to experimental questioning, to physiology. Indeed, one may say that morphology is that which is not yet understood physiologically. The separation of the different tasks of botany is not in the nature of things proper, but is only a preliminary means at first to orientate ourselves with reference to the maze of phenomena. The barriers between these tasks must then in the nature of the case fall with further progress. I do not wish to deny the value of phylogenetic investigation, but the results which it has brought forth resemble more the product of creative poetic imagination than that of exact study, *i. e.*, study capable of proof. If the knowledge of the historical development of plant forms hovers before us as an ideal, we shall approach it only when we attack the old problems of morphology, not simply with the old method, that of comparison, but experimentally, and when we regard as the basal problem of morphology not phylogenetic development, but the essence of development in a large sense. Even if we had the story of development spread out clearly before us, we could not content ourselves with the simple determination of the same; for then we should be constrained to ask ourselves, how it has been brought about. But this question brings us straight back to the present, to the problem of individual development. For there is for natural science hardly a more significant word than this of Goethe's: 'was nicht mehr entsteht, können wir uns als entstehend nicht denken. Das Entstandene begreifen wir nicht.' It is then the task of modern morphology to learn more exactly the factors upon which at this time the origin of structures depends. To this task, for which there was at that time but little preparatory work consisting of a few important attempts by the gifted Thomas Knight, Wilhelm Hofmeister, who is known to most of us only as a comparative morphologist, did a too little recognized service. For he pointed out, even before this trend of study became apparent in zoology, that the ill-designated 'Entwickelungsmechanik' pursues essentially the same goal as the causal morphology of botany.

We may regard as a motto this sentence from Hofmeister's 'allgemeiner Morphologie': 'es ist ein Bedürfnis des menschlichen Geistes, eine Vorstellung sich zu bilden über die Bedingungen der Formgestaltung wachsender Organismen im allgemeinen.' This is even now the problem of present day morphology. Comparative consideration, including, of course, the especially important history of development, offers us valuable preparation for the intellectual grasp of the problem, but, above all, for the pursuit of the experimental method.

That the zoologists also have felt this necessity to strike out into new ways besides that of comparative morphological observation shows anew that for all organisms the problems are really the same. Let us then take for our watchword development, not only as a problem, but also for the methods with which we seek to bring ourselves nearer its solution.

SCIENTIFIC BOOKS.

Research Methods in Ecology. By FREDERIC E. CLEMENTS, Ph.D. Lincoln, Nebraska, The University Publishing Company. 1905. Pp. xvii + 334.

This work by Professor Clements is intended by the author as a handbook for investigators and for advanced students of ecology, and not as a text-book of the subject. It, therefore, contains a somewhat elaborate account of methods used by the author in his studies of the last eight years during which a serious attempt has been made by him to discover and to correlate the fundamental points of view in the vast field of vegetation.

The book is presented in four chapters or

parts, the first of which deals with the scope, historical development, present status and important applications of ecology. Under the latter caption its connection with physiology and pathology, experimental evolution, taxonomy, forestry physiography, soil physics, zoogeography and sociology is pointed out. The second chapter is concerned with the habitat and methods of its investigation. First, the factors are determined and classified and then an account is given of the various instruments, including geotomes, psychrometers, psychrographs, photometers, selagraphs, thermometers, clinometers, trechometers, etc., which are employed in the study of the habitat, together with methods of charting statistics. By these instruments and methods statistical analysis of soil water content, humidity, light, temperature, precipitation, wind, soil structure and chemistry, altitude, slope, exposure, etc., is made possible. There is attention paid to the details of choosing instruments, stations and readings. The plotting of curves and determination of graphic representations is explained. The third chapter has to do with the plant, the stimuli which it receives, the nature of its response, its adjustment and adaptation especially to water and light as stimuli. Here some experimental evolutional methods are set forth having to do with the selection of species, the determination of factors and the recording of habitat cultures and control cultures. The fourth chapter, which is the most extensive and to which the other three are in a sense preliminary, has for its general subject the formation or vegetation unit consisting essentially of plants in a habitat, the need for exact investigation of which is set forth by the author. Quadrats, transects, migration circles, are described and their use explained. The two important arts of cartography and photography in their relation to ecologic inquiry are given space, and methods of preparing and preserving formation and succession herbaria are indicated. The development and structure of vegetation are taken up under the conception that the formation is a complex organism which possesses functions and structure and passes through a cycle of development similar to that of the plant. The functions of a formation are described as association, invasion and succession, while its structure may comprise zones, layers, consocies, societies, etc., all of which may be referred to zonation or alternation. Thus classified, the facts and laws of migration, dissemination, barriers and indemism, polygenesis, etc., are given detailed discussion. The final pages are devoted to experimental vegetation with description of culture methods for formational aggregates.

Throughout the volume Professor Clements makes use of his carefully devised nomenclatural system, the extent of which is very considerable. A great many thousand new words and nomenclatural combinations are proposed, for the most part derivatives from the Greek. This system has already been brought to the attention of ecologists in papers in Engler's 'Jahrbücher' (1902) and elsewhere and has attracted attention. A glossary of ten pages in which the more fundamental new words are gathered is a helpful addition to the work. An index is not provided, but the glossary to some extent fills its place.

Eighty-five illustrations, for the most part half-tones, of vegetation, plants and apparatus serve to lighten up the text. Most of these are original views of Colorado vegetation prepared by the author and give a very excellent idea of the grouping of plants upon some of the mountain habitats.

Altogether, Clements's 'Research Methods in Ecology' is a notable contribution to the literature of ecology and the author is to be congratulated upon its successful delivery to the botanical world. Conway MacMillan.

The Becquerel Rays and the Properties of Radium. By Hon. R. J. Strutt. London, Edward Arnold. 1904.

One closes Mr. Strutt's book with a feeling of rare satisfaction. The reader has had a clear and concise presentation of the fundamental phenomena of the Becquerel rays, and the phenomena centering around that astonishing substance, radium.

The book, which lays no claim to an exhaustive treatment of the subject, is primarily written for those who wish to know something about radioactivity and are interested in sci-