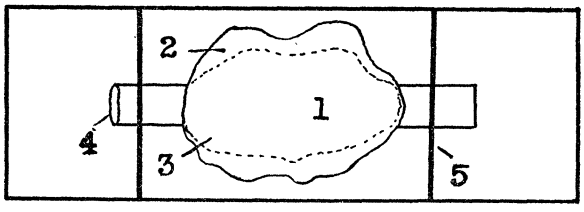
A SIMPLE METHOD FOR THE STUDY OF LIVING FRESH-WATER SPONGES

THE pores, oscula and superficial canals of fresh-water sponges can be readily seen with the aid of a good lens. The many branching canals which extend throughout the sponge body, the flagellated chambers and the cellular structure, however, can not be easily studied on the living sponge. All these structures may be demonstrated by a very simple method.

If a small healthy sponge or a portion of a larger one is placed on a glass slide at the bottom of a dish of pond water (water 2 to 3 inches deep) it will soon adhere to the slide and grow out on the surface of the glass as a thin incrustation. If the sponge used is growing on the stem or leaf of a water plant it will tend to float. In this case the stem (4) or leaf should be tied to the glass slide by



pieces of thread (5), as shown in the diagram. The slide should be changed to fresh pond water every twenty-four hours. Generally a thin marginal membrane, attached to the slide around the sponge mass, appears within twenty-four hours. By the end of the second day a wide area (2, 3) of sponge tissue has grown from the original mass, and by the end of the third day large canals are easily seen in this area without the aid of a lens. If the sponge used is small, all the tissue deserts its original substratum and moves out on the slide. If the original sponge is large the thick portion (1) may be carefully cut away without injury to the encrusting mass. The slide may then be taken from the dish, covered with a thin cover glass, and studied with the oil immersion objective if necessary. At the periphery of the mass there is a thin marginal membrane (2) in which the various types of amoeboid cells may be more easily studied. The inclusions of these cells are more clearly seen if a very dilute solution (1–10,000) of some vital stain such as Nile blue or methylene blue is added. In the thicker part of the incrustation (3) the flagellated chambers, with the actively beating flagella are seen. These preparations may be studied for long periods, provided water is added at the edge of the cover glass quite often. The cover may be removed without injury to the sponge and the slide returned to the pond water for future study, or the specimen may be fixed on the slide and a permanent stained mount prepared.

JAMES T. PENNEY
UNIVERSITY OF SOUTH CAROLINA

SPECIAL ARTICLES

INSECTS AS VECTORS OF YELLOW DWARF OF ONIONS[1]

FOR the past few years onion growers in the vicinity of Pleasant Valley, Iowa, have been greatly concerned over a virus disease of the onion, known locally as "yellow dwarf," and the means by which it is disseminated under field conditions. During the season of 1928 losses from this malady amounted to as high as 95 per cent. of the crop in some plantings. At that time field observations made it quite evident that some agent, perhaps an insect, was responsible for the spread of the disease. Since 1928 yellow dwarf has not been so prevalent in the fields nor so severe in its attack, a result largely due to the practice of using only disease-free sets. Such sets were secured either from localities where yellow dwarf had never appeared or from fields within the infected area free or almost free of the disease as determined by indexing. During this period, however, it remained constantly evident that there was dissemination in the field by vectors.

While making a survey of the insect pests attacking onions in Iowa the writers, aside from studying the forms that might be called of primary and secondary importance, have given attention to several species which are not able normally to subsist on onion, but which, nevertheless, occasionally or only incidentally feed upon it. Although many tests have been made with members of the former groups it has from the first seemed probable that in the latter would be found the vectors of the virus.

Yellow dwarf, or "crinkles" as it is sometimes called, is so named because of its most characteristic symptoms—*viz.*, yellowing and stunting of the plant, accompanied by drooping and frequently by crinkling and chlorosis of the leaves. Under certain conditions the symptoms may be completely masked until after the bulbs have undergone a rest period and then have been regrown. Such plants may serve as a means of carrying the disease from season to season and as a

[1] Journal Paper No. B40 of the Iowa Agricultural Experiment Station.

source of infection to insect vectors. The disease is not tranmitted through the seed.

In the insectary at Ames yellow dwarf has been transmitted to a large number of onion plants by three species of aphids[2]—the bean aphid (*Aphis rumicis* Linn.), the corn leaf aphid (*Aphis maidis* Fitch) and the apple grain aphid (*Rhopalosphium prunifoliae* Fitch), and by the six-spotted leaf-hopper (*Cicadula sexnotata* Fall.). Observations indicate that the bean aphid and the corn leaf aphid are responsible for a large percentage of the transmission of the disease. These two plant lice are quite common in the fields at Pleasant Valley and feed very readily on the leaves of the onion. Moreover, cage experiments with these two forms gave the highest percentage of transmission. The apple grain aphid does not feed as readily on the onion and only a few cases of transmission were secured with it, as was also the case with the six-spotted leaf-hopper. Although the latter is very common in the fields and readily feeds upon the onion plant further experimentation is needed to substantiate its rôle as an important vector of yellow dwarf.

For the experiments the different species of aphids were reared in separate rooms on some of their preferred hosts. From eight to twelve individuals of a species, after having been confined on a diseased plant for twenty-four hours, were transferred to disease-free plants in individual cages. When so confined on an onion, practically all the aphids died within a period of three to six days. In more than 200 definite transmissions the symptoms of yellow dwarf appeared on an average of seven to twelve days after the initial exposure to feeding by viruliferous lice. Plants thus infected were then successfully used as sources of inoculum to infect other plants. As controls, plants not exposed to the feeding of lice and plants supporting lice which had not been exposed to a source of inoculum were used. The symptoms of the disease have not yet appeared in any of these control plants, whereas in those exposed to aphids which had previously fed on diseased plants a high percentage of infection has resulted. In fact, in more than 100 tests during the month of February, 1932, 91 per cent. of the caged plants showed typical disease symptoms within 12 days.

The viruliferous aphids were confined on seedlings, sets and mother bulbs in various types of cages. In a number of tests the vectors were limited to small portions of an individual leaf, whereas in others they were permitted to run at large over a caged plant and to feed upon any part of this plant. Regardless of the portion of the plant upon which the aphids had been confined the first visible evidence of the disease always made its appearance in the new shoots. Frequently, in the larger onions no indications of the disease were ever apparent in older leaves upon which the insects had been confined, whereas the new shoots of these plants disclosed typical symptoms of yellow dwarf.

[2] Aphidae determined by Dr. F. C. Hottes.

C. J. DRAKE
H. M. HARRIS
H. D. TATE

THE PRE-OLIGOCENE STRATIGRAPHY OF PORTO RICO

LATE in 1930 Mr. James Thorp, of the Bureau of Chemistry and Soils, U. S. Department of Agriculture, discovered fossils in moderate numbers in the older rocks of Porto Rico. The several localities found are situated in the central part of the island at points where fossils had not previously been reported. The discovery was followed by an energetic search, in which Dr. N. L. Britton, chairman of the Scientific Survey of Porto Rico and the Virgin Islands, Mr. W. D. Noble, of San Juan, and Mr. Thorp were the chief participants. In March and April, 1931, at the invitation of Dr. Britton, the author examined the fossiliferous localities, supplementing the collections already made. Pending detailed studies of the material, a preliminary statement of its stratigraphic significance is herewith offered.

The collections contain approximately twenty species in a sufficiently good state of preservation for specific description, and there are a dozen additional forms which give some promise of ultimate identification. The majority of the species either are new or are closely related to, and perhaps identical with, species known in the older rocks of other Antillean islands. The assemblage is dominantly molluscan, but it also contains one or two species of algae, at least three of corals, one echinoid and one or two belonging to the arthropods.

The rarest specimen is that of an ammonite, the third thus far discovered in Porto Rico.[1] With the two ammonites previously found, it has been referred to Dr. John B. Reeside, Jr., of the U. S. Geological Survey, who has kindly submitted the following opinion:

> The small specimen with strong sculpture (Fig. 6, right)[1] seems to me a *Barroisiceras* very close to *B. haberfellneri* (von Hauer) in the strict sense (*cf.* Grossouvre, Les ammonites de la Craie superieure, pl. 1, fig. 1a, 1b). The large fragment [among the recent discoveries] seems to be a *Parapuzosia* close to *P. corbarica* (Grossouvre). I do not know any forms like these in the Lower Cretaceous [but] think them to indicate middle Upper Cretaceous age—Coniacian of the European nomenclature.

[1] H. A. Meyerhoff and I. F. Smith, "The Geology of the Fajardo District, Porto Rico," N. Y. Acad. Sci., "Scientific Survey of Porto Rico and the Virgin Islands," Vol. II, pp. 224–225 and Fig. 6, 1931.