number of genera and subgenera in the check list, but this is evidently a pure *lapsus*, as only eleven are omitted in his paper, viz., *Endomychura, Cymochorea, Phœbastria, Palassicarbo, Rhyacophilus, Uranomitra, Burrica, Chelidonaria, Pachysylvia, Myiobius* and *Neocorys*.

Witmer Stone

SPECIAL ARTICLES

SOME OLD-WORLD TYPES OF INSECTS IN THE MIOCENE OF COLORADO

The work of the past summer at Florissant has yielded us a large collection of fossils from the Miocene shales. Most of the material awaits examination; but a few things of unusual interest have been examined, and these have been found to include some forms allied rather to those of the Old World than to those now inhabiting this continent. A brief notice of these is now given. The specimens themselves were exhibited at the recent Zoological Congress in Boston.

DIPTERA

Glossina oligocena (Scudder)

A very good specimen, found at Station 14 by Mr. Geo. N. Rohwer. The mouth-parts are preserved, as also the body, wings and legs, all agreeing so well with the modern tsetse flies that generic separation is impracticable. The genus *Glossina* is to-day confined to Africa, and although placed by Austen in the Muscidæ, is a very peculiar type, better regarded as belonging to a distinct family Glossinidæ. The fossil species is not new, but was described by Scudder as *Palæstrus oligocenus* in 1892,—a supposed new genus of Œstridæ. Scudder's type, which has been compared with the new specimen, lacked the head and other important parts, otherwise its true position would certainly have been recognized.

The former existence of a tsetse fly in America is of particular interest as having a possible connection with the disappearance of some of the Tertiary Mammalia, as Professor Osborn had suggested.

HYMENOPTERA

Perga coloradensis sp. nov.

A good specimen from Station 14 (W. P. Cockerell). A large sawfly, about 27 mm. long and very robust; referable to the Australian genus *Perga*, and similar to *P. schiodtii* Westwood, from New South Wales, but larger, the antennæ longer and with a larger club (length of club, 3 mm.), stigma much more slender, virtually rudimentary, an interval of more than 1 mm. between the basal and cubital nervures at their place of approximation, and the scutellum and prothorax dark like the rest of the thorax. The anterior wing is 20 mm. long, and the basal nervure meets the transverso-medial. Konow makes the tribe Syzygoniides to include two Australian genera (with thirty-seven species between them) and two Brazilian genera (with three species between them). The fossil is clearly of the Australian, not the Brazilian, type, suggesting that the route of migration was a northern one, *via* Asia.

NEUROPTERA

Halter americana sp. nov.

A wonderfully preserved example with the wings spread, from Station 13 B (S. A. Rohwer). The anterior wings are clear hyaline, 31 mm. long, with the venation as usual in the genus; hind wings (as in all the Nemopteridæ, to which family it belongs) very long and narrow, length 46 mm., with an apical fiddle-shaped expansion, which is dark colored. The Nemopteridæ are to-day confined to the Old World, except a single species of *Stenorrhachus* found in Chile. The Florissant insect is not of the Chilian genus, but belongs to that section of *Halter* which includes the Persian *H. extensa* (Oliv.). In *H. extensa* the black area of the hind wings is broken into two, whereas in the fossil it is solid and continuous. The persistence of such an extremely peculiar type through such a long time and such migrations indicates a remarkable degree of stability.

Panorpa arctiiformis sp. nov.

Station 14 (W. P. Cockerell). A spotted species, looking like an Arctiid moth; wings about 13 mm. long. Close to *P. rigida* Scudder, already described from Florissant, but larger, with the third band (the last before the dark apex) much broader. Among the living

species, it resembles *P. nuptialis,* Gerst., from Texas, and *P. picta,* Hagen, from Smyrna; but it is closer to the latter. In *nuptialis* the inner edge of the apical black area is straight, but in *picta* it is zigzag; in the fossil *arctiiformis* it is as in *picta.*

One of the new plants obtained this year in the Florissant Miocene is of interest in the same connection. It is *Heyderia coloradensis* sp. nov., an incense cedar very closely allied to the living *H. decurrens* (Torrey) K. Koch, of California. The larger leaves are about 5½ mm. long, perhaps less acutely pointed than in the living plant, but in arrangement and general structure quite the same. I follow Dr. N. L. Britton in separating *Heyderia* from the *Libocedrus* of the southern hemisphere; the genus contains two living species, one in California, the other Asiatic. Our fossil agrees very closely with a specimen in the herbarium of the New York Botanical Garden which was collected by Torrey in 1865 in the grove of *Sequoia gigantea* in California. As showing the persistence of a "plant association," it is interesting to note that the fossil species also grew by or under *Sequoia* trees, as is proved by a fragment of *Sequoia haydeni* on the same piece of shale, touching the *Heyderia. Sequoia haydeni,* the Florissant redwood, is the *Hypnum haydeni* of Lesquereux, a fragment of it having been originally described as a moss!

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CENSUS OF FOUR SQUARE FEET

THE approximate numbers of the fruits and seeds, the insects and other invertebrates present on a given area are data for which the student of economic problems has frequent need. It is important, therefore, to have a more accurate conception of the abundance of these items than is derivable from offhand estimates. The present paper is offered as a contribution to the knowledge of this subject, with the explanation that the results herein detailed are not held applicable to any classes of surface other than those examined, nor to any region but that of Washington, where the collections were made. However, it is probable they safely may be used as a basis for reasonable analogies with respect to other localities.

Pausing to note only that the investigation was undertaken primarily because of its relation to the study of bird food, the method used was as follows: areas, two by two feet, of forest floor and of grassy meadow, were examined in November and March, respectively. Everything on the surface of these plots and the ground itself, to the depth a bird easily can scratch, was removed and all plant and animal objects of classes known to be used as food by birds were counted. The following were obtained from the four square feet in the woods: Coleoptera 12, Hemiptera 7, Hymenoptera 8, spiders 11, other Arthropods 26, Annelids 9, Gasteropods 11, cocoons and insect eggs 27, or altogether 112 animal items; in addition there were 194 seeds and fruits. Assuming, as we may in perfect justice, that the plot in question was in no way exceptional, the analysis indicates that on the average there are present on each acre of forest floor in this locality 1,216,880 animals of the kinds above specified and 2,107,810 fruits and seeds.

From the four square feet of meadow there were collected: Coleoptera 61, Hemiptera 20, Hymenoptera 940, spiders 53, other Arthropods 127, Annelids 33, Gasteropods 20, cocoons and eggs 20, or altogether 1,254 animal objects; there were also 3,113 seeds. The averages per acre for meadows, therefore, are: Animals, 13,654,710, and seeds, 33,822,745. On first thought these estimates seem incredible. Hence in order to show that they are the result of the summing up of numbers, individually so small, that no one would question them, I present the following complete lists[1] of the living invertebrates and seeds from each area.

WOODS: INVERTEBRATES: *Chilopoda* 7; *Oligochæta* 9; *Thysanura* (including 1 *Japyx* sp.) 15; *Homoptera* (*Gypona* sp.) 2; *Heteroptera* (*Euschistus fissilis* 2, *E. tristigmus* 1, *Cryphula parallelogramma* 1, *Rhyparochromus* n. sp. 1) 5; *Coleop-*

[1] For the greater part of the identifications of insects the writer is indebted to Messrs. E. A. Schwarz, O. N. Heidemann and Nathan Banks.