reau of Entomology, by Mr. C. P. Clausen, parasite expert of the bureau, at the request of Professor Kuwana. It is to be hoped that the paper will be reprinted eventually, but since several new Japanese species of scale insects and hymenopterous parasites have been described in the paper it seems desirable to give a brief statement as to its contents.

The new species of Coccidae described are the following: *Prontaspis yanonensis,*[1] a close relative of *Chionaspis citri* Comst., from many species and varieties of *Citrus; Geococcus citrinus,* the second representative of this peculiar Pseudococcine genus, on roots of orange; *Rhizoecus kondonis,* another Pseudococcine species, from the roots of orange trees, and *Orthezia yasushii,* stated to occur on wild chrysanthemum and *Artemisia vulgaris.* In addition, the three species of *Ceroplastes* occurring in Japan, *rubens,* Mask., *floridensis* Comst., and *ceriferus* (And.), and *Geococcus oryzae* (Kuw.), previously considered to be a *Ripersia,* are discussed at length. An extended description of the different stages, accompanied by numerous quite satisfactory figures, is given for each species, and the description is supplemented by a discussion of the biology and host relationships of the species where information on these has been obtained.

The second article in this bulletin, as indicated by the title, consists in part of a consideration of the hymenopterous enemies of the introduced coccid, *Ceroplastes rubens,* and in part of technical descriptions of new Encyrtids. An extended discussion of the biology, habits, host relations and economic importance of the two species *Micropterys speciosus,* described as new, and *Coccophagus lecanii* Fitch is given, together with descriptions, accompanied by figures, of the different stages of each species. The general conclusion is reached that neither is effective in checking the increase and spread of the coccid host.

The second part of the paper describes the following new genera and species of Hymenoptera, all from Japan: *Clausenia,* new genus, and *C. purpurea,* new species, reared from *Pseudococcus* sp. on Citrus; *Neocopidosoma,* new genus and *N. komabae* new species, from a Tortricid larva on *Elaeagnus; Cheiloneurus ceroplastis,* new species, from *Ceroplastes rubens* and *C. ceriferus; Anabrolepis japonica,* new species, swept from bamboo infested with *Eriococcus onukii; Anabrolepis bifasciata,* new species, collected by sweeping: *Aphycus timberlakii,* new species, from *Lecanium* sp. on *Euonymus; Microterys ericeri,* new species, from *Ericerus pe-la* on Ligustrum.

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[1] First described (in Japanese) as *Chionaspis yanonensis* (Byokin Giachu Iho. Bur. Agr. D. H. Agr. and Comm. Japan, No. 10, 1923, pp. 1–33).

## SPECIAL ARTICLES

### GLACIAL PEBBLES IN EASTERN KENTUCKY[1]

WITHIN the last year (1923–24) the discovery of erratic pebbles of apparent glacial origin widely distributed throughout northeastern Kentucky has provided the first concrete evidence in support of a hypothesis of Pleistocene glacial ponding in a part of Kentucky heretofore thought to be without glacial characteristic. The occurrence of old elevated stream channels along the Ohio, notably at Huntington, West Virginia; Ashland, Kentucky; Ironton, Wheelersburg and Portsmouth, Ohio, has been known for some time, having been described by Leverett[2] and Tight.[3] These abandoned channels occur at elevations ranging from 680 feet to 690 feet above sea level. While they contain gravels chiefly composed of quartzite and chert of stream origin, possibly more remotely glacial, they are not to be confused with the pebbles which are now being found in remote parts of eastern Kentucky at much higher elevations.

In the course of non-glacial field work geologists on the Kentucky Geological Survey, including the writer, have found 18 pebbles varying in size from a few ounces to 13 pounds, consisting principally of quartzites, but with an occasional granite, gneiss or other crystalline or metamorphic rock. These pebbles range in elevation from 720 feet on the Big Sandy River to 850 feet on the North Fork of the Licking River, and have been found in Lawrence, Elliott, Lewis, Morgan, Carter and Boyd counties. Field evidence indicates that similar pebbles may also be found at similar elevations in parts of Menifee, Greenup and Rowan counties, though these are not a certainty. The drainage systems involved in these discoveries include the Big Sandy River, Little Sandy River and Tygarts Creek, and the North and Elk Forks of the Licking River.

Based on evidence now in hand, which will be supplemented this year by further investigations, the following hypothesis is advanced:

The general accordance of elevations of these pebbles coupled with their certain extraneous origin and decidedly glacial characteristic suggests their invasion into Kentucky by means of floating ice. It is held that they probably represent a complex assortment derived from both river and glacial front sources during the period of readjustment of the northward flowing drainage of this portion of the Cumberland plateau, while cols were being degraded to form the present course of the Ohio River at points just above (1) Ironton, (2) Portsmouth and (3) Manchester, Ohio, and possibly just above Cincinnati. It is

[1] Presented before the Kentucky Academy of Science, Lexington, Ky., May 10, 1924.

[2] Monograph XLI, U. S. G. S., p. 106, 1902.

[3] Prof. Paper No. 13, U. S. G. S., Plate XV2, 1903.

thought that the higher and more remote pebbles (800 to 850 feet) represent invasions by floating ice at the time of the first cutting of the Manchester col, which may have been originally about 850 or 900 feet. Ridges in the vicinity of Manchester now show elevations ranging up to 1,000 feet above sea level. Pebbles occurring in Kentucky at points near to the major drainage at elevations ranging from 720 to 750 feet are taken to represent subsequent ponding during the latter cutting of the Manchester col, and possibly those at Ironton, Portsmouth and Cincinnati. Ridge elevations at Ironton now range between 800 and 850 feet; at Portsmouth between 900 and 950 feet; and at Cincinnati (Dayton, Kentucky-Walnut Hills, Ohio) between 850 and 860 feet.

The section involved in this ponding in eastern Kentucky has not been topographically mapped except in part. Barometric elevations run throughout this section indicate that the highest ridges will range from 1,000 to 1,200 feet. At the highest level of ponding, ridge topography in this section would have appeared insular, the region resembling somewhat the Thousand Islands region of the St. Lawrence. A study of the elevations of these pebbles, their position and the gradient of some high level fluvatile gravels and terraces may possibly bring out the fact of uplift in the southwestern part of the section subsequent to the Pleistocene. The period of ponding at an elevation of 850 feet appears to have been short, as terraces apparently were not widely developed. There is no evidence now in hand to prove the extension of glacial ice lobes into this part of the state. Stratified drift is absent and ridge topography does not show a general beveling. Ponding in northeastern Kentucky at this time very possibly covered an area of about 2,000 square miles.

The occurrence of pebbles at high levels on that part of the drainage of the Licking River which adjoins the Little Sandy River may mean (1) that these ponded glacial waters flowed over one or more low divides in this interior part of Kentucky, and (2) that these southern cols were in direct competition for a time at least with those which were removed at such northern points as Manchester and elsewhere. To accept this theory the assumption of regional uplift in Morgan County and vicinity during and subsequent to the Pleistocene becomes a necessity. Yet this assumption would seem to be far more plausible than (1) a high damming of the Licking River and (2) glacial ice floating southeastward along the serpentine course of the Licking over 100 miles to the Elliott County line.

If the Morgan–Elliott County passes thus brought into prominence were indeed temporary debouchures for impounded glacial waters, to the superior hardness of the lower Pottsville clastics of this region and some coincident regional uplift may be ascribed the present course of the Ohio River bordering northeastern Kentucky. Had the Coal Measure sediments of Morgan and Elliott counties less competently met the erosive action of surging glacial waters the course of the then formative Ohio River would undoubtedly have been directed up the valley of the Little Sandy River and down the Licking River. Such a hypothetical change in the pattern of the Ohio River would have (1) reduced the area of Kentucky by 2,500 square miles, (2) placed Lexington, the heart of the Blue Grass Region, within 35 miles of the Ohio, and (3) profoundly altered the history and economics of the entire lower Ohio valley.

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## TEMPERATURE AND MUSCULAR EXCITABILITY

THE influence of temperature on muscular excitability is a problem yet unsettled, although numerous investigations on it have been published. Controversy continues among investigators, who have found different optimal temperatures; some place the optimum at or near 30° C., while others have found it at or near 5° C., and still others have determined two optima situated at these two levels.

The majority of investigators have taken the height of the contraction curve as the indicator of muscular excitability. This indicator, however, is not accurate because many factors may modify it. In my experiments I have used the threshold of contraction when induced break shocks, measured by Martin's method[1] in Z units, were applied to the gastrocnemius muscle of the frog. After the animal was pithed the muscle was excised and placed in a moist chamber surrounded by a water-jacket. The Achilles tendon was directly connected to the myograph. Temperature changes were induced gradually to insure a close correspondence between the reading of the thermometer in the moist chamber and the actual state of the muscle. The threshold was assumed when a minimal movement of the lever made its mark on the drum. The changes in the temperature were made in different ways. At times room temperature was the point of departure, and the temperature was lowered or raised gradually. At other times the start was made from high or low temperature. In the course of longer experiments the range was traversed repeatedly; up and down, down and up. A determination of threshold was usually made after each increment or decrement of one degree.

The results which I have obtained prove that the

[1] Martin: "The Measurement of Induction Shocks," New York, 1912.