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-

ence. Abstruse ideas are left out just so far as possible, and the work, although not phrased in popular language, as we understand the term to-day, is nevertheless very clearly and readably written. Mr. Strutt has evidently the faculty of presenting scientific facts in a very pleasing and attractive and convincing form. In short, he shows the stamp of the teacher.

Notwithstanding all the evident care of preparation in the work, Mr. Strutt has once or twice allowed himself to become careless in the use of terms. For example, on page 66, when treating the selfelectrification of radium, he uses the term 'perpetual motion,' stating that the above phenomena more clearly approach it than any other action we are acquainted with. It seems to me that the term is very wrongly applied, because perpetual motion means the performance of work without the expenditure of energy; and there certainly is energy expended in the above phenomena. Later on in the book (page 167) he states that 'Nothing that we can do to any portion of matter will in the smallest degree affect its weight,' etc. This is rather too loose a statement to let pass without comment.

Chapter I. discusses some general statements about the discharge of electricity through gases, a subject that Dr. J. J. Thomson has so thoroughly investigated. The discussion of the cathode and Roentgen rays contains descriptions of the various phenomena connected with them.

Chapter II. deals with the discovery of radioactivity, the first portion treating of the signal work of Becquerel, who discovered the rays which bear his name, namely, those rays which are given off by some salts, and which have photographic properties, but which differ from Roentgen rays and also from ordinary light.

The discussion of the various phenomena relative to uranium prepares the reader for the story of the discovery of radium. Mr. Strutt explains in an interesting and instructive manner the chemical procedure gone through to make it possible to obtain radium from pitchblende, a mineral in which was discovered by Madame Curie a radioactivity far in excess of what was expected. This fact led Madame Curie to conclude that there resided in the mineral some other more active constituent than uranium.

In Chapter III. we have the properties and nature of the radiations described together with the fluorescent, chemical and physiological effects. This is followed by a rather complete discussion of the alpha rays, beta rays and gamma rays, with several diagrams illustrating experiments carried out to determine the deflection of the alpha rays and beta rays. The experiments with gamma rays have so far been negative.

At considerable length in one of the chapters is described the subject of radioactvity in the earth and its atmosphere, a branch of the work to which Mr. Strutt has contributed rather extensively. Other chapters treat of absorption and ionization; changes occurring in radioactive bodies; the products of radioactive change.

The last chapter gives a short account of the electrical theory of matter, to which Professor J. J. Thomson has given much thought. This chapter is very suggestive and supplies food for contemplation.

At the end of the book there are three appendices, the first of which contains a number of experiments which any one may perform with a bit of radium. A sufficient amount of radium necessary for these experiments would cost in the neighborhood of twenty-five dollars. With this appendix are given two plates.

The other two appendices treat respectively of the mathematical theory of the deflection of the beta rays; a short account of the extraction of radium from large quantities of pitchblende.

The book is non-mathematical throughout, except for the appendix mentioned, and shows a keen insight into the subject dealt with. This, however, is to be expected from a man who has done so much work in the realm of radioactivity. On the whole, the book is to be commended to those who are of a scientific turn of mind, and who wish to understand clearly the principal phenomena of radioactivity.

G. B. OBEAR.

PROVIDENCE, May 24, 1905.