The final part of the work deals with what is denominated 'plant formations,' and a plant formation is defined as 'a piece of the floral covering, the extent of which is determined by a characteristic correlation or association of vegetable organisms, *i. e.*, it is a stretch of land the limits of which are biological and not physiographical.' They may or may not, therefore, be coextensive with the regional distribution of the plants which compose them.

With respect to their origin they may be either primitive or recent. Primitive origin is necessarily more or less conjectural. It involves the study of the extinct flora of the region and the geologic changes which finally led up to the establishment of existing conditions. Recent formations may arise either from nascence or by modification. If by nascence they must originate upon areas previously destitute of any floral covering, while in the second case they are formed by the elaboration or modification of existing formations, often by the intrusion of foreign elements. Abandoned cultivated patches may represent the first, timber claims the second. Formations often disappear through the agency of fires, floods, mankind, etc., in which cases new formations may arise by nascence.

As an example of the latter is quoted the establishment of *Botrydium granulatum* or *Vaucheria sessilis*, with the cup fungi *Humaria* and *Scutellinia*, on muddy flats, formerly occupied by water plants, but subsequently exposed by the drying up of ponds or streams. A carpet-like layer may then supervene, composed of *Riccia glauca*, *Funaria hygrometrica*, etc., which in turn may be replaced by low-growing flowering plants, such as *Portulacca oleracea*, *Lepidium intermedium*, etc., and this in turn may yield to taller growing *Chenopodiums*, *Amaranths*, etc.

In the origination of formations by modification two sets of factors may be distinguished—natural and artificial. The first are either biological or physical, the second are due to the influence of man or other animals. An unusually wet season in the sandhill region or a dry one in the lowland will often modify the floral covering in a striking way, and modification through the agency of man is too obvious to require more than passing mention.

The various plant formations recognized are finally considered in detail and discussed under headings and sub-headings, physiographical and biological. For example, under the forest formations may be found the river-bluff formation, including (1) the red oak-hickory formation, (2) the bur oak-elm-walnut formation, etc.; under prairie formations, (1) prairie grass, (2) buffalo grass; under foothill formations, (1) under-shrub, (2) mat and rosette, (3) grass, etc., and many others.

The work as a whole is exceedingly valuable for the wealth of facts recorded, irrespective of any conclusions which may be deduced from them, and no one can fail to appreciate the immense amount of conscientious labor which it shows.

ARTHUR HOLLICK.

Synopsis of the Naiades, or Pearly Fresh-water Mussels. By C. T. SIMPSON. Proc. U. S. National Museum, XXII. 1900. Pp. 501–1044.

Some people think that the preparation of zoological catalogues and synopses is a low grade of work, which should be turned over to those who are not capable of doing anything better. Certainly one occasionally meets with examples of zoological bibliography bad enough to have been compiled by the most incompetent, but it is to be remarked that the authors of these works are often really skilled in anatomy or some other branch of the science. The fact is that the preparation of such a work as we have before us, with its orderly arrangement of innumerable references, requires not merely a high grade of intelligence, but a special kind of ability, which is none too common. We may therefore begin by thanking Mr. Simpson for a work which no other living man was equally competent to produce, and which will be invaluable to all students of the naiades. But to regard the work as merely a piece of good bibliography, would be extremely erroneous. Mr. Simpson has carefully studied a considerable majority of the species, and the arrangement of them is original with him. He has, by an examination of the soft anatomy, been able to show that the genus *Unio* of authors is in reality a heterogeneous mass of distinct genera, which

he duly describes. In all, 72 genera are recognized, of which 25 were first named by Mr. Simpson, while many others, credited to various authors, were first properly defined by the same writer. All this amounts to a revolution in naiadology, comparable with that produced by Pilsbry in the study of the Helicidæ.

Of interest to general biologists will be the map given showing the distribution of the naiades. In the Old World the regions of Sclater and Wallace are respected by the fresh-water mussels, except that New Guinea goes with the Oriental region, as also do Japan, Corea and Manchuria. In America the neotropical region is valid for naiades, but North America is divided into three primary regions, the Atlantic, the Mississippi and the Pacific, but the last is considered a part of the Palearctic! In all about 1,117 species are recognized, many having long lists of synonyms. Concerning the innumerable so-called species described from France by the followers of Bourguignat, Mr. Simpson says: "Life is too short and valuable to be wasted in any attempt at deciphering such nonsense, and I have not even cumbered the pages of this work with a list of these new species." It is indeed unfortunate that the interesting character of the European fauna should be obscured by the treatment it has received at the hands of its students. The fresh-water mollusca, in particular, exhibit a wonderful polymorphism, which in the highest degree merits the attention of the evolutionist; but when every varying phase is designated a species the result is mere chaos. When I lived in England, I knew of a number of ponds producing special forms of *Limnæa* (particularly *L. stagnalis*), which were so different that they could be recognized at a glance; one of the most distinct of these varieties abounded in a pond no bigger than a large rug, and was found nowhere else. The same sort of thing is true of the European naiades, and a careful comparative study of all the forms called species by the Bourguignat school, with an account of the several conditions under which they exist, would be an extremely valuable contribution to biology.

As is inevitable in so great a work, a few errors of nomenclature occur. The new genus *Dromus* will be considered by some too similar in name to *Dromius*, Bon., but I think it should be allowed to stand. The genus *Nodularia* Conrad, 1853, is preoccupied by *Nodularia* Oken, 1815. This will apparently oblige us to call the genus *Lanceolaria* Conrad, with *Lanceolaria grayana* (Lea) as the type, while the section of *L. douglasiæ* (Gray) can be called *Nodularidia* n.n. On p. 851, *Ptychorhynchus incertus* should be *P. murinus* (Heude), and on p. 897, *Spatha tristis* should be *S. rochebrunei* Jousseaume.

T. D. A. Cockerell.

East Las Vegas, N. M., May 12, 1901.

SCIENTIFIC JOURNALS AND ARTICLES.

The leading article of the *Botanical Gazette* for May is the 'Genetic Development of Forests of Northern Michigan, a study in Physiographic Ecology,' by H. N. Whitford. The factors that influence tree growth are divided into three groups—climatic, ecologic and historical. Favorable climatic factors make possible a forest formation; ecologic factors bring about the plant society condition; and the historical factors, by changing the physiographic features, change the plant societies. The life histories of five series of plant societies are discussed, *viz.*, sand, clay, rock, swamp and clearing societies. In four cases there is a gradual progression from xerophytic societies to a mesophytic forest. In the case of the swamp the progress is from hydrophytic societies to a mesophytic forest. The article is illustrated with eighteen half-tone reproductions of photographs. E. W. D. Holway contributes his third paper on 'Mexican Fungi,' in connection with Dr. Dietel, describing thirty-one new species of Uredineæ. Mr. G. M. Holferty gives the results of his study of the ovule and embryo of *Potamogeton natans*, clearing up a number of gaps in our knowledge of this primitive monocotyledonous type. The paper is illustrated by two excellent plates. Mr. Charles T. Druery, of London, writes upon 'Fern Variation in Great Britain,' and calls the attention of American students to the great scientific value of looking after fern 'sports.' Mr. D. G. Fairchild, agricultural explorer of the U. S. De-