SCIENTIFIC BOOKS

MARINE ALGAE

Marine Algae of the Monterey Peninsula, California. By GILBERT M. SMITH. ix + 622 pp., incl. 98 pl. Stanford University Press. 1944.

IT is definitely an event in biology when the first comprehensive account of an important group of plants for any area becomes available. For the western coast of the United States but few attempts have been made to list all the marine algae. The earlier lists were admittedly fragmentary. Setchell and Gardner in their later years, attempting a complete manual, covered the smaller groups but not the most difficult, the "red" algae. Consequently Smith's manual, although for a limited area, is the first comprehensive marine flora designed for use on the Pacific coast. The nineteenth century writers had but a few scattered specimens on which to base their reports, and even Setchell and Gardner in their earliest complete account (1903) with less than ten years of field experience had relatively few, whereas Smith had available all the accumulation of a very long generation of intensive collecting and publication on their part over the whole coast line, and a number of years on his own over his particular territory. Consequently he was in a position to do, and has done, a thorough job. The book lists about 385 species; the author estimates that this is 80 per cent. of the flora of the western United States shores between southern California and Puget Sound. The large proportion of the western flora encompassed justifies him in presenting the local flora of a few miles of shore line with the elaborateness of a major taxonomic work.

The introduction to this work opens with a brief sketch of phycological study on the Pacific coast, and more particularly Monterey, information not previously brought together. In it appears, together with the notable early explorers and botanists, those amateurs whose collections so generously aided the studies of the later botanists Farlow, Setchell and Gardner. The writer brings out the fact that three or four early English explorers of the west coast collected a few striking algae at Monterey—Menzies in 1792 for instance, whose species were published by Dawson Turner, and those collected by Douglas and by Thomas Coulter which were described by W. H. Harvey. The later group of collectors after Coulter were largely residents of the west, and with them our detailed knowledge of the flora really begins.

The author of the book under review came to the study of these plants indirectly, for after sundry smaller works he prepared two volumes of an important taxonomic work on Wisconsin fresh-water phytoplankton, and then digressed to the preparation of text-books, first on fresh-water algae, then on cryptogams in general. However, though Smith went to Stanford a recognized authority on fresh-water and particularly plankton algae, he found opportunities in California for this kind of work less attractive than those for marine observations, to which he then turned. He withstood the temptation to study the flora of the whole west coast, an enterprise upon which Setchell and Gardner embarked but which they failed to complete, and concentrated on a small geographical area of notable floristic importance. This is in the temperate zone of algal distribution, which is the richest zone on this coast yet comprehensively explored. Furthermore, there is a local area on the Peninsula for forms normally of more southern distribution.

After sketching earlier algal studies at Monterey, the author gives a description of the physiography and vegetation of the district. This section, which could hardly be made adequately detailed in a work of larger geographical scope, might advantageously have been considerably larger here where the field is circumscribed, and have gone into matters of local distribution and ecology in greater detail. There is a useful, detailed designation and description of various localities in the Monterey region, which connects obsolete and popular place names with official ones. The directions for the collecting of algae are excellent; they are rather widely applicable to procedure in cold water, but not altogether suited to milder regions.

The author has spared no pains to make generic and supergeneric descriptions inclusive of the best and most recent studies in the morphology and life histories of these algae; for instance, those in the Phaeophyta dealing with alternating generations and the sexual or non-sexual function of the plurilocular reproductive organs, and in the Rhodophyta dealing with carpogenic apparatus and cystocarp development. Elements still controversial creep in here, however, especially in the Phaeophyta. The author has continued in this volume his policy of revising the major divisions of the algae to afford what he considers a more just recognition of the importance of groups of equal value. This appears first in his elevation of algal classes to the rank of divisions, a move he has favored before.[1] Few except perhaps some phycologists will be pleased with a classification of the plant kingdom into perhaps a dozen divisions, seven of which are algae! It is of little advantage in the present case, since but one class appears in each of these divisions involved except the Phaeophyta, where

[1] G. M. Smith, "Cryptogamic Botany," Vol. 1, "Algae and Fungi," p. 6. vii + 545 pp., 299 fig. New York: McGraw-Hill Company, 1938.

the old term Phaeophyceae disappears altogether, and where he recognizes as classes the Isogeneratae, Heterogeneratae and Cyclosporeae. The group definitions seem quite precise in this particular book and grant no latitude in the principal character involved, the relative stature of the alternating generations. This is unfortunate, for it is evident at once that some of the genera do not conform to the specifications for the Heterogeneratae and Isogeneratae (*Cutleria,* 1938, p. 240). The class definitions should better have described the range of forms included, rather than just the climax type in this respect. A peculiar and unfortunate situation has developed in the treatment of the Haplostichineae. Originally distinguished by its compound filamentous structure, as contrasted with the parenchymatous structure of the Polystichineae, this group is reasonably distinct. The trouble lies in the prescription of trichothallic growth for it. This peculiar manner of growth is classically illustrated by *Cutleria* and is not characteristic of many of the genera Smith places in it, notably *Myrionema* and in general the Chordariales. Smith's definition of the term *trichothallic* is so unrestrictive that it permits this unfortunate treatment (p. 22). Setchell and Gardner (*e.g.,* 1925, pp. 398, 544)[2] used this term very loosely and Smith seems to have even further departed from its exact meaning.

While thus dividing the Phaeophyta, the author leaves the Rhodophyta with but one class, maintaining the long-accepted subdivisions of Bangioideae and Florideae as subclasses. One notes that Smith retains as class designations Chlorophyceae and Rhodophyceae, but when he comes to subdivide the Phaeophyta his classes do not conform to the same pattern. The International Rules expressly recommend (1935, p. 5, Rec. viii)[3] avoidance of such confusion.

In general the descriptions are divided into three paragraphs, dealing respectively with the general body form and structure of the plants, their asexual and sexual reproduction. This is a very nice feature, enabling attention to be focused on the portion of the description needed. Within these paragraphs the author has departed from the cumbrous classical descriptions with a succession of dependent phrases and substituted sentence form. Since, however, he has frequently not been particular about complete sentence structure or consistent in the use of articles, they do not always read smoothly. It seems redundant to repeat in nearly every species description the guarding phrase, "as found on the Monterey peninsula . . .," a qualification discussed for the book on p. v. The phrase heading each subdivisional key, ". . . in the Local Flora," is a limitation to be tacitly assumed. Likewise it seems needless in those instances where there is but one representative of a subdivision to put in such a heading as: "With one Genus in the Local Flora," or other like phrase, the fact being obvious.

Citations with the several species are essentially designed to cover only the synonyms as involved in the west coast algal literature and references to the plant in the Monterey district. Separate citation of papers dealing with the morphology and life history of the genus most conveniently follow the genus description.

The distribution of the various species is dealt with in three entries. First in order, the local Monterey distribution is given in close detail, including depth at which the plants grow and the characteristic substratum, but rarely anything regarding their seasonal prevalence, useful information which must certainly have been available for most of them. Following this is given the type locality, but nothing more regarding world distribution. Lastly, and probably it should most usefully have come first, the range of the species on the Pacific coast is given. The species descriptions are nearly all based rather rigorously on local material; the descriptions suffer thereby in their applicability to the same species over its complete range, where greater diversity of size and form may be expected. Since these descriptions are thoroughly worked out anew they present considerable new information, a valuable feature.

The typography is attractive, and the proofreading on the whole has been good. The paper is thick, producing a rather plump book; the cloth binding is light in color and probably easily disfigured. The figure of *Postelsia* on the front cover is striking, but not as well reproduced as the same subject on the wrapper.

The book is amply and very handsomely illustrated, the drawings all original, and the reproduction is excellent. Nowhere is so large a proportion of the Pacific algal flora illustrated; many of the species are nowhere else adequately portrayed. An approximation of an illustration for each species is reached. The habit drawings are of great beauty of execution, and generally, so far as the reviewer has been able to compare them, representative of the plants concerned. However, he has reservations regarding a very few, such as *Enteromorpha compressa* and *Gelidium pusillum.* The drawings of smaller structures are likewise clear and well done, though sometimes reproduced on a needlessly large scale (pl. 41, fig. 1, pl. 49, pl. 82, fig. 3) and too crowded on the plate (pl. 12, figs. 4–6, pl. 48). The irregular plate length met with in some

[2] W. A. Setchell and N. L. Gardner, "The Marine Algae of the Pacific Coast of North America," III. "Melanophyceae." Univ. California Pub. But. 8(3): 383–898. Pl. 34–107. 1925.

[3] J. Briquet, "International Rules of Botanical Nomenclature." Edition 3. 152 pp. Jena: Gustav Fischer, 1935.

instances (pls. 77–81) could have been improved by better spacing and slightly greater reduction of some of the drawings, without loss of detail.

These somewhat technical points will probably only bother the specialist slightly, and the general botanist will find Smith's "Marine Algae" as attractive and useful as his other books have shown themselves to have been. Since the time is not ripe for a flora covering the whole western coast line, Smith has done biologists a great service in providing them with an excellent algal manual covering the adequately known part of its flora.

WM. RANDOLPH TAYLOR
UNIVERSITY OF MICHIGAN

SPECIAL ARTICLES

CHEMICAL BASIS OF FEVER[1, 2]

FEVER, as a rule, is associated with some form of cell injury. The writer has recently demonstrated the presence of a substance in inflammatory exudate which *per se* offers a reasonable explanation for the pattern of injury in inflammation.[3, 4] This substance has been termed necrosin. It is located in the euglobulin fraction of exudates. Preliminary studies undertaken by Major A. Mirsky and the writer indicate that this toxic substance may well be a proteolytic enzyme or, at least in its present state of purification, it contains proteolytic activity. These earlier studies have also demonstrated that the euglobulin fraction of exudates, recovered by ammonium sulfate fractionation, is pyrogenic when introduced into the circulating blood of dogs.[4, 5] Moreover, it has been pointed out that none of the other protein fractions of exudates are fever-inducing. Inasmuch as the active material is also recovered in the blood stream of an animal with a concomitant inflammation,[4] it is conceivable that the absorption of the toxic euglobulin fraction of exudates from the site of injury may help in explaining the development of fever accompanying inflammatory processes.

The studies have been carried out on rabbits[6] with exudate and with various fractions extracted from it. The exudate, as a rule, has been obtained from the pleural cavity of dogs previously injected with an irritant as described in an earlier study.[4] In several instances the material was obtained from human sources.

The fraction to be tested is introduced into the marginal ear vein of rabbits, and the rectal temperature is recorded periodically during an interval of approximately six hours. The temperature of a normal rabbit scarcely varies during such a period, the maximum increase averaging 0.63° F. In excessively hot days, there may be in the rabbit an increase in temperature of about 1° F. The introduction of saline, the euglobulin fraction of normal human or canine serum, the pseudoglobulin fraction of exudates (*i.e.*, the leukocytosis-promoting factor)[7] and the albumin fraction of exudates have all been quite ineffective in inducing any appreciable rise in temperature. The average increase in such a series of rabbits has been 0.66° F.

The introduction, on the other hand, of exudative material into the ear vein of rabbits elicits within about an hour or two a conspicuous increase in temperature, averaging 2.37° F. This pyrogenic effect is duplicated by the euglobulin fraction of exudates, the average rise being 2.46° F. Normal non-hemolyzed serum induces a negligible rise averaging 1.05° F. Hemolyzed serum, on the contrary, induces a somewhat more conspicuous rise averaging almost two degrees Fahrenheit. This finding suggests the possibility that ruptured red corpuscles liberate an appreciable amount of pyrogenic factor into the general circulation. The observation deserves further consideration, especially in regard to various conditions, such for instance as are encountered in malaria. It may well be that the chills and fever manifested in this disease are in part referable to the release of the pyrogenic factor from red cells. Furthermore, the pyrogenic factor is recovered to some extent in the non-hemolyzed serum of an animal with a concomitant inflammation. This is suggestive that the factor is absorbed into the circulation from the site of injury.

In contrast to what is known of ordinary euglobulins, necrosin has been observed to be insoluble in the presence of NaCl or sulfate ions.[6] This finding, at first, had been interpreted as the possible manifestation of an atypical euglobulin.[6] Pursuing the study further it has recently been found that one can dissociate and obtain from the whole fraction a true euglobulin soluble in the presence of $SO_4^=$, leaving an insoluble residual fraction behind. The procedure adopted is as follows: The exudate, obtained usually from the pleural cavity of dogs, is treated with am-

[1] From the Fearing Research Laboratory, Free Hospital for Women, Brookline, Mass.

[2] These studies were aided by grants from the Johnson and Johnson Research Foundation, New Brunswick, N. J., and the Dazian Foundation for Medical Research.

[3] V. Menkin, SCIENCE, 97: 165, 1943.

[4] *Ibid.*, *Arch. Path.*, 36: 269, 1943.

[5] *Ibid.*, *Proc. Soc. Exper. Biol. and Med.*, 54: 184, 1943.

[6] *Ibid.*, *Federation Proc.*, 3: March, 1944.

[7] *Ibid.*, "Dynamics of Inflammation," Macmillan Company, New York, 1940.