

Brief Reviews of Island Floras

Plants are the most ubiquitous and obvious features of almost all island landscapes. They are basic to all island science, and any island ecological study necessarily involves a consideration of the flora. Accurate knowledge of the identities and characteristics of the plants that are components of the ecosystems studied would seem to be essential. That this is not always realized or accepted by ecologists is one of the reasons why island ecology is superficial and even inaccurate. The same is, of course, true of the animal components of the ecosystems.

ISLAND NEWS AND COMMENTS

Acceptance of the above at once poses the problem of how to determine the identities of the usually very numerous plant species on the islands studied. Clearly, voucher specimens must be collected and preserved. Identifications are based on these. The usual procedure, then, is to take the specimens to someone who is reputed to know what they are, and ask him to provide names. If there were experts available on the flora of all islands or island groups, part of the problem might be solved, if the experts were not too busy. The fact is that there are many islands for which no florists are available. Even more important is the need of the ecologist, himself, to have a working knowledge of the flora of the island or islands he is working on. This may be acquired, if the ecologist is lucky, by extended working in the field with an expert on the flora. Some useful knowledge may be gained by studying specimens identified by others, especially if these are specimens collected and prepared by the ecologist himself. There is no good substitute for "hands-on" experience with living plants.

Lacking a willing expert, the ecologist usually has to learn to collect and identify the plants, himself. If he has ready access to an adequate herbarium (collection of dried and identified plant specimens) he can do this, if he has some elementary training in taxonomic botany. This latter should clearly be a part of the education of anyone who calls himself an ecologist. A necessity (not always available) is a flora of the island or region under study.

A flora is a book or paper on the plants of a place or area. Floras range from mere lists of the names of the plants, not very useful except to one who has a usable knowledge of plants, to popular picture-books, always attractive and frequently inaccurate as to identities of the plants. Illustrations, if any, are usually informative but not much help in the comparison of a plant with the plants of the region. In descriptive floras of all degrees of detail, with or without keys for

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Office of the Engineer, Headquarters U.S. Army Forces, Far East, Tokyo, Japan. (Unpublished.)

Tamura, T. 1946. On the geology of the Bonin Islands. *Journal of the Geological Survey of Japan* 1(1): 1-5. Translated by Military Geology Branch, U.S. Geological Survey, Office of the Engineer, Headquarters, Army Forces Far East, Tokyo, Japan. (Unpublished.)

Tamura, T. 1951. Progress on the first records of fossils from the Bonin Islands. *Journal of Japanese Geology* 29(4): 125-128. Translated by Tamura, T., 1950, Engineer Intelligence Division, Office of the Engineer, Headquarters U.S. Army Forces, Far East, Tokyo, Japan. (Unpublished.)

Tamura, T. 1957. On the photogeographical maps of the Bonin and Volcano Islands. *Proceedings of the Japanese Geographical Society* 5: 1-4.

Tamura, T. and S. Akami. 1957. *Island News and Comments*. 1, 201 pp. Vol. II, 223 pp. Tokyo, Japan: Hirokawa Shoten.

Woodhouse, E. R. 1959. Observations on the flora of the Ogasawara Islands (Part 2). *Notes from the Botanical Garden of the University of California* 69: 7-12.

Yamamoto, T. 1976. *The Yamanote Islands in the Bonin and Volcano Islands*. Tokyo, Japan: Ministry of Education and Arts, Cultural Affairs.

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Even to list the available island floras would be a major task. Two comprehensive lists of floras of the world, including islands do exist, those by Blake and Atwood and by Frodin, which are indispensable. To extract a list of island floras from these would be a worthwhile project.

For Atoll Research Bulletin readers, brief reviews and comments on recent or current island floras may be of use or interest. The following list are examples. One may mention, here, the fact that any flora starts to become out of date, or obsolete, at the time it is published. New discoveries, often stimulated by the new flora, itself, and taxonomic and nomenclatural changes very soon make a new edition or whole new flora desirable. However, few floras ever become useless. All have information pertinent to the place and time which may never be completely available elsewhere. Also, since floras are normally arranged systematically and indexed, such information remains retrievable.

FLORA VITIENSIS NOVA, by A. C. Smith, Pacific Tropical Botanical Garden, publisher. Four volumes published, 1: 1979; 2: 1981; 3: 1985; 4: 1988; two more in preparation.

This is a magnificent and important work, over 50 years in preparation, by one of the outstanding systematic botanists of this century. This is a descriptive flora (descriptive only to generic level), with comprehensive and very useful keys. It is unusual in that major attention is given to typification, especially at generic and specific levels. The arrangement of families is in most respects according to the Takhtajan (and Cronquist) scheme, discussed in the introduction. The introduction also includes an extremely useful discussion of taxonomic philosophy, methodology, editorial practice, nomenclature, and a valuable concise treatment of Fijian geography, geological background and phytogeography, and a history of botanical exploration in Fiji, with information on collections made. A beautiful series of color and black and white photos illustrates the landscape, interesting botanical features, and vegetation of the islands. The first three volumes of this work have been reviewed elsewhere. The fourth volume, comprising many gamopetalous families, has recently appeared. It fully continues the meticulous tradition of the preceding volumes. The author was assisted by S. P. Darwin in treating the large family Rubiaceae. One could scarcely imagine a better collaboration on this difficult family, though the rather narrow splitting of genera in some cases might be questioned.

The two remaining volumes are eagerly awaited by all persons seriously interested in Pacific botany. One could only wish that a worker as able and dedicated as A. C. Smith were available for each of the other major Pacific island groups.

FLORA OF THE CAYMAN ISLANDS, by George R. Proctor, 1984. Kew Bulletin Additional Series XI, 834 pp., 256 figures, available from H. M. Stationery Office Government Bookshops.

The main function of a "manual" type of flora, quick and accurate identification of the plants of a given area is admirably accomplished with Dick Proctor's book, which has now been available for four years. The area covered, the Cayman

Islands, northwest of Jamaica and south of middle Cuba, in the Caribbean, not familiar to many before but now, as almost everywhere in the island world, attracting more and more tourists, has long needed a flora, more than ever now. There are three of these islands, Grand Cayman, Little Cayman, and Cayman Brac, roughly aligned west to east. They are of elevated limestone, total land area about 102 square miles, relatively low and flat, Cayman Brac being the most rugged and reaching an altitude of 43 m. On Grand Cayman "The Mountain" is somewhat over 6 or 8 m. The core limestone is hard, massive, white of mid-Tertiary age, and much more recent reef limestones surround this central core. The surfaces are much eroded, providing a variety of habitats.

An extensive chapter on Environment and Plant Communities, well illustrated by profile diagrams and photographs, by M. A. Brunt is a valuable feature of the book. It describes and discusses the vegetation, bringing out the fact that practically no undisturbed dryland vegetation remains, and that human activity has reduced most of the former forest or woodland to thicket (scrub).

Phytogeographically the flora is related mainly to that of Jamaica, somewhat also to Cuba and the other Greater Antilles, with minor elements southwestward and to the widespread pantropical flora.

Taxonomically the approach is commendably conservative, not indulging in the all-too-common excessive family and genus splitting that has been rather common in the region. 601 indigenous and naturalized species are recorded, belonging to 389 genera, arranged in 121 families. Cultivated plants are not treated, though occasionally they are mentioned. Families, genera, species, and varieties are described and keyed with keys that work.

Synonymy is kept to a bare minimum, too much so for botanical tastes, but unconfusing for the novice who may not understand how a plant can have several names. Specimens are cited by island, collector and number. A brief statement of distribution and habitat is given for each species. Vernacular names are usually provided. Practically every genus is illustrated by a clear, well-executed line drawing. Errors seem almost lacking.

All in all, this is a very useful and satisfactory book. Dick Proctor is to be congratulated.

FLORA OF THE BAHAMA ARCHIPELAGO, by Donovan S. Correll and Helen B. Correll. 1982. 1692 pp., 715 figs. J. Cramer, Vaduz.

This massive book, the culminating achievement in the outstanding career of Don Correll and his wife, Helen, is one of the best manual-type floras ever written. It covers the vascular plants of an enormous insular area, the Bahamas, comprising 35 principal islands, 700 cays, and about 2400 vegetated rocks, a total land area of about 14,500 sq. km, scattered in a sea area 1000 km long and 480 km greatest width. The islands are low, maximum 65 m elevation, entirely of limestone, lithified or loose sediments, with diverse micro-topography.

The flora comprises 1350 species, 21 infraspecific units, belonging to 660 genera, arranged in 144 families. The family arrangement is traditional, Engler and Prantl,

with genera and species alphabetical within the families. Practically every genus is illustrated by an excellent line drawing, mostly by Ms. Pricilla Fawcett. The keys are concise, bracket-style, and eminently workable. Every entity, at all levels, is described. Brief statements of habitat and distribution are provided. A table of distribution by 11 island areas for which herbarium specimens were seen, summarizes the geography of each species. It was obviously impractical to cite specimens without producing a multivolume work, though such specimens exist to thoroughly document the work, and the principal herbaria containing them are listed. Synonymy is limited to that pertinent to the Bahamas. Taxonomy is reasonably conservative, with comments about problematical cases.

In the preface are outlined and discussed the history of Bahama botany, the circumstances of the production of this work, and extensive acknowledgements.

This book is one of the rare instances in my experience where no criticism is appropriate. It will long be a model of how floristic manuals should be written. Our great appreciation is offered to the authors (senior author now deceased).

PLANT LIFE OF THE GREAT BARRIER REEF AND ADJACENT SHORES, by A. B. Cribb & J. W. Cribb. 1985. 294 pp. illus. Univ. Qld. Press, St. Lucia, London, N. Y.

This is a timely, well-prepared, beautifully illustrated popular book covering the more obvious plants of Australia's immense Great Barrier Reef. It is only claimed to be a popular book, but the beautiful and well-chosen color photos, and the limited but informative text, written by competent botanists convey much information of use to botanists, marine biologists and ecologists.

The book comprises six chapters, glossary, references, and index of plant names. For each plant are given family name, scientific binomial, vernacular name, description, interesting remarks on occurrence and uses, and a color photo. The first chapter is a description and explanation of the Coral Reef, setting the stage, setting, and functions of the plants. Then follow chapters on Seaweeds, the Islands, Plants of the Shore, Flowering Plants in the Sea, and Flotsam. The plants that a visitor - scientist, tourist, or scuba-diver - is likely to see are all or mostly there. One may not always agree with the names given, but most of the differences are matters of opinion. The chapter on flotsam interesting fruits, seeds, and other beachcombers' treasures of plant origin is an interesting and useful innovation in such books. Certainly this book is indispensable for anyone planning even a casual visit to Queensland's Great Barrier Reef.

A REVISED HANDBOOK TO THE FLORA OF CEYLON, Dassanayake, M. D. and F. R. Fosberg, eds., 1980 - . 6 vols. continuing, Amerind Pub. Co., New Delhi.

The flora of Ceylon has a special significance as one of the two tropical floras available to Linnaeus, and furnishing the types of a substantial number of the widespread tropical plants named by him. The specimens on which his *Flora Zeylanica* were based, collected by Paul Hermann, Dutch botanist, in the 17th Century, are good, for the period when they were collected, but leave something to be desired by modern standards.

In the late 19th Century, Henry Trimen, with help from Joseph Hooker, provided the island of Ceylon with a five volume flora, *A Handbook to the Flora of Ceylon*, that for its time, was one of the outstanding floras of any tropical area. It was written before many modern taxonomic ideas, and particularly the type method in nomenclature, were in vogue. Furthermore, by the late 1960's, it was completely unavailable. It was time for a major revision to replace this not very available handbook.

A major cooperative project, to augment the collections of Ceylon plants and to produce a new flora, was undertaken by the Smithsonian Institution, at the suggestion of, and under the direction of F. R. Fosberg.

Authorities on the different plant families in the flora were invited to participate, and were enabled to spend several months or more, collecting and studying the plants in the field, with the aim of providing treatments of their groups for the new flora. Field explorations were continued under this arrangement, using U.S. excess foreign currency funds, provided under Public Law 480 to cover the costs. The work of the invited botanical participants was voluntary on their part and, except for their travel and field expenses, funded by their own institutions. Publication is taking place, funded by the Smithsonian Excess Foreign Currency Program.

Six volumes have appeared to date, printed in India, with most of the editorial work by Professor Dassanayake, of the University of Peradeniya. Several more volumes are in press or preparation.

The arrangement of the families is in the order in which manuscripts are received from their authors and can be edited. The intended volume on the grass family, by several authors, is all in hand and was being coordinated and edited by the late Dr. T. R. Soderstrom. It was unfinished at his death, and the editing is being completed by Prof. Neil Harriman.

The treatments of the families are descriptive, with keys, discussion, and citation of specimens. They vary somewhat, as no rigid editorial control was imposed. Hence, they reflect their authors' ideas and standards, rather than those of the editors. They provide a firm basis for continued work on the plants of the wonderful island, or mini-continent of Ceylon (now officially called Sri Lanka).

The books may be procured, while the supply lasts, from the Botany Department of the Smithsonian Institution.

FLORA MALESIANA, van Steenis, C.G.J., ed. 1950-continuing, 11 vols. to date, Ryksheerbarium, Leiden; pub. Nijhoff, Dordrecht, Netherlands.

This is a flora in the most comprehensive sense, with descriptions, synonymy, keys, morphological and ecological discussion, bibliography, and usually an illustration for each genus. The scope is Malesia - the hundreds of islands that comprise Indonesia, Malaysia, Philippines, New Guinea, Bismarck Archipelago and the Solomon Islands. Series I covers the seed plants, Spermatophyta, Series II, the vascular spore-bearing plants, Pteridophyta. Volume I of series I is an incomparable Cyclopaedia of Collectors, brief accounts of all of the hundreds

of people who have collected specimens and information on Malesian plants. This was done by Mrs. M. J. van Steenis-Kruseman, wife of the editor. The greater part of this compilation was done under World War II imprisonment, at the library of the Bogor herbarium. The other 10 volumes have been prepared by the Flora Malesiana staff and many experts recruited from and with the cooperation of botanical institutions in many parts of the world. It is a truly international enterprise, though centered in the Netherlands. Though its declared scope is the flora of Malesia, it is an indispensable asset for anyone working on the plants of anywhere in the Indo-Pacific region. It is hoped that support and cooperation will continue and bring about completion of this enormous enterprise. It is and will always be a monument to the imagination and tireless energy of the late Professor van Steenis.

Some Plants of Kiribati, an Illustrated List, R. Overy, Ivan Polunin and W. G. Wimblett, 146 color photos, Tarawa, Kiribati.

The Gilbert Islands, known to western geography for well over 150 years, and now principal component of the new Republic of Kiribati, do not have a descriptive flora, nor even until very recently (ARB 295, 1987) a complete list of the plants growing in the archipelago. To fill this vacuum the Kiribati National Library and Archives has sponsored a document entitled "Some Plants of Kiribati, an Illustrated List" containing 146 color photos, as well as Gilbertese names and uses, of Plants found in the Gilberts. This book, under the authorship of R. Overy, Ivan Polunin and W. G. Wimblett (herein abbreviated O.P.W.), was issued in a very limited edition (30 copies), in Tarawa, 1982.

A copy was supplied to us for comment and to have the botanical names checked for accuracy, and a request was made for any necessary corrections. Each species included is illustrated by a color photo, but there are no citations of specimens, though some were said to have been sent by the authors to Fiji for verification of identifications. Examination of the photos shows a distressing proportion of incorrect names. The book only treats less than 150 out of a list, probably not quite complete, of 260 species and varieties, 95 of them probably indigenous. We do not agree with the statement on p. III that there are probably no truly native species on these atolls. We estimate that there may be between 75 and 100.

To provide an interim list with correct names, so far as can be determined from specimens available and reliable published records, we have made a compilation, published as ARB No. 295.

The principal herbarium collections that we have seen are those made by Catala, Moul, Sachet, Herbst and Allerton, Madson, and Raulerson. We have also examined various older specimens that we have encountered in various herbaria.

Flora of the Galapagos Islands, by I. W. Wiggins and D. M. Porter (1971), Stanford Univ. Press, 998 pp., \$37.50.

An excellent example of manual type flora, this is indispensable for anyone dealing with the plants of this famous archipelago. Families, genera, species and

lesser taxa are described very adequately and listed with pertinent synonymy and references. Distribution maps and drawings are provided for most genera, with remarks on their distribution and ecology. An introduction covers, adequately but briefly, the geography, history, climate, geology, soil and vegetation zones, fauna history of botanical collections, scope and method of work and materials examined. A beautifully reproduced set of 96 color photos of landscape, birds, vegetation and individual plants add greatly and aids visualization of this strange environment. The keys are workable, and with the drawings, make identification of almost any plant in these islands easy and reliable. The authors had the cooperation of a number of excellent specialists in different difficult plant groups.

VOLCANOES AND ISLANDS: BRIEF REVIEWS

The awesome subject of volcanoes has interested and impressed a wide range of people since the days of the destruction of Pompeii and Herculaneum by Vesuvius, and undoubtedly for a long time before that. In the last few years there have appeared a number of books on volcanoes, widely differing in nature, style of writing and aimed at different audiences. Considered together they give a good picture of volcanic phenomena, though it would take many books to give an adequate geographic coverage. And there is no questioning the fact that most of the books will tell the person who has had first-hand experience with volcanoes in eruption much more than one who has not seen volcanoes or only dead or dormant ones. Fascination with volcanoes is easy to develop, especially once one has seen one in action. That it may be a fatal fascination is occasionally demonstrated, as at Mt. Helens a few years ago, or at Myojin Reef some years back when a boatload of Japanese volcanologists got too close and were never seen again.

What makes the study of volcanoes particularly interesting and appropriate for those, especially scientists, who are concerned with islands, is that so many islands, especially almost all "oceanic islands", are volcanoes, and owe their origin and special features to volcanic activity and processes.

Volcanoes, active, dormant, and long dead, are well-distributed over the earth's surface, active ones being especially common in the "ring-of-fire" around the periphery of the Pacific Ocean, where the continental "tectonic plates" impinge on the margins of the "Pacific Plate" and several lesser oceanic plates. Volcanism takes place along mid-oceanic ridges, where the earth's crust is pulling apart, and on plate edges where "subduction" and "overthrusting" create enormous pressures and heat, and pieces of crust are forced down into the molten or semi-molten mantle layer. Here they are melted and become masses and reservoirs of "magma" or molten rock. These, under the pressures created, both by tectonic movements and by volatilization of some rock-components and melting of others, spew forth through cracks and weak places in the crust, to form "montes ignivomes" or fire-vomiting mountains, commonly called volcanoes. Under the plates, away from their margins, are also occasional "hot-spots" where the temperatures are such as to melt the crust, and magma is forced up through cracks and conduits and pours forth as lava. Of this are mountains and islands made. One such "hot-spot" is considered responsible for the Hawaiian Island Chain, continued northward as the Emperor Sea-mount Chain.

The following series of notices or brief review will call attention to vivid accounts, descriptions, and vast amounts of information about these tremendous phenomena recent and contemporary episodes in the building of the earth and the creation of oceanic islands. That most of the books reviewed are popular, but still accurate and very informative, speaks well for the writing abilities of the members of the volcanologic profession, and for the state of knowledge about volcanic phenomena. Scientific books do not have to be dull, or written in jargon.

My selection of books for review is simply determined by their availability to me and limitation of time to search them out and read them. There may well be other, perhaps as good or even better, books that have not come to my attention. Those reviewed all appear to me to be interesting to one to whom the formation and history of islands is important.

Krakatau 1883--The volcanic eruption and its effects, by Tom Simkin and Richard S. Fiske, 464 pages, Smithsonian Institution Press, 1983. Washington, D.C. /Cloth \$29.00; paper \$15.00.

This book, published on the 100th anniversary of the second most famous volcanic eruption in history, can only be described as a tour-de-force, bringing together, organizing, and interpreting everything recorded and otherwise available about this world-shaking event. Though not the greatest eruption in historic times, but next to that of Vesuvius in 79 A.D., Krakatau is probably the most written about. To bring together such a mass of recorded information was a notable accomplishment. The result is perhaps the most comprehensive account of a "classic geophysical event" available -- 88 eyewitness descriptions, all official records, accounts of the destruction by ash-falls, earthquakes, tsunamis and nuees ardentes, as well as miscellaneous information on such phenomena as pumice-rafts, noise heard thousands of km away, world-wide observations of vivid sunsets, etc. provide the primary information.

All of the interpretive accounts by later writers, including the first English translation of Verbeek's major monograph of the eruption, written in 1885, and all available information on post-eruption changes and recolonization, revegetation, and subsequent eruptive activity are set forth in detail. This makes an overwhelming mass of information, more than most minds can grasp and assimilate. The authors, however, sift and integrate this and weave a most convincing and understandable interpretive account. The volume is a basic for the science of volcanology, and for the study of the original colonization of plants and animals of new volcanic islands.

Volcanoes in the Sea, the Geology of Hawaii, ed. 2, by Gordon A. Macdonald, Agatin T. Abbott, and Frank I. Peterson, 1983, 517 pages, a revised and augmented version of the notable book of the same title published in 1970 by the first two authors, both published by the University of Hawaii Press, Honolulu. Price of second edition \$29.95.

Fortunate is the ecologist who has available for the region in which he works an understandable, comprehensive account of its geology and physiography. This serves as a physical framework and historical background for the biological phenomena he is investigating. Such an account, in a highly readable and

magnificently illustrated form, has been available for the Hawaiian Islands since 1970, in the first edition of the work here reviewed. Work on the ecology and geography of the state of Hawaii has benefitted enormously from it during the 14 years between the two editions.

This second edition, revised and reorganized, and with much of the new understanding of the dynamics of the earth accomplished in the last decade incorporated, by Frank Peterson, serves the above described function even better than its predecessor. In addition to being an enormously successful textbook for the amateur volcanologist, such as this reviewer, with the addition of the new chapter on "Plate Tectonics and the Origin of the Hawaiian Islands", it becomes a means for the amateur geographer, also such as this reviewer, to understand the new concepts of the behavior of our planet as a whole. Phenomena of many sorts, observed but poorly understood earlier, now fall into place in a wellfounded theoretical framework, extremely useful in many related sciences, but also providing the deep intellectual satisfaction of an understanding of the system of which we are a part.

The Volcano Letter /1925-1955/, R. S. Fiske, T. Simkin and E. A. Melsen, eds., 1987, Smithsonian Inst. Press, 530 issues, plus index.

The Volcano Letter, a serial leaflet issued over a period of 30 years, by the Hawaiian Volcano Observatory, Kilauea Volcano, Hawaii is a veritable mine of information on volcanoes, volcanism, and related topics, but one which until the appearance of the present volume, was difficult to consult. A publication of from 1 to 4 sheets at a time, even of interesting material such as in this one, is likely to be discarded, sooner or later, rather than being kept. Librarians regard them as a nuisance - they are accustomed to handling books and substantial bound journals, rather than single or folded sheets. Full sets are rare, indeed. Hence, the appearance of the complete 530 issues, bound in a large handsome volume, is an important event in the history of volcanology, both professional and amateur.

Its founder, the renowned volcanologist T. A. Jaggar, also founder and longtime director of the Hawaiian Volcano Observatory, situated on the rim of Kilauea Volcano, undertook both to educate and interest the public on volcanoes and volcanism, and to keep a detailed published record of every manifestation of activity by Kilauea, one of the most closely observed volcanoes on earth. Jaggar and his successors over the years brought together an enormous amount of information, world-wide in scope, much of it either not recorded elsewhere, or only in ephemeral news items or personal notes. Browsing through these leaflets, one with any interest in what goes on in the earth and the origin of certain widespread landscape types, finds it hard to stop turning the pages and continuing reading.

The editors, the Mineral Sciences Department of the U.S. National Museum of Natural History, the Smithsonian Institution Press, and the Atherton Seidell Fund are to be thanked and congratulated for making this great source of information readily available. No natural science library of any consequence will want to be without it.

Planet Earth - Volcano, T. A. Lewis and staff, eds., 1982, Time-Life Books, Alexandria, Va., 176 pages, profusely illustrated.

While most popular books on volcanoes concentrate on the relatively tame, easily observed shield volcanoes, this one starts with a detailed account of one of the most fiercely explosive of volcanoes, Mont Pelee, on Martinique, Lesser Antilles. This mountain, in 1902, destroyed a city and killed its 30,000 inhabitants in a few minutes time. This fascinating and terrible narrative goes on to bring in the origin, in central France, of early volcanology, accounts of the persons involved, the development of modern volcanology, description and diagrammatic representation of how the internal mechanism of volcanoes functions. The book is a fascinating volcanic history of the earth, from the destruction of Pompeii, with accounts of the great eruptions and the different kinds of volcanoes and eruptions, the developing methods of studying them, and ending with the dramatic story of Mount St. Helens, in the western Washington Cascade Range.

This is a small book, but I could not suggest a more comprehensive and still vivid portrayal of this aspect of the world's most dynamic complex of processes.

Volcanoes, Earth's Awakening, by Katia and Maurice Krafft, 1980, Hammond, Maplewood, N. J., 160 pages of text, figures and color plates.

This is a popular book, the main feature of which is an abundance of some of the most spectacular and beautiful photos of volcanic phenomena ever made. A very informative introduction explains the history of volcanology, its main ideas and principles, with maps on mercator projection showing the outlines and directions of movement of the earth's tectonic plates and accompanying phenomena, and of the distribution of active volcanoes.

The rest of the text is principally a very informative explanation of, and captions for, the extraordinary collection of photos. This text is marred for some of us by almost disgustingly extravagant language. Many of the photos and much of the discussion are of insular volcanoes, e.g. Stromboli, Piton de la Fournaise, Aleutians, Katmai, and the Icelandic ones. Any amateur volcanologist would be interested and informed by perusing this book.

Volcano, by Maurice and Katia Krafft. 1975, published by Harry N. Abrams, N.Y., 174 pages, 55 color plates, 5 powerful engravings, and 14 diagrams, 8 tables.

This, though still a popular book, is an entirely different sort of book from the one by the same authors noted above. It is essentially a primer of volcanology, with a strange introduction by Eugene Ionesco, a series of poems on the volcano theme, by Max Gerard, 5 engravings designed to convey the essence of volcanism, by several artists, and are markable series of color photos, mostly by the authors and their associates. A series of tables by M. Krafft give some statistics on the performance of volcanoes throughout the world. At least one of these tables, the 7th of 8 unnumbered tables, page 166, giving a comparison of the energy produced by a number of volcanoes, expressed in terms of number of hydrogen bombs. Since hydrogen bombs are not at all uniform in size or yield, this table is essentially meaningless and should not be taken seriously.

The text is calculated to give those with no geological background the information necessary for an elementary understanding of the structure and dynamics of the planet we live on, and the mechanics and significance of volcanoes in this context. This discussion is graphically illustrated by 14 bold diagrams which reinforce the ideas outlined in the text.

This has not much to offer to the person with an up-to-date background in geology and geophysics, but the color plates are some of the best we have ever seen, and far more varied than those in most books about volcanoes. It is also a sumptuously produced book. The poems will be rewarding to those who appreciate blank verse. The engravings convey the essence of volcanic art.

The Volcanic History of Taranaki, by V. E. Neall, 1974, 17 pages, published by Egmont National Park Board, New Plymouth, N.Z.

This attractive booklet, was written to help visitors to Mount Egmont understand and appreciate what they are seeing. Taranaki District of New Zealand, forms a rounded peninsula extending into the sea on North Island's west coast. Its principal features are four volcanic centers, on a line extending from New Plymouth, southward, the oldest being Sugar Loaves and Paritutu dome at New Plymouth, active 1,750,000 years ago. Next is Kaitake, active, 575,000 years ago, then Pouakai, active 240,000 years ago, and Egmont, active from 70,000 years ago until 100 years ago, since when it has been dormant. The booklet describes and interprets the series of events marking the formation, development and decline of the first three volcanoes, and the building of majestic Mt. Egmont, the dominating feature of Taranaki District (the author neglected to give its summit elevation). A useful feature of the book is explanation of volcanic terms in language an average tourist can understand. The explanation follows events in chronological order over almost the last 2 million years. The booklet is well illustrated with excellent black and white photos. It is a tiny booklet, but fills a need.

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The Belize Barrier Reef Ecosystem: An assessment of its Resources, Status and Management. by J. S. Perkins, 1983. 1-141, A1-A41, New York Zoological Society.

It is almost a truism that an important scientific investigation or program should have, in addition to the traditional data-gathering and analytical phases, a synthetic phase in which the facts brought out in the analysis are put together, related, and their over-all significance developed. Though this seems obvious, it is not even attempted in many investigations, and when undertaken, it frequently proves to be a refractory and frustrating enterprise in spite of modern computers and modelling. Not all minds are equally adept or versed in both of these major aspects of the scientific process. Sometimes a different person must undertake the desired synthesis.

The work under consideration shows that the synthesis need not be elaborated by the person or persons conducting the investigation, but can be brought together

by a perceptive person from works of one or more others. It is an example of an eminently successful synthesis of a mass of information, much of it from a number of reports of investigations of the Belize Cays--atolls and barrier reef islets. These are mostly by David Stoddart and colleagues (ARB nos. 87, 95, 104, 131, 256, 257, 258, 259) and in the volume recently published on the reef-system around Carrie Bow Cay by the Smithsonian (Rützler and Macintyre eds. 1982)

The report considered here is well organized. In order to be understandable to non-ecologists it is written in clear, jargon-free English. It has a geographical introduction describing the country and especially the remarkable barrier reef and sand-cay system. Much attention is given to its scenic and biological resources and their interactions and functioning as a living ecosystem.

The history of man's influence on the Barrier Reef islets, starting with Maya occupation, is documented by reports of many archaeological sites and historical and archaeological accounts of aboriginal and European colonial occupation. After presenting the nature and history of this complex, man's present relation to it is described. Economic data are presented, the degree to which the natural resources have been and are being exploited, especially the fisheries, is explained. The growing importance of tourism is emphasized and the potential loss of much of the benefit of this if the biological resources of the reefs are over exploited.

Short descriptions of each class of resources are given, with information on governmental input and control, if any, of utilization. Relation of industrial activities to natural and scenic resources is discussed at some length. Research and education in these contexts are considered. Related governmental structure and legislation are outlined, and their effectiveness or lack of it, pointed out. The economy and its relation to conservation, as well as social structure, attitudes and customs are related to all of the preceding considerations.

A series of appendices bring together the factual data concerning the resources available.

Woven into the total paper are recommendations on how the resource system may be managed on a sustained basis. One may only hope that the authorities of the new nation, who seem to want the best for the citizens, will pay attention to the author's recommendations.

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Holocene Reefs of Bermuda by Alan Logan, 1988 Sedimenta XI. University of Miami, Miami Beach, Florida 33139. \$7.00. 62p.

This guidebook on the reefs of Bermuda is the latest addition in the SEDIMENTA series published by the Fisher Island Station's Comparative Sedimentology Laboratory. It is an excellent addition to the set of guidebooks published during the Third International Coral Reef Symposium on the reefs of Barbados, Belize, Grand Cayman, Jamaica, Panama and St. Croix -- which are still available from the University of Miami.

Although the Bermuda reefs contain depauperate coral and gorgonian fauna, they form a diversity of reef structures that have attracted the attention of a wide variety of marine scientists. This guidebook introduces you to the major reef types, their dominant biological and geological characteristics and a comparison with other western Atlantic coral reefs. Other topics covered include, cryptic communities, the aggressive interaction between coral species, coral diseases, coral growth rates, bioerosion, diagenesis and sedimentary characteristics. None of their sections are extensive in their coverage of the topic but they do provide the reader with an excellent introduction to the literature on reef studies in Bermuda with well-conceived illustrations and high quality reproductions.

Finally, there is an outstanding appendix that provides the visitor with a choice of three well documented field trips of the various Bermudian reef types. There is also a systematic list of stony corals and hydrocorals backed up with a set of excellent illustrations of the colonies and close-up photographs of corallite patterns.

This is a nicely prepared guidebook and an absolute must for both scientists and non-scientists who need an introduction to the reefs of Bermuda.

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The Natural History of Enewetak Atoll, Volume I, The Ecosystem:Environments, Biotas, and Processes, DOE/EV/00703-T1-Vol. 1(DE87006110) 228p., and Volume II, Biogeography and Systematics,DOE/EV/00703-T1-Vol. 2 (DE87006111) 348p., 1987, D. M. Devaney, E. S.Reese, B. L. Burch, and P. Helfrich (Eds.), U.S. Department of Energy,Office of Scientific and Technical Information, Oak Ridge, Tennessee.

Ernst Reese is to be congratulated for his dedication and perseverance in ensuring the publication of these unique volumes on the natural history of a Pacific atoll. Although other atolls of the world have been the focus of extensive research, in particular the Aldabra and Mururoa Atolls, these Enewetak volumes represent the first time that a synthesis of the research from one atoll has been brought together in a single comprehensive publication.

"The Natural History of Enewetak Atoll" represents an overview of the research activities of over 1000 individuals, mostly marine biologists, who worked at, what is

now known as the Mid-Pacific Marine Laboratory--some old-timers will fondly remember it as the Eniwetok Marine Biological Laboratory. Volume I consists of a series of review chapters on a wide variety of basic topics including history, geology, oceanography, and most extensively marine biology--containing excellent chapters of the subtidal and intertidal ecology, reef processes and trophic studies. Other chapters focus on the terrestrial ecology, meteorology, biology of rodents and avifauna. These well illustrated articles provide the reader with an outstanding introduction to the natural history of Enewetak and reminds us of some of the major contributions to the understanding of reef ecosystems that were accomplished at this site.

The first volume also provides us with the setting for the detailed taxonomic reports that comprise Volume II. The majority of the 31 chapters in this volume are basically species checklists of predominantly marine invertebrates along with fish, algae and fungi. The terrestrial groups covered include plants, insects, reptiles, birds and mammals. The chapters in this volume vary widely in detail--from simple lists of species to well-illustrated compilations of species with comments on their biogeography and working keys to identify the species. In particular, the non-specialist will appreciate the chapters on sea anemones, brachiopods, bryozoans, molluscs, holothurians and fishes.

These natural history volumes of Enewetak have set a standard for others to follow in terms of assembling a comprehensive documentation of the research activities of an atoll ecosystem. Such investigations are carried out by specialists in many disciplines who published in an ever-increasing variety of journals. Reese and his colleagues have provided an exceptional reference publication which will not only assist those who will visit Enewetak in the future, but also all of us who work on coral reefs and their associated islands.

As a U.S. Government publication, these volumes are available to U.S. residents for \$61.90 from Dr. E. S. Reese, University of Hawaii at Manoa, Department of Zoology, Edmondson Hall, 2538 The Mall, Honolulu, Hawaii 96822. All others are faced with a cost of \$123.80 US and should address their requests to NTIS Energy Distribution Center, P.O. Box 1300, Oak Ridge, TN 37831. For further inquiries please contact Ernst Reese.

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Korallenriffe, Ihre Verbreitung, Tierwelt und Ökologie [Coral Reefs, their Distribution, Animal World and Ecology], by Helmut Schuhmacher. BLV Verlagsgesellschaft München, Bern, Wien (1976). With 205 Photographs (127 in color) and 28 drawings.

This attractive little book is a comprehensive, generously illustrated summary of what is interesting to know about coral reefs. The author is a young but experienced field researcher who not only knows the relevant literature but can also add personal observation and interpretation to his subject. No specialized knowledge (except some basic German reading ability) is necessary to follow the clear and concise text. Definitions, glossaries (including English terms), summaries and ample illustration make the book easy to use and keep the interest alive.

The introduction reminds the reader of the fascination he has always felt when reading or hearing about coral reefs. The subsequent chapters define reefs, indicate where they occur and show what they look like. The reef provinces of the Indo-Pacific and Atlantic regions are described separately and then compared in terms of reef abundance and diversity of corals and associated animals. Main reef types and their occurrence, structure and zonation are discussed. Then the book focuses from reef-building (limestone secreting) organisms, in general, to hermatypic coelenterates and stony corals, in particular, highlighting morphological and anatomical features, processes of reproduction, symbiosis' nutrition and calcification, and ecological requirements. A chapter on coral predators, eroders and competitors leads to discussion of reef origin, formation, growth and dynamics and culminates in the historical dispute over the origin of atolls and coral isles. Finally, the author explores environmental conditions and diversity and associations of organisms in the various reef zones and habitats, and behavioral patterns that develop in the reef community.

Emphasis of this book is on Indo-Pacific reefs because of their quantitative importance and the author's experience in the Red Sea. Important works on structure, zonation and communities of Atlantic reefs are unfortunately neglected, thus making the volume less useful for readers heading for this part of the under-sea world. There are no literature citations in the text. A section on suggested further reading in the back of the book contains several poor choices and omits many important references. Highly specialized monographs and articles should also be arranged separately from college textbooks and popular accounts. A certain scantiness of text on reef associated organisms is off-set by the wealth of well chosen illustrations, particularly the top quality color photographs. The drawings are neat and could have been increased in number to replace some of the poorer black and white photographs. All figure captions are informative, include common as well as scientific names of organisms and reflect the scientific competence of the author.

As a whole Schuhmacher's *Korallenriffe* is superior to anything in its genre, and translation into English, at least, can be recommended with confidence. It is a handy vademecum for the sport diver and nature lover, as well as a stimulant and refresher for the student and naturalist.

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LES ASCIDIENNES DE POLYNESIE FRANCAISE. THE ASCIDIANS OF FRENCH POLYNESIA. C. Monniot and F. Monniot. Memoirs du Muséum National D'Histoire Naturelle-Zoologie. Tome 136 (Volume 136). 200 FF

This is the first taxonomic paper published on ascidians from this area and it is quite understandable that the dynamic husband and wife team of Claude and Françoise Monniot, who have collected and studied ascidians from most areas of the world, would be the first to study ascidians from Polynesia. This work is in French with English and French summaries.

The majority of the specimens were collected from the islands of Tahiti, Moorea and Tikehau, plus a few from Tupai, Mataiva, Rangiroa and Hao. Following an introduction of the growth relationships of ascidians in that particular area, a description is given of the three islands that served as major collecting sites (Moorea, Tahiti and Tikehau); the collecting depths, temperatures, and associated animals are discussed, followed by a brief discussion on techniques used. Next, the authors give a very detailed diagnosis of the 92 species of ascidians that were found in Polynesia, 39 of which are new. Twenty-seven of the new species belong to the family Didemnidae. Each new species is illustrated showing abdomen, gonad and thorax. There are scanning electron microscope plates of spicules and illustrations of parts of colonies of the new species of Didemnidae and others provided in the back of the text. There was one S.E.M. plate that I would like to have seen included, that of *Didemnum digestum* Sluiter, 1909. The Monniots compared the spicules of a new species, *Didemnum uturoa* to the spicules of *Didemnum digestum*. The authors provided a plate of the new species and it would have been helpful to have an S.E.M. spicule plate of the previously described species adjacent to the plates of the new species for comparison, even though the comparison is made in the text. The 39 species diagnosed include specimens from the families Didemnidae, Polycitoridae, Polyclinidae, Cionidae, Perophoridae, Corellidae, Ascidiidae, Styelidae, Pyuridae, and Molgulidae. The families Cionidae and Molgulidae are reported for the first time in this area with one new species described for each family. The other new species that were described were from the families Polycitoridae, Perophoridae, Ascidiidae, Styelidae, Pyuridae, and Polyclinidae.

The authors discuss the distribution of ascidians in the four different types of biotopes. The four types of biotope include the external slope, barrier reef, the zone of patch reefs, and deep lagoon. The barrier reef is the most productive, at least in Moorea, because of the constant nutrient supply from wave bursts and the proliferation of algae. In the external slope the waves are very strong and this zone has suffered many tornados, and few species can survive the turbulence. Those that are found on the external slope live under coral and in the crevices, protected from the turbulence. In the patch reef, where there is no wave surge, ascidians are found a few meters from the surface and not much deeper. The deep lagoon has a cloudiness of sediment with sediment deposits on the corals and only a small number of the species were reported.

There is a discussion on the proportions of colonial and solitary ascidians, the percentage being 84% colonial to 16% solitary, which has been found to be typical of the tropical Pacific Ocean. Colonial forms also dominate in the Atlantic but not by such a large margin. Longevity, primarily through budding, is most likely the

reason for this difference. Finally the authors discuss the numerous new species of Didemnidae and their dominance over other families and the possible reasons for this dominance. They note seven reasons for this but listed two different reasons under number five as one reason, so there are actually eight reasons detailed that play a key factor in Didemnidae dominance:

1. Spicules. The authors' discussion is contradictory because they list the spicules as a reason for Didemnidae dominance and then mention that it has not been proven that having spicules is an advantage to this family.
2. The surface of the oral siphon in relation to the volume of the colony (very large openings) assuring entrance of nutrients.
3. Branchial volume compared to cells of other tissues. The authors discuss the fact that the Didemnidae have, among the Aplousobranchia, the largest relationship of volume branchie/volume viscera, another assurance of large amounts of nutrients.
4. Small height or stature of individual adults. There is a discussion of the capacity of zooids to reproduce sexually at a much quicker rate when they are producing small individuals and using less energy than it would take to produce larger individuals.
5. Mode of incubation of the larvae.
6. Mode of budding. It is advantageous for the Didemnidae to reproduce by budding from the esophagus and the abdomen simultaneously.
7. Mobility of the colonies - Occupation of the substrates. Mode of budding of Didemnidae assures longevity on a particular substrate and contributes to extension of the colony.
8. Algal symbionts. The presence of algae satisfies the need for photosynthesis where sunlight is lacking.

This volume can be recommended for beginners as well as established ascidiologists. It would be an asset to any invertebrate library.

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