Book Reviews

Adaptation and Origin in the Plant World: The Role of Environment in Evolution. Frederic E. Clements, Emmett V. Martin, and Frances L. Long. Waltham, Mass.: Chronica Botanica; New York: Stechert-Hafner, 1950. 332 pp. $6.00.

The senior author of this publication, the late F. E. Clements, is well known for his writings in the field of plant ecology. He has been one of the pioneers in this branch of botany in the United States and his publications, along with those of another pioneer, the late H. C. Cowles, have done much to formulate and clarify our ideas of plant succession. The textbook, *Plant Ecology*, with which Clements shared authorship with J. E. Weaver, was for many years the standard text for introductory courses in this subject.

Dr. Clements was a field botanist. Observing plants in the field under varying external conditions, he was perhaps unduly impressed by the role of environment in molding organisms and finally came to believe that new forms could arise by the action of environmental factors alone. The present volume represents the results of controlled experiments conducted in the field, over a period of some 40 years, which were intended to determine the role of environment in evolution. The preface, by Edith S. Clements, states that the results of these studies, conducted by Dr. Clements and his co-workers, were originally planned to be published in a series of four booklets. The first book in this series (E. V. Martin and F. E. Clements), was published in 1939. The second booklet is an account of adaptation under control in many garden habitats at Santa Barbara, including the Dune Gardens. The third volume was to have dealt with response to climatic and edaphic conditions in numerous natural gardens of the transplant transect on Pikes Peak. The fourth and final book of the series was intended to be a detailed analysis and discussion of the convergence and conversion of species at both centers and of the ecological basis of evolution. The original plan was somewhat modified after Dr. Clements' retirement, when it was decided to combine booklets II and III into one volume. This manuscript was practically completed before the death of both Dr. Clements and Dr. Long in 1945. The present volume consists of most of that material, in addition to some of the information originally intended for book IV.

The publication is copiously illustrated by excellent photographs and there are numerous tables and graphs. With the current interest in experimental taxonomy, many will find these data of particular interest, although the authors' interpretations may be open to question.

It has long been known that organisms show different responses to varying environmental conditions. The authors of this volume conclude that adaptation is brought about by responses to direct physical factors and is expressed both in function and in form. They further state that for all the species employed, there is no evidence that it arises through the selection of genetic strains or variations. They believe that it is possible to convert one Linnaean species into another by altering the environment. Further, that while "the conversion of one genus into another, morphologically at least, is much more difficult than with species, it is far from impossible." One might wonder whether these supposed species and genera are able to hybridize, and the answer is provided in the publication. Crossing was employed in a number of species, chiefly with reference to its *supposed* value in distinguishing between species and forms of lesser rank. The result was that "crosses between groups with the character of Linnaean species have failed in all cases tried." It seems incredible that environment is able to convert one species into another when these plants are so unrelated that they are unable to exchange genes. If species A and B are not able to hybridize and through environmental changes A is converted to B, we should expect that a cross between the new A and B would be successful. This reviewer has failed to find in the publication any evidence that such an experiment was attempted. A rather strange statement is that "Perhaps hydridization is to be regarded primarily as a nutritional (chemical) rather than a genetic disturbance directly."

In contrast to these conclusions are those of Clausen, Keck, and Heisey (*Carnegie Instn. Wash. Publ.*, 1940, 520), who conducted similar experiments. Dr. Clausen is an able geneticist, and Dr. Keck is a taxonomist of sound reputation. These authors conclude that natural selection determines the character of the plants that occupy a given environment, and that the ability of a plant to accommodate itself to a new environment is dependent upon its genetic constitution. They further state that, in their studies, changes produced by the environment give no evidence of permanence, and although they may be quite spectacular, they never obscure the individuality of the plant.

The present volume is no exception to other publications by Dr. Clements in regard to specialized terminology. Fortunately, there is a glossary, without which many might have found difficulty in following the discussions.

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Phenomena, Atoms and Molecules. Irving Langmuir. New York: Philosophical Library, 1950. 436 pp. $10.00.

This collection of papers by Irving Langmuir might well be dedicated to the spirit of W. R. Whitney, who to such a large extent was responsible for the development of basic research in an industrial laboratory.

Of the 18 papers, three deal with general principles of science, its development, and scientific philosophy. The fourth, "Surface Chemistry," is the lecture given by Langmuir at the time he received the Nobel prize,

and is a classic not only from the point of view of content but also because of the clarity with which the subjects are presented. The seventh paper, "Atomic Hydrogen as an Aid to Industrial Research," is far more than the title promises, and gives an insight into the psychology of discovery and the importance of basic research in industry.

A large number of the essays are devoted to the arrangement of molecules, their distribution and orientation, and the connection between the structure of liquids and surface tension, the phase of Langmuir's work that is so famous. There are also his investigations on atomic hydrogen and the question of chemical forces, valency, and structure.

One wishes that every student of physics or chemistry could study these papers carefully, and it is regrettable that the price of the volume is so high. If a reprint of the first four essays and the seventh could be published as a small pocket book it could be used with profit by students of science and science education. There is a complete bibliography with more than 200 titles, offering an amazing outline of the various activities of the author in a large number of fields of physics and chemistry.

KARL LARK-HOROVITZ

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The Sea and Its Mysteries: An Introduction to the Science of the Sea. John S. Colman. London: G. Bell and Sons; New York: British Book Centre, 1950. 285 pp. 12s. 6d. net.

This very readable book covering the broader aspects of oceanography is a welcome addition to the literature, particularly for those wishing a general picture of marine life, of waves and currents, and of the chemistry of sea water. The illustrations are clear and well chosen. There is a delightful account of the Great Barrier Reef of Australia, which will appeal to scientist and layman alike.

The authoritative chapters on "Animal Plankton" and "Life in the Depths" are very interesting reading. Only minor criticisms can be offered. Some people may object to the overemphasis of the Atlantic and the inadequate treatment of the Pacific. The chapter on "The Shape of the Sea" is comparatively accurate but disappointingly short; it gives very little of the recent American investigations. The "Short List of Reading Matter on the Sea" at the end of the book could have been somewhat lengthened to supply the needs of readers who develop a wide interest in oceanography.

Understandable errors regarding the character of tsunamis (tidal waves) may be found in the book. These waves are erroneously attributed to earthquakes rather than to the movements that cause or accompany the earthquakes, and the "much faster" movement of tsunamis than wind waves in shallow water is erroneous, as many of us who experienced these waves in Hawaii can testify. The continental slope is said to have a "ruling gradient between 1 in 17 and 1 in 30," but a world-wide study indicates that the average is 1 in 14. One imagines that Colman's figures came largely from the Atlantic, although even there greater average declivities are found. One of the best features of the book is the clear indication throughout that the author knows the sea from firsthand experience. This is particularly apparent in the last chapter, with its stimulating account of many of the natural phenomena likely to be encountered on a sea voyage.

FRANCIS P. SHEPARD

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Plant Pathology. Sir Edwin J. Butler and S. G. Jones. London-New York: Macmillan, 1949. 979 pp. $10.00.

The first part of this book, on "General Principles," includes discussions on the structure, growth, life histories, dissemination, and variation in fungi; host-parasite relationships; influence of environment on disease; resistance and susceptibility; virus diseases; and deficiency diseases. Most of these topics are presented thoroughly, yet clearly and simply. The discussions appear to be based on extensive firsthand knowledge of a large number of fungi and diseases, as well as critical evaluation of world-wide literature on the subjects. Chapter 2, which includes discussions on persistence of parasites from year to year, heteroecism, specialization of parasitism, saltation, nutritional stimulation of parasites, and epidemics, is perhaps rather weak. Significant literature published in some of these fields in the last 20 years is not cited (only 35 references are cited for the entire chapter, permitting only sketchy coverage of most subjects). Some of the basic and practical principles established in plant pathology as a result of researches in these fields during the last 20 years are not mentioned.

The section on principles is followed by a nine-page synopsis of the classification of fungi that admirably summarizes the distinguishing characteristics of classes, subclasses, and principal orders and families of fungi. Under each family the genera most important in plant pathology are listed.

Section 2 includes summaries of selected diseases of the major groups of crop plants—cereals, forage and pasture crops, potatoes and root crops, pulses (peas and beans), vegetables, fruits, ornamentals, and forest and shade trees. Under each crop there are one or more examples of diseases caused by the major groups of organisms known to be of pathologic importance on that host. The general types of diseases to which the major crop plants throughout the world are subject are well covered. Discussions of the individual diseases are clear, thorough, and well documented by literature citations, both to specific research papers and general reviews.

There are 435 illustrations, most of them excellent, some of them outstanding. Many are original; few have ever appeared previously in any text. Most of the specific diseases discussed have good illustrations of symptoms, the fungus, and pathologic histology.

Literature citations follow each discussion of general principles and each individual disease or crop. The citations are arranged alphabetically, an advantage for the reader. However, only in a very few instances are titles or page numbers of papers cited; thus the reader cannot