the royal blood to entitle him to the throne, or, if his lineage be too strong, had we not better establish a democracy of insects and, by the suffrages of tortured animal life, relegate this buzzing busybody to his proper sphere?

Seriously, however, I am led to inquire whether there is not strong reason why we should make an effort to avoid the expression of lineal rank in groups of animals. The most specialized are often degraded in many respects, and there is no basis for the expression of rank except their phylogeny, and the higher groups of insects are certainly not connected in any lineal series, but represent divergent, or in some cases, perhaps, nearly parallel branches from some common ancestral form or group of connected forms. To place any one group as the head of a lineal series is to give an expression that is not present in nature.

Lists of insects may have to be written in a lineal order, but can we not emphasize more strongly the point that this order is not an expression of natural relationship?

Mr. Smith thought that the line of argument adopted by Messrs. Aldrich and Townsend was inconclusive, and that the article referred to carried with it its own refutation. He thought Mr. Osborn was correct in that the orders should be placed parallel, but that groups or families were more highly developed in some orders than in others. Mere specialization is never a test of rank in itself, and any line of argument that places the Hippoboscidae at the head of the insects as the highest in rank, is simply unworthy of attention, since it omits the intellectual or nervous development as a factor.

The Secretary read the following paper:—

THE LIFE-HISTORY OF THE NORTHERN MOLE-CRICKET— *GRYLLOTALPA BOREALIS*.

BY E. W. DORAN, PH. D., COLLEGE PARK, MD.

Although this is a common insect in many parts of the United States, it is not generally found in great numbers in any locality, and, notwithstanding its general distribution, the various stages of the insect seem not to have been described or figured.

While I am not yet able to clear up all the points in its history, I have studied the insect in all its stages, though I have not reared it from the egg to maturity, on account of the time required for it to develop—in all probability three years.

During the last six months I have had about fifty specimens in confinement, representing all the stages of the insect. They were nearly all obtained in one limited locality, about the edge of a small pond near the Maryland Agricultural College. I found every stage in this locality except the egg. Two females oviposited in the breeding jars, and I now have larvæ about two months old. I present the following description of the insect in all its stages :—

1. *The egg*.—The eggs were deposited in confinement in irregular heaps without any apparent arrangement. The number is only 40 to 50, though it is stated that *G. vulgaris* deposits 200 to 300. There is an irregular enlargement of one of the canals, about an inch and a-half in diameter, in which the eggs are placed.

The egg is of a dirty whitish or light brown colour, opaque, with no distinct external markings. Length, about 3 mm.; width, 1.7 mm. Shape slightly ovoid-reniform.

The date of the deposition is a little uncertain. May 20, 1892, I made extensive excavations in their burrows, but found no eggs, though I took three gravid females; one of these was dissected, and the eggs appeared pretty well matured, though not full size. Two females were placed in confinement, one had oviposited June 8, eggs from the second were not found till June 25. The eggs of the first had hatched June 18, ten days after they were found. The eggs of the second hatched between Aug. 1st and 10th, about a month and a-half after the first lot, and five or six weeks after they were deposited. Both were subjected to the same conditions.

2. *The larva*.—When first found the larvæ may have been a week old. They closely resemble in appearance the mature insect. Length, 6 mm.; antennæ long, 37 mm., anal stylets, 3 mm. Head and thorax shining black, with median dorsal line lighter. Abdomen lighter in colour than thorax; the dorsal part of each segment dark brown, the space between segments creamy; the first three rings very dark, the rest lighter, except the 7th, which is generally broad and dark. The underside of the body is creamy white. Anterior pair of legs light brown, middle pair with femora darker, posterior pair darker except at the joints, tarsus of first pair broad, toothed, as in imago. Legs and abdomen slightly pubescent. Before the first moult the larvæ have the power of leaping several inches. After this they do not seem to have this power, and are more sluggish in their movements. After the first moult they have the

power of ejecting a viscid, nauseous fluid for protection, and if several are confined in close quarters they invariably get badly "stuck up" if excited. After first moult the colour of the dorsal part of the abdomen is darker.

The larval stage evidently lasts about two years. Several specimens taken Jan. 4, 1892, were about 13 mm. long. These kept in confinement in a warm room during the winter moulted April 18th, when all died. They were then about 16 mm. in length. May 20, two or three larvæ were found which were very little larger than those taken in January before. They are said to be inactive in winter, hence had not grown so fast as those kept in a warm room. Along with these small larvæ were taken some about 18 mm. in length, but much stouter in appearance, all of which had pupated before June 18. These last larvæ were evidently about two years old, and after pupating were not distinguishable from pupæ taken at the same time.

3. *The pupa*.—After pupating they are about 29 mm. in length, with considerable increase in thickness, especially in the abdomen. There is a very slight change in appearance otherwise, except for the appearance of the small wing pads.

This stage evidently lasts almost a year. Those which pupated in June, or last of May, will not deposit eggs this year. They are yet (Aug. 15) pupæ.

4. *Imago*.—The mature insect has but short, apparently feeble wings, while the body is long and heavy, hence their powers of flight are evidently not great. The male measures about 31 mm. in length, while the female may reach 37 mm. or 38 mm. This stage has been described and figured in various publications.

Food Habits.—It is generally supposed that the mole cricket lives chiefly upon roots of grasses, etc. I much doubt that this is the usual food, and it is certainly not the entire food. In the wild stage the burrows are generally found in moist, sandy places near the water, often where no vegetation is found. They make long, winding channels, often six to eight inches deep, forming new burrows very much like a mole. This habit would seem to indicate that they are in search of animal food, especially angle or earth worms. In confinement they seem to feed but little, if at all, upon roots of grasses, and for several months they have had nothing but earth worms given them, and they seem to thrive upon this diet. If pressed by hunger they will readily devour the smaller or

weaker of their own kind. If two are confined in a small vessel over night one generally kills the other. Several of my specimens have been destroyed in this way.

Mr. Smith asked if it was known that some of the Acrididæ occasionally fed upon animal diet, and stated a case where a species of *Melanoplus* had been fed upon house flies.

Mr. Riley stated that several of the Acrididæ were known to be omnivorous, especially *Melanoplus spretus*. He also stated the experience he had had when in France in regard to a secret remedy a Frenchman had for destroying *Gryllotalpa*. Upon investigation, the secret remedy was found to be nothing but pouring soapsuds into the holes made by the insect.

Mr. Fletcher gave his experience with a specimen of *Gryllotalpa* in confinement in a glass jar. Potatoes were planted in the jar and the roots spread throughout the bottom of it. Meat was placed on top of the earth in the jar, but so far as he could notice the specimen ate nothing. It is a very animal-like insect, and is rare in Canada.

Mr. Hubbard thought that the *Gryllotalpa* was common in Canada, but was hard to find except in particular places.

Mr. Weed stated that he had the species sent for identification quite often, but it was rare except in particular places.

Mr. Riley then read a paper on "The Osage Orange Pyralid," by Mary E. Murtfeldt, Kirkwood, Mo. (Published in "Insect Life.")

Mr. Weed stated that the species was quite common in Mississippi, the moths having been taken abundantly.

Mr. Smith stated that the osage orange in some parts of New Jersey was seriously attacked by the Bag-worm, *Thyridopteryx ephemeraeformis*, which was the only thing that seemed to trouble it.

Mr. Riley then read the following :—

NOTE ON A BORER IN THE STEM OF THE RED CURRANT.

BY E. W. CLAYPOLE, AKRON, OHIO.

For several years I have observed traces of a borer in the tips of the twigs of my red currant bushes, whose habits did not correspond with those of any insect with which I am acquainted. My knowledge of the subject is very limited, and I consulted the department at Washington. In reply it was suggested that possibly it was the same insect which infested the tips of the raspberry, *Oberca tripunctata*. But the facts not