not improbable that such an examination would enlarge somewhat the variation in distribution as above given. Indeed, in another connection Apstein cites four catches made in Dobersdorfer See upon the same day, in which the variation from the mean is 100% or more, in three instances out of the four. This wide variation is, however, explained by our author as due to the presence of intervening sand bars in the lake. The results of counting individuals of various species in the plankton taken on the same day at different localities show a uniformity less marked than that indicated by the volumetric determination. There is no indication whatever of the presence in the plankton of 'swarms,' which Apstein defines as a local accumulation of animals of one species in one locality while the surrounding area is slightly, or not at all, peopled by it. This uniformity in the horizontal distribution is due to the similarity of the chemical constituents in the water, resulting in a uniform growth of the phyto-plankton and the zooplankton depending upon it. It is thus primarily a matter of food relations.

The vertical distribution of the plankton was determined by the subtraction process, and is subject to the error produced by the progressive clogging of the net. It seems very desirable that this problem be attacked by the pumping method. Apstein's results indicate the accumulation of the greater part of the plankton in the surface stratum of 0–2 meters, in which from $1\frac{1}{2}$ to 60 times as much plankton is found (per cubic meter) as is present in a similar volume in the water below a depth of 2 meters. In this particular his results are in harmony with those of Reighard, Ward, and Birge upon our own lakes. Most organisms prefer the surface waters, only a few rotifers and *Entomostraca* actively seeking the deeper and colder strata. The vertical distribution of many forms, especially among the phyto-plankton, is closely linked with the life cycle. The maximum numbers occur in surface waters, and as these decrease and resting stages appear, they seek the deeper water, to increase again and rise to the surface as the maximum returns.

Apstein still maintains that plankton-rich and plankton-poor waters are characterized by the predominance of the *Chroöcocaceæ* and *Dinobryon* respectively. Reighard has shown that these criteria cannot be adopted for Lake St. Clair, and later work is making it still more evident that waters may be rich or poor in plankton quite irrespective of the conditions attending such diversity in the lakes of Holstein. The suggestion that plankton-rich waters are occasioned by the abundance of water-fowl is of questionable value, though local data may seem to support it.

Only those familiar with the routine of plankton investigation can appreciate the vast amount of work which Apstein's book represents, though his results will command the attention of everyone interested in the œcological side of biology. The science of fresh-water planktology is still in its infancy; its methods are as yet imperfect, and its problems are so intricate that years of continuous investigation in a number of localities will be required to establish broad generalizations. Dr. Apstein has been a pioneer in the field, and the great value of his work lies in its exploratory character and in his suggestive mapping out of the problems of planktology.

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GEOLOGIC ATLAS OF THE UNITED STATES. FOLIO 25, LOUDON, TENNESSEE, 1896.

THE Loudon folio, recently published by the U. S. Geological Survey, represents that portion of the Appalachian province which is situated between the parallels 35° 30′ and 36° and the meridians 84° and 84° 30′. This area contains 968 square miles, divided between Blount, Monroe, Loudon, Knox, Roane and Morgan counties of Tennessee.

The folio consists of a topographic map, a geologic map, structure sections, stratigraphic sections, a map of the economic resources, and descriptive text. The author is Arthur Keith.

The text begins with a general description of the Appalachian province and points out the relations of this part to the others, with regard to its surface features. The local features of the drainage by the Tennessee river and its tributaries, Emory, Clinch, Tellico and Little Tennessee, follow next in description.

The various forms of the surface are pointed out, such as the Great Valley of Tennessee and the portions of the mountain district and the Cumberland Plateau, by which it is bounded, and the relation between these forms and the underlying rocks is made clear.

Under the heading 'Stratigraphy,' the geologic history of the Appalachian province is presented in outline, and the local rock groups are fully described in regard to composition, thickness, location, varieties and mode of deposition. The formations, thirty-three in number, range in age from Cambrian to Carboniferous, far the greater part being Cambrian and Silurian. The mountain district is chiefly underlain by the Ocoee series, whose age is doubtful. Rocks of Carboniferous and Devonian age occupy two small belts on either side of the Great Valley, and Silurian and Cambrian strata are repeated in narrow belts along the Great Valley. Limestones, shales and interbedded sandstones make up the Silurian and Cambrian strata; sandstones and shales, with coal seams and a limestone near the base, constitute the Carboniferous, and the Ocoee rocks are conglomerate, sandstone, slate and limestone.

The details of the strata are graphically represented in the columnar section. The different manner in which the formations decay is discussed, and the dependence of the residual soils and surface forms on the nature of the underlying rock. Great changes occur in the formations of this region, and the Knox dolomite is the only one which is uniform throughout. The direction of change was exactly reversed between Cambrian and Silurian time.

In the discussion of 'structure,' after a general statement of the broader features of the province, two methods are described in which the strata of this quadrangle were deformed. Of these the extreme Appalachian folding, accompanied by faulting and metamorphism, is by far the most prominent and is about equally developed throughout the quadrangle. Faults, especially, are most strikingly exhibited here. Deformation by vertical uplift also is exhibited, but only in comparison with broad surrounding areas. In this quadrangle the Great Valley is at its narrowest, on account of the extreme shortening in deformation. The structure sections illustrate the sharp folds and frequent faults into which the strata were forced.

Economic products of this region are coal, variegated marble, red hematite, building stone, lime, clays, timber and slate. The outcrops of the formations containing these are illustrated on the economic sheet, together with the locations of the mines and quarries. The iron ore and slate are of minor importance now; the coal district is a part of the great coal basin of Tennessee, on the same formations as the chief mining center of the State; and the marble belts are a part of the principal productive region for that stone. Various conditions affecting the value of these deposits are pointed out, and the associations and availability of the building materials and timbers are discussed.

FOLIO 27, MORRISTOWN, TENNESSEE, 1896.

The Morristown folio, also recently published, by the same author, deals with that portion of the Appalachian province which is situated between the parallels 36° and 36° 30′ and the meridians 83° and 83° 30′. This area contains 963 square miles, divided between the counties of Greene, Cocke, Jefferson, Hamblen, Grainger, Claiborne, Hancock and Hawkins, all in Tennessee.

Included in the folio are topographic, economic and geologic maps, structure and stratigraphic sections and five pages of descriptive text.

After a description of the broader features of the Appalachian province, the local geography is analyzed. The various types of surface features are pointed out and their relations to the underlying rocks are shown. Local facts, such as elevations and the drainage by the tributaries of the Tennessee River, the Nolichucky, French Broad, Holston and Clinch Rivers, are detailed.

Under the heading 'Stratigraphy' the geologic history of the Appalachians is presented in outline. This is followed by a detailed account of the local rock groups in regard to their location, composition, thickness, variations and mode of deposition. The soils and forms of surface produced by each formation are discussed with the formations. Twenty formations are distinguished in this quadrangle,

ranging from Cambrian to Carboniferous, far the greater portion being Cambrian and Silurian. The rocks of Carboniferous and Devonian age are found only in two narrow belts in the ridge district and are represented by only four formations. Over the rest of the area Cambrian and Silurian strata are about equally divided. A great variety of limestones, shales and sandstones compose the Cambrian and Silurian rocks, shales and sandstones the Devonian, while only limestone appears in the Carboniferous. Great changes take place in the Silurian strata, and limestones on the northwest are represented by shales and sandstones at the southeast. The general character of the formations is graphically represented in the columnar sections, one being drawn for each of the two chief geologic districts.

In the discussion of structure, after a general statement of the broader features of Appalachian structure, the two types of deformation shown in this region are described, and instances are pointed out in the structure sections. In the ridge district the most prominent feature is the faulting, which has cut the strata up into long, narrow blocks and produced the characteristic ridge topography. Southeast of Holston River the rocks were deformed by close folds. Deformation by vertical uplift is also existent in this region, but it can be observed only in comparison with other and larger areas. In the structure sections most of the details of the different structures are shown.

Economic products of this region are marble, building stone, lead, zinc, lime, cement, clays and timber. The outcrops of the formations containing these are represented on the economic sheet as far as possible, together with the locations of mines and quarries. The principal industries are the production of zinc and marble; the timbers and water-powers are also of general importance. The various conditions which affect the development of these resources are discussed.

SCIENTIFIC JOURNALS.

AMERICAN CHEMICAL JOURNAL, JULY, 1897.

On the Decomposition of Diazo Compounds: By W. E. CHAMBERLAIN, G. F. WEIDA and W. BROMWELL. The three papers contained in this number of the journal on this general subject give the results obtained in the study of the action of methyl alcohol on certain salts of diazobenzenes and diazotoluenes. Chamberlain, following up the suggestion of Remsen and Dashiell, found that, while under ordinary atmospheric pressure the main reaction between methyl alcohol and paradiazotoluene nitrate consisted in the substitution of the methoxyl for the diazo group, yet when the reaction took place under diminished pressure the hydrogen reaction was more favored. With an increase in the pressure the product remained as under ordinary pressure. When sodium methylate is used, and when an alkaline carbonate is added to the alcohol, only the hydrogen reaction takes place. Beeson found that alkalies and zinc dust would not only cause the formation of benzene, by the decomposition of a salt of diazobenzene, but also of diphenyl. The author of this work was, however, unable to obtain any ditolyl from an analogous decomposition of diazotoluene, probably owing to some different conditions of temperature at which the reactions take place.

Weida has compared the results of the decomposition of the three nitranilines and aminobenzoic acids with methyl alcohol, with the results obtained by Remsen and Graham when ordinary alcohol was used.

In the case of the orthonitrodiazobenzene sulphate the only product was nitrobenzene; but the meta- and para-compounds gave a small amount of nitranisol beside the nitrobenzene. The salts of the diazobenzoic acid did not act as they did when treated with ordinary alcohol, but showed a tendency to give the alkoxy reaction. They all gave as the principal product the ethereal salt of the corresponding methoxy acids.

Bromwell followed the same line of research as Chamberlain, using, however, the ortho-compound where the latter had used the para. He found that the ortho-compound decomposes at a lower temperature and gives the alkoxy reaction as the other does. When orthomethoxytoluene was treated with cold concentrated sulphuric acid a monobasic sulphonic acid containing one acid residue was formed, and when it was oxidized the corresponding benzoic