this tabulated evidence of careless proof-reading.

The reviewer has found it difficult to give a satisfactory account of the contents of the second and third chapters in a short review, so that those who may wish to follow the author's applications of his fundamental ideas must read the original.

H. C. JONES.

JOHNS HOPKINS UNIVERSITY.

*Text-book of Organic Chemistry.* By A. BERNTHSEN. 2d English Edition, translated by G. MCGOWAN, from the 4th German Edition. London, Blackie & Son. New York, D. Van Nostrand. 1894.

The general excellence of this work is indicated by its reception both in German and in English speaking countries. Four German editions in six years have been found necessary, and the second English edition will probably be even more extensively used than the first. The present book is a work of about 575 pages, fifty more than the previous edition, and occupies a position between the elementary and the encyclopedic text-book. As stated in the preface, the descriptive part is condensed as far as possible, and special emphasis put upon summarizing the characteristics of each class of compounds. There are frequent valuable tables of the principal properties of important classes of compounds. The subject-matter is treated in a way showing the intimate knowledge of the literature to be expected from a chemist like Bernthsen, though it seems strange that he makes no reference to American periodicals, but seems content to use the often imperfect abstracts in the foreign journals. The fourth German edition was published in 1893, and the subject is well brought to that date. A point would have been gained, and the value of the book greatly enhanced, had the translator brought to the date of publication of the English editions at least those chapters which treat of classes of compounds on which important work was done in 1893 and 1894. I refer particularly to the sugars, terpene, etc. The translation is good, though sometimes too literal. Many German expressions have crept in, and do not make the matter any clearer. In the text, formulæ of substances are frequently used instead of names. It would be better to use names only, but if $P_2S_5$ is used in one place because it occupies less space than Phosphorus Pentasulphide, it should be used always, and the one should not appear on one page, and the other a few pages further on. On the whole the work is well adapted to the needs of those American colleges in which organic chemistry can receive the time and attention it deserves. With it a mature student can easily get a good working knowledge of the subject. For undergraduate work, as carried on in most of our colleges, a less ambitious course, thoroughly given and embodying the use of a smaller text-book, seems desirable.

FELIX LENGFELD.

UNIVERSITY OF CHICAGO.

*Systematische Phylogenie der Protisten und Pflanzen.* ERNST HAECKEL. Jena, 1894, Pp. 400.

Prof. Ernst Haeckel, of Jena, has recently begun an extensive work on the systematic evolution of animal and plant life. It is to be in three parts, the first of which has just appeared as the '*Phylogeny of the Protista and the Plants.*' The second part, on the phylogeny of invertebrates, and the third part, on that of vertebrates, are also promised during the present year. In the present volume the author outlines his plan and presents in the opening paragraphs the main data upon which his phylogenetic trees are based, namely, the three branches of natural science, palæontology, ontogeny, or the life history of individuals, and morphology. The work as a whole is in

Haeckel's most attractive popular style, and is divided and subdivided into titles and headings, thus making it delightful for reading and reference.

The first organisms, he imagines, were Monera, or '*Probionten*,' which were small homogeneous plasma particles with no anatomical structure. Life activity here was limited to mere assimilation and growth, and where the latter exceeded a certain limit of cohesion of the constituent plasm the organism split into two parts and thus formed two organisms. This was the beginning of reproduction and of inheritance. The homogeneous protoplasm of these Monera was an albuminate arising from a mixture of water, carbonic acid and ammonia. The origin of life, therefore, is little more than this particular combination of inorganic parts at a certain period. While it is probable that the Monera were widely created at this period, the atmosphere, temperature, etc., being in the proper condition, it is not probable that they have been produced spontaneously since then. Haeckel states the stages in this creation as follows: 1st. Nitro-carbon compounds were formed by the synthesis and reduction of various acids and salts. The composition was about the same as that of albumen. 2nd. The albumen molecules with water formed crystalline, but as yet microscopically invisible, molecules. 3rd. These albumen groups arranged themselves in definite ways and formed microscopically visible plasma granules. 4th. These plasma granules had the power to assimilate food, a chemical change, and to grow, and at the limit of cohesion to divide and form new ones. These homogeneous plasma granules were *Monera*.

All of this, however, is hardly new to the readers of Haeckel. The greatest novelty of this work lies in his radical views as to the re-classification of animals and plants. He first separates them on the old lines according to their mode of nutrition. Plants are essentially formative organisms and have the power by the thermal energy derived from the sun's rays to change inorganic into organic combinations, taking up carbon dioxide and throwing off oxygen. Animals, on the other hand, are just the reverse; with them the chemical energy of combinations is reduced to heat and motion. It follows that plants must have been the first forms of organisms on the earth, because they only are able to transform by the energy of the sun's rays inorganic substances into organic. Animals were developed secondarily from the plants by a process of parasitism. That is, some of the plants began to absorb and assimilate parts of other plants, thus changing from an inorganic, carbon-dioxide diet to an organic mode of nutrition. This process of nutrition-change, known as *metasitism* (*metasitismus*), is familiar in certain of the higher plants which have acquired the power to absorb solid nutriment, for example, the insectivorous plants. Haeckel derived the original name then from the original plant by a mere change in nutrition. Metasitism plays a most important part in the new theory, and in this book is given more importance than it has hitherto received.

From this original homogeneous substance the several parts of the cell, as it is known to-day, were derived by a process of differentiation. Certain parts of the plasm, by reason of their position, became adapted for the acquisition of food, while the internal parts, unable to take in food, gradually assumed reproductive functions, and in time came to have a certain definite form; thus arose the cell nucleus. The outer portion of the cytoplasm, in addition to its nutritive function, gradually acquired a protective function also, and membranes were differentiated. Later, by a process of incomplete cell division, colonies of these simple cells were formed, and from these the higher cell aggregates were derived by a process of division of labor. Haeckel supposes, from the almost universal appearance of nuclei in cells, that this differentiation, into nucleus and cytoplasm, must have taken place at a comparatively early period, and that all of the forms of life which have a nucleus must have been derived from one early nucleated type, for he is a firm believer in the inheritance of acquired characters.

The primitive plants, from which all of the organic world has been derived, are called 'Probiontes' or archephyta. From this primitive stem, which was non-nucleated type, and composed of absolutely homogeneous protoplasm without indications even of the 'micellæ,' of Hertwig, or the 'Schaumplasma,' of Butschli, were given off the primitive nucleated plant types of the Flagellata in one direction, and the primitive non-nucleated animal (Moneran) types in another. In addition to these two derivatives there was a third, which represents the original chlorophyl bearing plant. These were the *Cyanophyceæ* or Chromaceæ, in which the chlorophyl is not in the form of small plates, but exists as a diffuse coloring matter within the cell. From these forms, which also were non-nucleated, the Bacteria arose by a process of metasitism.

In the primitive plant types of Flagellata the nuclei have not acquired a distinct differentiation, but remain absolutely homogeneous (*i. e.*, not divisible into nuclein, paranuclein, etc.), and therefore represent the first and most primitive forms of nuclear differentiation. These are not derived from the Monera or non-nucleated animal types, but come directly from the primitive plant type or the Archephyta. He gives the name Mastigota to these early flagellated plant cells which belong to the class of Palmellaceæ, and from them he derives all of the higher plants and animals, the latter arising polyphyletically by the process of metasitism. The rise of the higher animals and of man is traced in a direct line down to these primitive plants. The first step in the scale is the origin of the animal Flagellates by change in the method of nutrition and consequent loss of chlorophyl or allied bodies. Then comes the formation of colonies and gradual division of labor until the highest type of protozoon organization is attained. This type is represented by the form *Catallacta*, which is thus the connecting link between the protozoa and metazoa. Volvox occupies a similar position in the phylogeny of the higher plants in their relations to the protophyta.

In general it may be said that this part of the 'Systematische Phylogenie' is a revision of the earlier views of Haeckel. The one essentially new feature is the division line which he makes between plants and animals. This border line has been the subject of contention between zoölogists and botanists for ages, and now he proposes to form a hard and fast distinction. The dividing line is the ability of the organisms, whatever they may be, to form chlorophyl or similar bodies, and thus to derive nourishment, in conjunction with solar energy, from inorganic substances. This, as may readily be supposed, makes havoc with our existing classifications, and the changes will be accepted, if ever, only after much contention. For example, the Fungi (Chytridiaceæ, Zygomycetes and Ovomycetes) are taken from the vegetable kingdom and transferred to the animal, and with them the Saccharomycetes (yeast) and the Bacteria. The latter he claims have absolutely no connection with the fungi—"*Indessen beruht diese Auffassung nur auf der Macht der dogmatischen Tradition und nicht auf welchem rationellen Urtheil*"—is Haeckel's forcible way of representing this position.

On the other hand, many of our so-called Protozoa are taken into the Protophyte division of plants. All forms which have coloring matter in the form of chlorophyl, and are, therefore, holophytic in their mode of nutrition, are transferred to the vegetable kingdom. The greatest drafts are upon the group of Flagellata, which are so often provided with chromatophores. He does not take the Radiolaria, however, with their 'yellow cells,' probably for the reason that they are symbiotic forms. This will probably be the sticking point in such a classification, for even if the dividing principle be admitted, the difficulty will ever be to decide, in these low forms, what is true chlorophyl formation and what symbiosis. The discoveries of Famintzin and Entz show that in many of the lower forms the presence of chlorophyl is due to minute plant cells which live independently of the animals with which they are associated. Before the classification can be complete it must be determined for each form whether the chlorophyl is a symbiotic plant or a natural product. GARY N. CALKINS.

GEOLOGY.

*Kansas River Section of the Permo-Carboniferous and Permian Rocks of Kansas.* CHARLES S. PROSSER. Bulletin Geol. Soc. America, Vol. 6, pp. 29–54. 1894.

In the above paper Professor Prosser considers the historic section of the Upper Paleozoic rocks as exposed along the upper course of the Kansas River. As is well known, the early geologists of the State engaged in a most animated controversy over the correlation of the geological formations of this region. Although the investigations of Meek, Hayden, Hawn and Swallow began more than thirty-five years ago and were vigorously conducted for a number of years, still the subject was not settled, and many of the points at issue between the disputants are still open for decision.

The author describes various typical geological sections as exposed in the steep bluffs of the Kansas river and its tributaries, giving the distinctive geological characters and fossils of the various divisions. In connection with this description, there is a complete review of the previous geological work, followed by a chart of tabulated sections, on which the correlation of the early geologists is indicated.

Possibly the most interesting fact in the paper to a geologist familiar with the region, is the statement that the Cottonwood and Manhattan limestones are the same. This limestone, which is the most valuable stone in the State for construction, has been extensively used, and the author states that he has traced it across the country from Cottonwood Falls, on the Cottonwood River, to Manhattan, on the Kansas River. Another interesting fact in reference to the stratigraphical geology is the correlation of the buff, magnesian limestones near Fort Riley with those of Florence, in the Cottonwood Valley.

In conclusion, it is stated that this is only a preliminary paper and that the writer has in hand the preparation of a report in which a full description of the formations of Central Kansas will be given, with the distribution of their fossils and their general correlation.

## NOTES AND NEWS.

### FORESTRY AND ECONOMIC BOTANY.

THE steady increase of interest in forestry matters, so desirable and essential, has recently become evident in many ways, especially in the Eastern States. New York, Pennsylvania and New Jersey have taken long strides in the right direction in the shape of much needed legislation; and the establishment of forestry journals for the promulgation of knowledge respecting the nature and value of our native trees is a step that will receive commendation from thoughtful people everywhere. The South Jersey Woodmen's Association has shown wisdom in securing an official organ through which they may increase the scope of their influence. The first number of 'The New