where; and to emphasize that this field, like other important areas of research in modern biology, provides a meeting ground for many, varied disciplines."

In this context the symposium, which was held in Hyderabad in 1964, appears to have been a success. The 12 papers from laboratories in India cover DNA and RNA metabolism in plant, animal, and microbial extracts, metabolic regulation, virology, and genetic mechanisms, and the role of hormones in regulation of RNA synthesis. They provide an informative survey of India's very commendable contributions to this rapidly advancing field.

The 19 papers by guests from six countries also cover a wide range of topics. Fully half of the papers explore questions that remain unanswered 2 years after the symposium. The bold attacks on these questions illustrate that the participants were leaders in their fields. It is unfortunate that the discussions were not included in this book. The lack of an index also detracts from the book's usefulness.

The book has value as a broad collection of exploratory, speculative, and review papers that range from 3 to 24 pages in length. The reviews of codon composition (by Lengyel and others), of the molecular basis of crossing-over (by Siddiqi), and of the translation of genetic information into proteins on polysomes (by Rich), and the paper on the design of pyrimidine antimetabolites (by Heidelberger) are likely to be useful to both student and researcher for some years to come.

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Cyrtandras on Oahu, Hawaiian Islands

Cyrtandra is the largest genus of Gesneriaceae and one of the great genera of the southeast Asian–Pacific region: there are perhaps 600 species. In 1883, C. B. Clarke recognized 167 species in the entire genus; there has been no general treatment since. Regional revisions are difficult enough, and the long delayed publication of Harold St. John's important **Monograph of Cyrtandra (Gesneriaceae) on Oahu, Hawaiian Islands** (Bishop Museum Press, Honolulu, 1966. 469 pp., $12) is very welcome. On this one island he recognizes 118 species. Of these 51 were published by St. John and Storey in 1950: even so St. John now adds another 41 species. This huge increase completely upsets all figures given previously for endemism in the Hawaiian flora. For instance Symkiewicz [*Act. Bot. Soc. Polon.* **15**, 15 (1938)] gave the total endemics for Oahu as 72, and his figures included only 12 species of *Cyrtandra.*

Inevitably plant geographers and others will ask if St. John's concept of a species is not unduly narrow, though the author explicitly states that these are linnaean species, not jordanons (p. 27). Judgment in these terms seems premature when no less than 53 of the 118 species accepted are based on a single collection. Local diversity is indicated by the occurrence of between 20 and 30 species in 4 of the 18 areas recognized. If anyone studies the Hawaiian *Cyrtandra* after working on those of Malaysia, he will be less surprised by these figures than botanists concerned with better known floras. The figures are, in fact, quite comparable to those likely to be given soon for Borneo. However there is one major difference that makes a strong impression: *Cyrtandra* in Borneo embraces a far wider range of form, especially in habit and in flower-size and color, than it does on Oahu. Other lines of variation, such as those resulting in connate bracts, horned calyces, and unusually long fruits, are repeated in both areas, though without any close affinity between the plants concerned.

The cytological information (contributed by W. B. Storey) shows that the 9 species examined have 34 somatic chromosomes. This number has now been found from Hawaii and Tahiti westwards to the Malay Peninsula. In so diverse a genus this is striking uniformity, and it goes right across the sharp change in fruit structure which was pointed out by H. B. Guppy many years ago. All species west of the Solomon Islands have hard green crustaceous fruits; all those eastward have fruits that become white and softly fleshy at maturity. Is this a better criterion for two subgenera than the persistence or otherwise of the calyx (used by C. B. Clarke, who is followed by St. John)? It may be convenient to split the Hawaiian species on the calyx, but it is certainly quite misleading to suggest that *Cyrtandra* has just these two subgenera and that both occur in Hawaii. Subgenera and sections as used in this revision are each probably one taxonomic rank too high in relation to the rest of the genus.

The production of this volume is very good. The author's meticulous descriptions are reinforced by some first class illustrations by Florence Meekel and Hung Sun Lau. These do not, however, support St. John's statement (p. 9) that the stigmas "all seem similar in Hawaii" (compare Figs. 64 and 174, for instance), and one would like to have a more critical study of this feature. Great attention has also been paid to mapping the distribution of sections and species. In fact we have been given a first-rate, formal, taxonomic monograph. *Cyrtandra* may not be an ideal genus for experimental work, but research into the difficulties of propagation, culture, and cytological examination should certainly be put in hand. In these highly localized Oahu *Cyrtandra,* studies of the complete populations of many species should now be possible. Some species may prove to have been too finely drawn, but to have stimulated such research would be St. John's real reward.

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Botany

The author, William D. P. Stewart, indicates that this book, **Nitrogen Fixation in Plants** (University of London Press, London, 1966. 180 pp., 25s.), was built around a series of lectures given to undergraduate botany students. As such, it constitutes a rather short but at the same time sufficiently comprehensive review of the field for anyone except the specialist. References well into 1965 are included, but proper weight has also been given to the older references upon which current developments are based.

The story of nitrogen fixation is introduced with a brief historical account which precedes a discussion of pertinent methodology employed in research. The author then devotes three chapters to symbiotic nitrogen fixation. The process of infection of leguminous plant roots and nodule formation includes references to recent work with electron microscopy which has

added much detailed knowledge about nodule structure.

The author's background gives him particular competence with the nonleguminous plants and the blue-green algae. In chapter 3, the groups of nonleguminous plants which fix nitrogen are cataloged. Because the endophytes in these root nodules have been resistant to cultivation free from the host, information about them is indirect. However, the structure of nodules, their formation, and the site of fixation are covered very effectively.

In a chapter on the physiology of symbiotic nitrogen fixation, Stewart has chosen to discuss the carbohydrate-nitrogen ratio, the transfer of fixed nitrogen in the plant, the physical and nutritional factors influencing fixation, and the effect of gases.

The treatment of nitrogen fixation in free-living organisms is divided into chapters on blue-green algae, bacteria, and the physiology of the process. These chapters include helpful compilations on the species of blue-green algae and the groups of bacteria that have been reported to fix nitrogen. The interaction of blue-green algae with other organisms presents a number of interesting biological associations. Each group of nitrogen-fixing bacteria is discussed briefly in an attempt to put them in perspective. In chapter 6 Stewart also lists the organisms that have yielded active cell-free preparations and discusses the requirements of these preparations for nitrogen fixation.

Chapter 8 deals with the biochemistry of nitrogen fixation. The author perhaps takes the oxidative pathway of nitrogen fixation too seriously. The discussion of current concepts of the mechanism of nitrogen fixation is good.

The final chapter is concerned with nitrogen fixation in the field, and the difficulties in obtaining quantitative results are properly stressed. The best data available are organized in assessing the practical importance of the various nitrogen fixers.

The list of references is excellent, and only a few that are of real importance to development of the broad picture have been omitted. The index is comprehensive and well arranged. The format of the book is attractive and the price is modest.

The author accepts a number of points from the literature which I question seriously. Although these may reflect legitimate differences of opinion, it appears often that the data at issue really are questionable and should be labeled as such. Despite some lack of critical evaluation in the text, Stewart is to be congratulated on writing a clear, readable, and very helpful book on nitrogen fixation.

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Marine Biology

In **Meeresbiologie: Eine Einführung in die Probleme und Ergebnisse** (Borntraeger, Berlin, 1965. 434 pp., DM. 88), Hermann Friedrich surveys the scientific problems, goals, and results of marine biology, primarily for students and nonprofessional marine biologists; however, his book will also be useful to scientists familiar with the sea. The well-organized text treats the development of marine biology, methods, and abiotic and biotic ecological factors (98 pp.); animals and plants of the pelagic realm (76 pp.) and of the benthos (95 pp.); the distribution of organisms in space and time (83 pp.); inhabitants of the marginal zones of the sea, including brackish water (18 pp.); and economic aspects (9 pp.). Since sufficient introductory information is presented, the reader need not resort to other texts on the ocean. There are 220 figures, a moderately extensive index, and almost 800 references.

The book stresses the ecology of species; the physiology of marine organisms is not considered to any extent. Emphasis is placed on the animals; bacteria are merely mentioned. The chapter on the benthos seems to be stronger than that on the plankton. Both chapters deal intensively with form and functions ("Lebensformtypen," like feeding and locomotory types) and with reproductive biology. There are a great many suggestions for further investigations, although many of the phenomena are not accessible to experimentation. I wish the author had provided more detail in some places rather than referring to the literature. The slightly speculative treatment of evolutionary aspects might be taken as a challenge.

More is said on autoecology than on synecology because more information is available on the former. Although problems of the biological classification of the marine environment are not stressed, a better integration of the terminology would have been helpful. Use of the term "biocoenosis," with its implications of close biological relationships between the species of the associations, although explained, is avoided. Marine production is discussed in the chapter on distribution. This is essentially a consideration of standing stock; the treatment of processes and rates is not fully up-to-date.

A few literature quotations in the text are handled inconsistently. The figures are clear throughout, but the captions to some figures and tables are deficient or are not even given. Also, inconsistencies in the choice of dimensions used in the text and figures, and in labeling the figures (sometimes in English), could be remedied easily in a new edition or translation.

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Aspects of Biophysics

What does biophysics mean? A definition is not as illuminating as an inspection of what biophysicists are actually doing. I recommend **Molecular Biophysics** (Academic Press, New York, 1965. 462 pp., $19.50), edited by Bernard Pullman and Mitchel Weissbluth, to the nonbiophysicist who is curious about the nature of the field and to the biophysicist himself who could scarcely know all the subjects that are discussed in this book.

Molecular Biophysics is a collection of 15 essays—written by a biologist, a physicist, a biochemist, an applied mathematician, a biophysicist, and eight physical chemists—on a wide variety of topics, ranging from valence theory and radiofrequency spectroscopy through nucleic acid structure and function to muscle contraction. The papers were presented at an international summer school sponsored by the North Atlantic Treaty Organization and the Office of Naval Research and held at Squaw Valley, California, in August 1964. Some of the contributions are elementary, others rather sophisticated. Some authors deal directly with biological problems; others treat problems that are only tangentially involved in biology. The individual contributions are almost all of a very high order, although again some present new material and others are general reviews of classic subjects.