Since insect behavior is not an important part of most courses in entomology, there is good reason for giving this phase of bee life more than ordinary emphasis. This is especially desirable in view of the fundamental necessity of such knowledge to the beekeeper. It is far more difficult to outline laboratory work in behavior than in anatomy, but the teacher of beekeeping has the accumulated material from experience and investigation to suggest work of this character. A serious difficulty is that your courses do not all run into the summer, but the winter cluster, the brood diseases, the development and care of the brood, wax secretion, effects of accumulated feces, responses to changes in temperature, light and humidity are all readily studied even in mid-winter. Since the wintering problem is the most serious one which confronts the beekeeper you are justified in giving this much attention. The greatest possible amount of manipulation of bees should be provided, even though you sacrifice colonies for this purpose. Then one or two periods may profitably be devoted to the study of apparatus and by the time these things are covered it will usually be time for outdoor work, assuming that the course begins in mid-winter.

It may reasonably be assumed that my suggestions are instigated by a feeling that all the beekeeping courses are not up to the standard that I would set. While I have not had experience in teaching beekeeping, I nevertheless feel that by coöperation the present defects may be remedied. Several rather surprising experiences with former students of beekeeping in various sections of the country have induced me to say what I have said, but I prefer that my criticisms be taken as general, not specific. I trust that this first conference will be a step toward correcting deficiencies.

THE BEEKEEPING WORK IN MASSACHUSETTS¹

By BURTON N. GATES, *Associate Professor of Beekeeping, Massachusetts Agricultural College, Amherst*

1. INVESTIGATION, under the Massachusetts Agricultural College Experiment Station.

Experiments and investigation, theoretical and practical, are being carried on concerning bee diseases, color vision of bees, wintering and beeswax, together with minor investigations in other lines.

2. COLLEGE INSTRUCTION

Two courses are offered regularly enrolled, four-year students.

Entomology 8, Beekeeping, two lectures and one laboratory weekly during the second semester. Elective, primarily for juniors but open to seniors. A text-book has not been assigned.

¹ Virtually an outline of the paper as presented.

Entomology 10, Beekeeping. A course more advanced than the previous one, designed primarily for seniors, but juniors may elect it. One lecture and one laboratory weekly during the second semester. This is virtually a seminar, hence no one text-book is used.

For students of the Ten-Weeks' Winter School. Two lectures and one laboratory period weekly.

3. EXTENSION WORK

The Extension work in beekeeping has not been definitely provided for. It includes:

An Itinerant School, meeting once in three years at Amherst, otherwise at various points in Massachusetts. When at Amherst the school is of two weeks' duration, and has a staff of four to seven lecturers and demonstrators. Time devoted, a full day for five days each week. Excursions and special demonstrations are arranged for Saturdays.

Summer School. Ten lectures and laboratory practices are offered each year during summer school.

Correspondence Course. A correspondence course is provided those who may elect it. Twelve lessons are offered, based on Mrs. Comstock's "How to Keep Bees."

Annually, during Farmers' Week, a three days' convention is provided.

The College maintains an elaborate equipment which is displayed under a large tent, at a limited number of agricultural fairs each season. It is probable that this equipment will include jointly an apicultural display from the State Board of Agriculture.

4. STATE BOARD OF AGRICULTURE

The inspection work of the state is carried on by three deputy inspectors and one chief under the direction of the State Board of Agriculture. Also, the majority of the lectures and demonstrations at the meetings of the beekeepers' societies and at their field days, are paid for from the funds of this Board. However the expenses of some grange and other lectures are borne by the institution before which they are given. The State Board of Agriculture has a series of publications, now numbering ten, designated "Apiary Series." Emergency and other demonstrations are held under the provisions of the Apiary Inspection Act.

5. OTHER WORK

The Beekeeping Department of the College maintains a wax rendering station and has handled enormous quantities of raw material for the beekeepers of the locality. This has proven a pleasing feature of the apicultural service of the state.

It is the plan and purpose in directing the apicultural work of the state, to unify or centralize it and in so far as possible to correlate it. Thus the College and State Board of Agriculture join in certain features of the work. This is desirable from the standpoint of eliminating duplication.

THE COLUMBINE LEAF-MINER¹

By E. N. CORY, *College Park, Md.*

HISTORICAL

This insect was first described by Hardy in the *Annals and Magazine of Natural History*, Vol. 4, p. 385, 1849 (Second Series, No. 24), under the title "XL, on the Primrose leaf miner; with notice of a proposed new genus and characters of three species of Diptera, by Mr. James Hardy."

In this paper Mr. Hardy separates *Phytomyza* from *Chromatomyia* on the basis of the shape of the pupa and the place of pupation, the latter pupating in the leaf.

It is of interest to note that considerable credence was placed on the myth, that the coming of a flying serpent was forecast by the presence of the tracery of the leaf-miner on the leaves. In the words of Hardy: "A flying serpent will poison the air, which becoming impure will cause the death of 19 out of 20 (people); and that the time will be known by this particular appearance on the leaves, which the pseudo prophet calls the reflection of the serpent."

Hardy records the insect as appearing first August 13. Very little biological data of value is recorded.

Kaltenbach records the insect in "Die Pflanzenfeinde aus der Klasse der Insekten" 1872, p. 13, placing *Phyt. albiceps* Meig., *minuscula* Gour. and *ancholiae* Rob.-Des. in synonymy. He states that the larvæ begin to work in June following a winding course, ending in an enlarged spot and finally end their wanderings at the time of frost in the earth.

In this country Dr. W. E. Britton, State Entomologist of Connecticut, was the first to record its presence, p. 145, Report of the Connecticut Agricultural Experiment Station, 1894.

In this account Dr. Britton described the larva as a footless grub 1-16 inch in length feeding in the parenchymatous tissues. The method of pupation, in the last larval skin, attached to the leaf is stated. Several broods are suggested, since the work of the insect was observed from June 26 to frost. Destruction of the infested leaves is suggested

¹ Contribution from the Maryland Agricultural Experiment Station.