation, xvii + 213 p., some fig., 53 photogr. (1976, Australian National University Press Canberra, A.C.T., Australia), price ± US$ 33.00, Dfl. 85.00, Flück-Wirth bookseller, CH-9053 Teufen, Switzerland.

Papua New Guinea is fortunate to know its natural resources, thanks to 15 CSIRO surveys begun in 1952. Here a summary overview of their results as regards the vegetation is presented; a book on the geomorphology by E.Löffler was issued in the same series. The title conceals the two other (unrelated) parts of the book, which I'd rather name Triptych on the Plant World of New Guinea. Part i is Plant Geography (22 p.) by M. M. J. v a n B a l g o o y, Part ii is Vegetation (75 p.) by K. P a i j m a n s, Part iii is Ethnobotany (75 p.) by J. M. P o w e l l.

Plant Geography (of the whole island) lists 7 assumptions: taxa are monophyletic; the higher their rank the older; the more species in common between two areas the more recent their contact; secondary centres of diversity are to be accounted for; disjunct areas are relics; endemic taxa result from isolation; ecological ranges are genetically fixed. The number of families depends on the taxonomists; New Guinea has 200 sensu Engler, 246 sensu Airy Shaw. Tables list 41 families in W. Malesia not from New Guinea, 37 from Australia not from N.G., 20 from N.G. not from W. Malesia, 36 from N.G. not from Australia, all in the narrow definition. There is no family endemism.

The genera number 1465, divided over 15 distribution (sub) types, the main ones: cosmopolitan-pantropical 307, Old World generally 294, Indo-Malesian not Australian 221, together 56%. New Guinea shares 1120 genera with W. Malesia, 900 with Australia; 345 N.G. genera are not in W. Malesia and 565 not

in Australia. (Sub)endemics amount to 195 or 13.3%. Although the N.G. flora is Malesian, the floristic difference with W. Malesia is in the same order of magnitude as the demarcation knots of Thailand/Malaya and of Formosa/Philippines. As for the rain forest genera, out of the 750 in New Guinea, 400 are unknown from N. Queensland; of the 430 N. Queensland genera, c. 90 are unknown from New Guinea. As for the montane genera, subject of interesting speculation (see *p. 2231*), "there is indeed a preponderance of southern and eastern genera over northern- and western-derived ones, but it is only very slight if montane genera are taken in a wide sense" (p. 15). Most of the 'southern' elements in the New Guinea montane flora belong to widespread families rather than to Australian ones. The savanna element is young.

The lowland of New Guinea emerged some 25 million years ago, the mountains were formed in the Pliocene, it is said, when New Guinea broke loose from Queensland. A discussion of the origin of the flora runs into many question marks. The mountain genera are listed, 140 in number, with distribution type and terse notes on their habitat.

Vegetation (of the eastern half only) was written in connection with Paijmans's 1 : 1,000,000 coloured vegetation map and explanation (reviewed on *p. 2631-2632*). Like that work, the present text is largely descriptive. It deals with vegetation in relation to land form: beach, saline and brackish swamp (including mangrove), freshwater swamp, lowland alluvial plains, foothills below 1000 m, lower montane, and upper montane. Under each of these categories, a general description is given, environmental factors like altitude, climate, drainage, soil, the sorts of vegetation, the seres, man-made vegetation, and obtainable products.

Under these 'vegetation types' a number of interesting items are (too briefly) discussed, e.g. Excoecaria scrub and woodland, Sporobolus grassland, various grass swamps, Melaleuca swamp savanna, pandan swamp woodland, Campnosperma swamp forest, Melaleuca swamp forest, Terminalia brassii swamp, Sinoga scrub (the former genus Agonis, Myrtaceae), Ischaemum-Themeda grassland, Schoenus-Eriachne sedge-grassland with termite mounds, Casuarina forest, Araucaria forest, Eucalypt savanna, Gulubia palm forest on Bougainville, tree fern savanna, Nothofagus forest, and many more. (Nothing, however, on sea grasses and very little on rheophytes nor on the Cycas savanna which intrigues me from a visit to the Bulolo valley when Mr. J.S.Womersley told me that there was an ecological secret about it which was none of my business - and I had no time to find out for myself.)

A reader who wants to learn about fire as a factor in the vegetation must look on p. 42, 57, 79-80, 94-96; there is no treatment of the subject as such. Reading the text is reward-

ing, though; the tone is conventional, and does in no way reflect the rugged majesty of the country with its qualities of ancient mystery, but the style is balanced, and interesting facts can be picked up: Castanopsis is occasionally found scattered in swamp forest (p. 89); Eucalypt savanna can revert to forest through a thicket stage of forest species developing under the trees (p. 79); pure stands of Anisoptera polyandra are mainly stages of young and advanced secondary forest. Vatica papuana has a wide range of habitat, growing gregariously on hill slopes as well as in swamps (p. 69). Also interesting is a comparison between Bornean and New Guinean forests (p. 70-74), in number of trees and species per hectare, pointing to an equal order of richness. But the idea that conifers are on their way to extinction seems hardly refuted by their good regeneration (p. 70), the time scales being incomparable.

Influence of the soil on the floristic composition is considered slight (p. 67), and we read very little about limestone, which surprises and disappoints me after having seen the enormous differences between the flora on the volcanic soil of Bosavi and on the limestone at Waro less than 50 km to the East.

A paragraph on the vegetation history from 38,000 years ago onwards, gives many recent facts. The vegetation of Irian Jaya, the western part, in 1½ page, is very superficial; it is a pity that the author did not read and summarize the few Dutch contributions of importance. The photographs are well-chosen and informative.

Ethnobotany is a full account of the plant species supporting the indigenous economy, apart from the introduced agricultural crops (briefly dealt with by J.S.Womersley in P.Ryan, Encyclopaedia of Papua and New Guinea, 1972, 222-232) and the timber species (see New Horizons, 1973).

Under a number of headings, plant genera or species are tabulated and the main ones discussed in a compact style. The headings are: plants used as food (differentiated into cultivated as supplementary food, cultivated as staple food, wild form used as staple food, transplanted, wild form used as supplementary food, introduced, and plants used in the Eastern Highlands District), medicinal plants (for cuts and wounds, burns, sores, headaches, mouth infections, fevers, colds, intestine disorders, control of fertility), rituals and magic, manufacture of tools and weapons, construction of canoes and rafts, housing and decoration, ropes for construction, cooking and wrapping food, making string and bark cloth, flowers and leaves for dress, personal adornment.

Well-represented families in this context include Araceae (13 genera), Compositae (17), Euphorbiaceae (19), Gramineae (20), Leguminosae (24), Palmae (12), Urticaceae (16). Indi-

vidual genera of great value are bamboos, Bruguiera, Burckella, Canarium, Cocos, Dioscorea, Gnetum, Metroxylon, Musa, Pandanus, Terminalia. The total number of species dealt with is 1035 (out of ± 9000), of genera 470 (out of 1465), of families 146 (out of 200). Multi-purpose are 297 species, 249 genera.

Studies consulted, 46 in number (mapped) cover the whole island, but are confined to those in English. Additions could be made, even by a layman like me, in the personal adornment sector: Nothofagus perryi, the cupules for a necklace (Fl. Males. i 7, 1972, 285); Bixa orellana, the fruit pulp for face-painting. Within these limits, however, it looks as if a truly masterful essay has been produced, conveying lots of interesting things in a well-balanced manner, on the main plant species, their cultivation and use, in connection with anthropology, environment, and history. Archaeological evidence dates the beginning of agriculture 8000-5000 years ago. The original vegetation as a basis for subsistence, time of various introductions, and the present nutritional base are also discussed. Much on birds, fish and hunting can again be found in the Encyclopaedia (reviewed on *p. 2220-2222*). For the extras, Plant Geography and Ethnobotany alone, the book is already worth having. — M.J.

POLHILL,R.M., Genisteae (Adans.) Benth. and related tribes (Leguminosae), p. 143-368, 10 tab., 44 fig., 5 pl., in Heywood, Botanical Systematics (1976), see Bibliography.

A monograph on generic level. No new genera, some reductions, essentially not much alterations on the systems of Bentham (1865) and Taubert (1894). Taubert considered the Genisteae as one tribe with 5 subtribes, Polhill raised 4 of them to tribe level and reduced the Cytisiinae to the Genisteae s.s., the accepted tribes are the Genisteae, Bossieae, Liparieae and Crotalarieae, together with 45 genera. The criteria used are mainly the gross morphology, but also attention is paid to anatomy (particularly the seed anatomy), chromosome numbers, and chemical constituents.

The general chapters are morphologically arranged, with chapters on vegetative parts, flowers (seen from the bee's eye, as a functional unit), fruits, and seeds. The very many figures are excellent, plates with examples of calyx shapes are given, also plates with sets of petals, fruits, stamens and pistils. Mostly 1-3 examples are given per genus.

The systematical part starts with a key to the tribes, based upon 'natural' characters. Per tribe a key is given to the genera, these are more practical. From a floristic point of view I find it a pity that no artificial key is given to all genera concerned, preferably with the first lead based on vegetative characters.

Another remark I must make is that the primitive tribes Podalyreae (incl. Thermopsideae), though fully treated in the general chapters, are not treated in the systematic part.

The system presented is a practical one, and certainly an improvement to that of Hutchinson (1964), which had 10 tribes and much more genera. In the Malesian area only the genera Rothia and Crotalaria are represented. The Indo-Chinese monotypic genera Heylandia and Priotropis are sunk into synonymy of Crotalaria.

In conclusion, it is a thorough study, providing students of Legumes with much valuable and new information. — R. Geesink.

ROBBINS,R.G. (ed.), Lands of the Ramu-Madang area, Papua New Guinea, 134 p., 14 fig., 27 photogr., 2 col. maps (1976, CSIRO, Box 1666 Canberra, ACT 2601, Australia), price ?

This is the coast area of Madang and further NW., 4-6° S, 144°30'-146° E, c. 23,000 sq. km; the Adelbert Range is in the middle; maximum altitudes exceed 2700 m, slopes are often more than 30%. A number of 36 land-systems are colour-mapped (1 : 250,000) described, with block diagram, surface area, main characteristics, and land use assessment; mostly poor. Flood plains occupy 18% of the area, swamps 9%. A 1 : 500,000 map gives 9 forest types, from the commercial point of view; many plant species are named.

This is no. 37 in the well-known excellent Land Research Series. The total area covered occupies the N. coast W. of 146° E, the Central Highlands, the SW. frontier area, and the tail S. of 8° S. — M.J.

SCHMID,M., Végétation du Viet-Nam / Le massif sud-annamitique et les régions limitrophes, 244 p., 15 fig. + 16 pl. (1975, ORSTOM, 70 Route d'Aulnay, 93140 Bondy, France), price 96F plus postage.

Environment: general geography; climate; natural regions of S. Annam massif; coastal regions; upland Cochin-China, Darlac and Pleiku; population. Vegetation types: nomenclature and floristics; warm semi-arid types of the coast, the sandy terraces, the alluvial plains, the volcanic soils; warm semi-humid types on basalt, non basalt rocks, alluvial plains, river banks, and water; humid types in the hills: forest and other vegetations on dryland, on waterlogged soils, and on river banks; semi-humid types in the hills, on basalt, on schist, light forest, waterlogged forest, on river banks, and on alluvial plains; montane types on placytique, on granite, on ridges, mossy forest, and in gullies, pine forest, remarks on bryophytes and lichens. Relations of climate and soil with the vegetation.

Evolution of the vegetation: competition, man, and seres. General considerations: fossil record, large families and species numbers, large trees, floristic comparisons with Cambodia, Laos, N. Vietnam and S. China, Thailand, Malesia, India, Africa, America (all sketchy); zonation, relations with soil, vernacular names. Index. Bibliography 183 items incl. taxonomy, also after 1962 but perhaps not complete as e.g. Rollet's Vegetation of Cambodia (*p. 2459*) is missing.

The area studied lies S. of the Kontum Massif, its northernmost tip at 16°, from there SE. to 14° on the coast and SW. to near Saigon, the southernmost edge at nearly 12°. Most of the land is above 200 m; it encloses the mountains of Dalat (to 2405 m). The author estimates that he explored in detail one third of this area of 40,000 sq. km; the total of vascular plants in it is said to be c. 3480 species. He could, however, not identify all the large trees. For the flora, he had to base himself on the shaky Flore Générale de l'Indochine, nevertheless he thinks that his collection of c. 5000 numbers contains some 60 novelties for the area, but nowhere does he cite collectors' numbers, which might yet have been useful in the case of a Quercus near Q. kerrii but with glabrous leaves (p. 62) or of a Lauraceae particularly common (p. 64) - the same as 'Phoebe sp. (?)' (p. 68)? Nor did he mention if and where his specimens have been deposited outside Paris.

Beside the floristic handicap, the vegetation of Indo-China is, of course, a very difficult subject owing to the complex effects of the severe dry season, and its long history of human interference. The author was originally a soil scientist who worked on this subject for a Ph.D. thesis apparently without much expert assistance, and so laboured against almost impossible odds. Yet there is an unnecessary lack of precision. Many plant enumerations are followed by dots .... suggesting that there is more to be said than the author does. There are figures given, but many things are estimated; on p. 65 a medium and high storey are listed but no measurements given. On p. 75, Rollet is quoted as saying that quantitative studies contribute little to an understanding of the essence of the light forests.

Eight 'formations végétales' are distinguished on the 20 by 15 cm black and white vegetation map on p. 139: mountain forest, dense evergreen forest, dense partly deciduous forest, light and pine forests, scrub and bamboo thickets, savanna and second-growth, grasslands, semi-arid formations. What a pity that so much work resulted in such a small map, and that the occasion was missed to update it with the scores of air photographs that have since been made!

Mention must be made of the new term hallier: a woody formation 5-10 m tall with a one-layer closed canopy, evergreen

or deciduous, with underscrub or scattered herbs, and a scarcity of climbers, mostly secondary at low or medium altitude; I gather that it is the brousse as used by Vidal.

The author's remark about the striking parcelling of the vegetation without transition in the Haut-Chhlang region, or the confusing vegetation pattern at Darlac (p. 47), raised hopes that he would give ample attention to human interference, but this is not so. And the effects of the Indo-China war have not even been discussed in an appendix, although the author must have been in an excellent position to make comparisons before and after. But let us end with a funny note: on page 142 Calamintha is spelled as Calamenthe. You are a Frenchman or you are not. — M.J.

SIMMONS,J.B. e.a. (ed.), Conservation of threatened plants, xvi + 336 p., offset, cloth (Plenum Press, 227 West 17th Street, New York, N.Y. 10011, U.S.A. Conference held at Kew, 2-6 September 1975, sponsored by NATO). Price unknown.

To those who believe that botanical gardens can ever make a real contribution to plant conservation, a world of importance opens. We meet an Arctic greenhouse (in Denmark), a helicopter to pick endangered Pritchardia palms from steep slopes in Hawaii for better accommodation and, of course, plenty of recording, documentation, information exchange, wherein seed bankers feel at home. Dr. R.Melville, on p. 182, even extends this world to the tropics, where "some of the area could be landscaped and planted with some of the more spectacular and beautiful native plants while the major part could be set aside as a wilderness garden, not open to the ordinary visitor, where research into conservation could be undertaken." He hoped that these "would be self-supporting and enhanced by introduction of animals which can be controlled carefully in relation to the plants."

It is about the only mention of animals (others, on p. 78, 159, 164, and 210 are equally casual). Yet on this very factor reality depends. In the Bogor Gardens only the Ficus species native in Java set fruit; the others do not, for lack of their very specific pollinating wasp. True, some plant species in a new environment find new pollinators, but even in the simple temperate ecosystems very few species establish themselves in the wild, and the rest vanishes if not properly cared for. Did not the number of species in the Leiden Botanic Gardens, which during Boerhaave's tenure has climbed to nearly 6000, drop to half that amount right upon his retirement in 1730? (Veendorp & Baas Becking's anniversary book of 1938, p. 148).

Hard facts of this sort trouble Mr. R.L.Shaw, who sketches - with hesitation - the awkward problem, on p. 44: at Kew there were 2000 accessions a year between 1961 and 1971, and

yet the total never climbs above the 25,000 taxa there already were in 1934. "There is only one answer. For every additional plant that arrives one is lost or discarded."

Other disquieting news I found in Kew Bulletin 1910. "No less than 14 Botanic Gardens and stations have been founded in the Malay Peninsula, in little more than a century, and of these 11 have been abolished, after a life of four to fourteen years." (p. 157). True, the existing gardens in Peradenyia, Calcutta, Bogor, have done better But they have nowadays another problem: a lack of accessions.

P.H.Raven is the only author who draws the matter in true perspective. In a well-balanced account, his concern is both with the tropics and temperate regions, under consideration of their many differences. As for the tropics, he fears that many species will be lost anyway. For tropical botanical gardens he sees an important function in education, in assisting in the creation of suitable nature reserves, and in helping in the development of ecologically sound methods of land use in which samples of diversity may be preserved (p. 160).

There is an occasional mention of conservation in situ as the most desirable form, by several authors. But the gardens are their main concern, and belief in the benefit of machinery and administration seems ineradicable. So a vision on plants as members of a functioning ecosystem seems altogether to be wanting .... just like in the pre-1900 centuries. This period when botany was almost exclusively a science enclosed by walls, began in 1543, with the foundation of the first living museum, the garden in Pisa. This period lasted till 1889, when the Cibodas nature reserve was established, offering facilities for real outdoor work. Shortly after, the era of ecology began.

Ecology, the study of biological relations, has not much use for a living museum, where only plant structures and individual life processes can be studied. Ecology, the basis of conservation, requires a new type of botanical garden: an ecosystem opened up for study and education, with labelled plants and ample instruction, by word and picture, on how plants live, interact with animals, and maintain themselves as species. To see this, men must come out into nature, not the other way around.

Such thinking, while advocated by Raven, is otherwise scarcely found in the present book. As a whole, it therefore takes an outdated view on the matter, notwithstanding all digressions into sophistication. — M.J.

STAFLEU,F.A. & R.S.COWAN, Taxonomic literature / A selective guide to botanical publications and collections with dates, commentaries and types, 2nd ed. Vol. 1: A-G, xl + 1136 p.

(1976, Bohn Scheltema & Holkema, Box 13079, Utrecht, The Netherlands), price $ 100; IAPT members can have it for $ 80 if they enclose a check with their order.

In coverage and detail, the first edition of 1967 has been greatly extended. Under the letters A-G, there were 465 titles on 188 pages then, vs. 2223 titles on 1027 pages now, and in much finer print. The works in the first edition were generally selected for their bibliographical difficulty; this one aims at all authors who before 1940 published at least three generic names. I presume that because of that year limit Airy Shaw escaped inclusion, although not much is said about families, I admit. Nonetheless, the limits seem generously drawn, witness the Dutch amateur botanists Abeleven and Bondam whom I would not accuse of the criterium. I did not understand at first, why Corner was left out while Bremekamp was in, but Dr. Stafleu told me that a limit was set which ran more or less between their ages. Also, the subsequent volumes have been planned to be a bit more extensive than the present one, which has already elicited many incidental contributions on the part of readers. Cryptogamists and paleobotanists have now also been included, and so have marginal persons of great importance like Buffon, Cook, and Darwin. Emphasis lies on the post-Pritzel, pre-1914 period, when taxonomy was at its culmination. Some authors are cited but not their books, like Burkill and Elmer, or not with all their important books, Copeland's Genera Filicum being absent, or with some non-taxonomic books, like A.DC.'s La Phytographie. For Malesia, some authorships go unrecognized, like H.C.D.de Wit, History of Malaysian Phytography, Fl. Males. i 4, which is simply attributed to Van Steenis, the editor. In general, Malesia seems not the strongest area of coverage, which does not matter, however, in view of the available works; moreover, Stafleu frankly admits his 'limitations, idiosyncrasies and background', as well as a neglect of works in non-Roman alphabets. While some emphasis, according to Stafleu, has been placed on Europe and North America, an item like TL-2: 553, namely Blanco, Fl. Filip. 3rd ed., contains quite a lot of original information (TL-2 is the recommended citation of Taxonomic Literature, 2nd edition). In general, in addition to previously published material here reproduced, Stafleu and his Utrecht-Washington team (who also compiled the Index Nominum Genericorum, of which this is a twin product) have delved up an enormous amount of information.

The structure of the work is similar to that of TL-1, under addition of a suggested abbreviation for each author and each book title; of contributions to composite works; of eponymy, i.e. names of genera (conserved or rejected in case or homonymy) and of periodicals in honour of an author; of

location of a handwriting sample; and of postage stamps commemorating an author. There is, per author, much more information as well. Full titles are given, copied from xeroxes of the original title-pages, ad absurdum in e.g. TL-2: 274 where time, place and circumstances of a Ph.D. session are recorded. Nearly all the facts are terse, dry, and wholly bibliographical: missing parts, new editions, reprints; even an indication that Boerlage's Handleiding (TL-2: 594) is a Dutch elaboration of Bentham & Hooker for Indonesia, dicots only, is missing, nor is it clearly indicated that Merrill Species Blancoanae gives a full interpretation of Blanco's works. Bakhuizen van den Brink's junior authorship of the Flora of Java can only be found under Backer and in the index, not under his own item. But these are the critic's crumbs about what is to be a monumental source book. Five volumes in all have now been projected, with ± 1000 pages each, so that the later ones will be a bit less unwieldy. At the end, a great many additions and corrections will be placed, and a big block of cumulative indexes. For a botanical library, this 2nd edition is indispensable; the private botanist still fruitfully can make do with the 1st edition, which is still available at Dfl. 86 = $ 35. — M.J.

STEARN,W.T., The Australian flower paintings of Ferdinand Bauer. Introduction by Wilfrid Blunt, 30 p. + map + 25 col. pl. with legend and map + 2 p. , 74½ by 46 cm (1976, London, The Basilisk Press, 32A Elizabeth Mews, Hampstead, London NW4 3UE, England), £ 420.

The first paragraph of the Preface reads: "This volume reproduces 25 coloured drawings of Australian plants made in 1801-5 by Ferdinand Lukas Bauer when he was official Botanical Draughtsman on the surveying voyage of His Britannic Majesty's sloop *Investigator* under the command of Captain Matthew Flinders, RN. The originals are in the British Museum (Natural History), London. They depict gracefully and accurately a diversity of plants from Western Australia, New South Wales, Queensland and the Northern Territory which were then new to science; they are superb examples of botanical illustration, the work of one of its greatest masters at the height of his powers. Earlier, Ferdinand Bauer had travelled with John Sibthorp in the Eastern Mediterranean region and had made under his supervision the illustrations for Sibthorp's and Smith's costly *Flora Graeca* but these lack the technical perfection and wealth of analytical floral and carpological detail which distinguish his Australian work done in association with Robert Brown. These later drawings please both eye and intellect by conveying so much information of scientific value in an easthetically enjoyable form. They express graphically what Robert Brown recorded in words and

they undoubtedly owe much to Brown's penetrating insight into plant structure investigated with the aid of the microscope. Brown is probably best known for his pioneer investigation of the Brownian movement of minute particles suspended in a fluid, his recognition of the general occurrence of the nucleus in living cells and his detection of the fundamental distinction between gymnosperms and angiosperms, but he made his first major contribution to botany through his taxonomic work on the plants gathered with Bauer on their expedition to Australia. His remarkably detailed Latin descriptions, like the illustrations made at the same time by Bauer, have for the most part remained unpublished. They provide, however, much information which is still relevant and when extant have been included in the text accompanying each plate."

The Introduction on p. 9-22 by the same author who wrote The Art of Botanical Illustration, wherein chapter 17 deals with the Bauer brothers, gives an account of Captain Flinders (1774-1814) and of the journey with the Investigator outlined on the two-page map. This is followed by 'The contribution of Robert Brown and Ferdinand Bauer to Australian Botany' (p. 23-29) by Dr. Stearn (who also wrote the excellent entry on him in Dict. Sc. Biogr. 2, 1970, 516-522). Stearn here dwells upon the hard to read manuscripts prepared by Brown mostly from the living plants and now surviving in the 'Solander boxes' at the BM, which were microfilmed and indexed by N.T. Burbidge, who listed the type-localities (Proc. Linn. Soc. N.S.W. 80, 1956, 229-233) and also prepared a MS. index.

Bauer made 236 watercolours; J.Britten (J. Bot. 47, 1909, 140-146) listed them and indicated the 55 which by then had been published. Thanks to this list, comparison can be made between the present perfect reproduction and others. Many occur in S.L.Endlicher, Iconographia, in clear outline but not in colour and thereby missing the wonderful exquisiteness of the originals, as can be well seen from e.g. Eustrephus, the 24th plate here, the 13th in Endlicher, the latter in black at first sight clearer and sharper than the former one in colour but actually the coloured one far richer in detail, and the copy is not always exact at that.

The plants are listed under their modern name, viz: plate 1 (there is no page for reference) Cycas* media, 2 Hibbertia* dealbata (Dillen.), 3 Cochlospermum* gillivraei, 4 Alyogyne hakeifolia (Malv.), 5 Abelmoschus* moschatus ssp. tuberosus (Malv.), 6 Flindersia* australis (Rutac.), 7 Callicoma serratifolia (Cunon.), 8 Verticordia brownii (Myrt.), 9 Kunzea baxteri (Myrt.), 10 Eucalyptus* pruinosa (Myrt.), 11 Mackinlaya* macrosciadea (Aral.), 12 Nuytsia floribunda (Loranth.), 13 Muellerina* eucalyptoides (Loranth.), 14 Stylidium* scan-

* Genera thus marked occur in Malesia.

dens, 15 Brunonia australis, 16 Dracophyllum secundum (Epacrid.), 17 Myristica* insipida, 18 Banksia* speciosa (Prot.), 19 Dendrocnide* excelsa (Urtic.), 20 Ottelia* ovalifolia (Hydrochar.), 21 Dendrobium* discolor (Orch.), 22 Cymbidium* suave (Orch.), 23 Diuris* maculata (Orch.), 24 Eustrephus latifolius (Liliac.), 25 Lomandra* hastilis (Xanthorrhoeac.). Under it, the synonymy is given, including later references, and a map with the station(s) where material of the species was collected; the species come from all around Australia. In the actual legend, scholarly and informative as well as entertaining, Brown's manuscript notes are printed, and a varying amount of interesting data, often including a few remarks on the genus and its affinity, circumstances under which the species were found, references to subsequent work, and the etymology of the name, e.g. in the case of Flindersia, where Brown "evidently based it on the extreme distinctness of his new genus, manifesting a combination of features that make its affinities by no means plainly evident". "Selection has been necessarily somewhat arbitrary", is all that Stearn writes on this subject. This may be an understatement. On going over the plates, 52½ by 35½ cm in 10-colour print on creamy paper, each carefully glued on a dark green background we see that on almost any of them not only details have been meticulously pictured (without an explanation but this is hardly necessary), but that a structure has been elaborated that would baffle many a modern artist because it is so extremely laborious by 20th century standards. At the same time the execution is so incredibly refined that it seems to have been copied from nature almost casually. Take the felt on the Myristica fruits or on the seed-bearing sporophyll of Cycas, the sculpture inside the fruit valves of Cochlospermum and the wool on the seeds, the hairs on the Abelmoschus and the veins on the petals, the density of foliage and inflorescences of the Callicoma branch, the innumerable stamens of the Kunzea (also reproduced in Endeavour 19, 1960, 30, but what a difference!), the exuberant inflorescence of the Mackinlaya, the complexity of inflorescence and flower of the Stylidium, and the hundreds of flowers, partly in bud partly open, of the Banksia, with its infructescence so suggestive that I feel the wool on my fingertips when looking, or the whimsicality in shape and colour of the Dendrobium flowers. You can sit for hours on end, pondering the mystery behind the creation of these plants and of the human talent to show them to posterity with such tenderness. There is more in the world than mere progress, and the Bauer brothers achieved an all-time sublimity to which this volume is a worthy tribute. — M.J.

WALKER,E.H., Flora of Okinawa and the southern Ryukyu Islands, ix + 1159 p., 185 fig. + 19 pl. (1976, Smithsonian Institution Press, Washington, D.C. 20560, U.S.A.), printed, bound, price $ 36.75.

Both natives and introductions are dealt with, Pteridophytes and Seed plants, 2080 sp. in 1008 genera in 218 families, 17 of them alien. No novelties seem to have been described. Full treatment is given, with first reference, later references mostly to local authors, some synonyms, some specimens cited, occasional brief notes. The author (assisted by specialists for certain families) is obviously rather an indoor scholar than a field worker: there is no general account of the environment or the vegetation, and ecological observations are very terse. The documentary basis, on the other hand, seems solid (except that for reasons unknown to me the author completely ostracizes the Flora Malesiana): the Introduction gives a brief account of source works (mentioning that Hatusima's Flora of the Ryukyus of 1971 was prepared independently from his, and has not been cited), there is a list of authors abbreviations, and a brief list of collectors, with a few lines for each, and a 'selected bibliography', annotated, of 5 pages.

A strong item is the vernacular names all transcribed in Roman letters, with their derivation; much of the Introduction is devoted to this subject as well.

The work seems very useful; the style is orderly, clear, balanced; the keys start from vegetative characters and are mostly simple and well-contrasted; there is an extensive glossary which also gives the equivalents in Japanese characters.

A rare printing error (Crateva in text, Crataeva under figure) does not diminish the excellence of the execution, although the figures are generally too much reduced. Localities are well-mapped on the end papers. — M.J.

WILLIAMS,J.T., C.H.LAMOUREUX & N.WULIJARNI-SOETJIPTO (ed.), South East Asian plant genetic resources / Symposium at Kopo, Cisarua, Bogor, Indonesia, 20-22 March 1975, sponsors FAO, BIOTROP, LIPI, 272 p. (1975, BIOTROP, Box 17, Bogor, Indonesia), printed, paper cover, $ 16.00.

The 32 papers, many regrettedly small, deal with Tropical fruits, Carbohydrate crops, Grain legumes and vegetables, Estate and plantation crops, Forest products, and General subjects. The address list of 104 participants makes a useful directory. It can be seen that this first attempt, initiated by the LBN-management at Bogor, to deal with a novel subject, had to be a comprehensive one. Some papers are more botanical, others more agricultural; 7 have been selected for summary in the Bibliography, under Anderson, Daniels, Frankel,

Martin, Sastrapradja, Whitmore, Williams, several more have botanical interest as well.

Contrary to some complaints which were circulated afterward, I cannot find that the importance of conservation was under-emphasized, as was the case with the value of taxonomy (see *p. 2734*). Both in-situ and ex-situ conservation are well alive in a variety of texts. Only, I am convinced that all attempts towards ex-situ conservation in the tropics are misguided. Too many species are involved, the hazards are too great. Even simple operations need too much luck to succeed. How many of the c. 250 species of tree seedlings from samples brought to the Bogor gardens in 1971-74 are now actually being tended towards adulthood? Seed banking, too, is risky. In 1973 I was asked to take with me several kilograms of Araucaria seeds from the cold storage in Port Moresby to the cold storage in Bogor. They arrived safely and hopefully, but nothing more was heard, only on enquiry much later: except for a trifling percentage, the whole precious lot had perished, owing to electricity failure. See also the review of Simmons: plenty of opportunity to learn from others' mistakes; one more reason to be glad that in Indonesia the seriousness of the threat to genetic resources was perceived so early, by biologists and civil authorities. The book is well-produced and as a whole contains much of value. — M.J.

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