evolution of the group. Fortunately, these views have proved illfounded, and a more minute and exhaustive study of shell characters in some groups has shown that valuable assistance in working out lines of development and the relations of different forms may be obtained by those who properly study the shell, its larval forms and dynamic relations to the organism. No one now doubts the importance of such studies in such large groups as the Ammonoid and Nautiloid cephalopods, the Volutidæ among gastropods, and the Naiades among pelecypods.

The study of the stages of evolution of the larval characteristics is a field hardly entered upon and promising rich returns to the student, and, for the paleontologist, deprived of all anatomical aid in tracing the lineage of peculiar extinct genera, the necessity of study of the nepionic stages of the fossils is fundamental.

For these reasons all contributions to our knowledge of existing larval forms are welcome, especially with such a wealth of illustration as in the present volume. Among the more important matters in it we find a very full account of *Janthina*, in both adult and larval states; of larvæ of the type of *Echinospira*, belonging to the Lamellariidæ; of the *Macgillivrayia* type like those of *Tritonium* and *Dolium;* of the *Sinusigera* type, including many genera of Rhachiglossa and Toxoglossa; a general discussion of the conditions of larval existence and their bearing on the characters developed; some account of pelagic nudibranchs, such as *Glaucus* and *Fiona;* a table showing the quantitative results of the dredging or towing nets; and a bibliography of literature consulted.

The only criticism which suggests itself is that it would be more convenient for those who have to use the book if the magnification of the figures was stated in units of the whole length, rather than merely indicated by the name and number of the objective used for the microscopic work.

W. H. Dall.

The Structure and Development of Mosses and Ferns. By Douglas Houghton Campbell, Ph.D., Professor of Botany in the Leland Stanford, Jr., University. 8vo. Pp. 544. London, Macmillan & Co. 1895.

The results of the long continued and patient work that Dr. Campbell has been publishing from time to time on the Pteridophytes have at last been brought together, with the results of a large amount of new work on the Hepaticæ and other Bryophytes, and the whole results in a large volume issued by the well-known publishers, Macmillan & Co., under the above attractive title.

The first thing to be noted as praiseworthy in the book is clearness and simplicity of expression, for while dealing with a recondite subject and using strictly technical terms, the book reads smoothly and is devoid of that stilted language that too frequently characterizes works of this nature. The logical arrangement of the matter follows closely on the simplicity of style and these two features are sufficient to recommend the work to the learner, for too many are repelled from many a fascinating subject by the nature of the language and the lack of a systematic arrangement of the matter.

But beyond these questions of form the subject-matter is fresh and direct from the hand of the laboratory worker. The studies on which the work is primarily based were made from American plants, many of them plants from the Pacific coast that have never before been studied from the developmental and morphological standpoint. Riccia hirta, Fimbriaria Californica, Porella Bolanderi, Anthoceros fusiformis, Ophioglossum pendulum (from Hawaii), Botrychium Virginianum and Marsilea vestita are only a few of the new plants that have been called in to contribute their life history for the verification and often modification of the work of Hoffmeister, Kny, Gœbel, Strasburger and others made on similar plants of central Europe. As one result of this new study, Dr. Campbell has given us a fresh supply of illustrations in place of the standard stock that has become threadbare from long usage in European and American text-books. If some of the illustrations are not quite so clear cut as some that have appeared in certain European publications of recent date, they more than make up for this in their freshness and accuracy for they represent exactly the conditions met with by the author and have not been filled in by the imagination, as is sometimes the case.

We are pleased to note that for the first time in any somewhat general treatise of botany the Hepaticæ have received something like their proper treatment, and their representative position as a highly important group from the standpoint of phylogeny is clearly stated at the outset and strikingly developed through the work. A fair estimate of their differentiation and highly probable antiquity is also well set forth.

Dr. Campbell regards the lowest Metzgeriaceæ, like Sphærocarpus, as the simplest plants of the entire group and considers that the other groups of the Hepaticæ were differentiated from the ancestors of some plant of this character before the development of the sporophyte had advanced so far as in present forms of that genus. He sets forth a most excellent answer to the remarkable position of Goebel regarding the status of Buxbaumia and contributes several new points bearing on the interrelationships of the various groups of the true mosses.

In classification Dr. Campbell does not depart widely from arrangements that have heretofore been set forth, in the Hepaticæ, for instance, following the lead of Schiffner. The position of Isoetes as the possible ancestor of the Angiosperms is perhaps the most divergent point presented in the classification.

Comparison of the work of others is well made, and wherever criticism occurs it is always in the friendly, urbane spirit that ought always to characterize workers in science; where conclusions are stated, they are couched in pointed and forcible language but never dogmatically. Altogether the work is a valuable contribution and will stand comparison with the best work of the kind that has been done anywhere.

L. M. UNDERWOOD.

Molecules and the Molecular Theory of Matter, by A. D. RISTEEN, S. B. Ginn & Co. Octavo, pp. 213.

This is an excellent resumé of the present state of our knowledge of the molecular theory, excluding most of the more difficult mathematical discussions, and including the principal conclusions of Clausius, Kelvin, Boltzmann, Maxwell and many others who have cultivated this department of physical science.

After some general considerations involving a presentation of the hypothesis of molecules and a definition of what is meant by a molecule, together with a brief statement of the assumed molecular constitution of solids, liquids and gases, the kinetic theory of gases is seriously taken up. The fundamental assumptions of the theory are discussed, Maxwell's Theorem is proved and the statistical method of treatment illustrated. The results of the kinetic theory are compared with the results of observation, and the chapter includes an examination of high vacua phenomena, the radiometer and other of Crookes' experiments.

The chapter on the Molecular Theory of Liquids includes, among other things, a fairly complete elementary study of surface tension and the phenomena of films. Chapter IV. is given to the Molecular Theory of Solids, concerning which there is really little known, but interesting studies of the phenomena of solution, diffusion, crystallization, etc., are here given. The concluding chapters on the Molecular Magnitude and the Constitution of Molecules are important and well done. The principal methods for determining molecular dimensions are gone into pretty thoroughly and the more recent hypothesis in regard to the constitution of the ether and the nature of matter are presented with great clearness and some fullness.

Among a few unimportant criticisms of the book that suggest themselves may be mentioned the holding on to the 'lecture' form of presentation. The foundation of the work was a lecture given by the author before the Washburn Engineering Society of the Worcester Polytechnic Institute, but it has been so expanded, and so much additional material has been supplied that it exceeds the limits of several lectures. As a large part of the new material is not in the lecture form and as little is gained by retaining it anyhow, it is to be regretted that the author did not reject it in the beginning.

As an echo of the discussion which occurred at the recent meeting at Springfield of the Society for the Promotion of Engineering Education, it may be well to note that on one or two pages this book illustrates the fatal results which are almost sure to follow the use of the formula $W=mg$, in the good old orthodox way. The author is lucky, however, in having apparently