is not poisonous. It is most reasonable to assume that it is resistant to such a temperature.

"The usual method in practise of preparing the shark flesh so that it may gradually lose its poisonous qualities is to cut the meat into thin strips which are hung up to dry in the sun and air; it thus loses its large quantity of water, and gradually its poisonous qualities disappear, so that it becomes a rather good food for the dogs, though it must still be used with caution and preferably mixed with a little blubber.

"Regarding the seat of the poison in the body of the shark we have the most divergent opinions; some assume that it is only in the musculature, others that it is exclusively present in the cartilage and others again that it is chiefly found in the peritoneal and spinal fluids, as it has been found that these fluids produce a severe pain when received in the eye. A proper judgment on these matters, however, will only be obtained by means of a special investigation of the poison, and such at the same time would elucidate its chemical composition, its physiological properties and various biological reactions."

A. H. CLARK

U. S. NATIONAL MUSEUM,
WASHINGTON, D. C.

SPECIAL ARTICLES

THE CROWN-GALL OF ALFALFA

DURING the past two years the writer has been engaged in studies upon the life-history of the organism described by Magnus[1] in 1902 under the name of *Urophlyctis alfalfæ*. It seems best to publish a brief statement of the results so far obtained, pending further studies.

1. The "resting spores" when placed in water cultures develop into sporangia.

2. Within these sporangia are formed motile spores of two sizes; usually one large spore and many small ones are formed in the same sporangium.

3. One or several small spores may become attached to one large one. Only one remains permanently attached. It has not been determined whether or not this attachment is in the nature of a sexual fusion. If so, the large spores and small spores are obviously capable of functioning as sexually differentiated gametes.

4. The motion of the large spore continues after the attachment of the small spore.

5. The small spores, the large spores and the united spores (zygotes?) become amœboid after a period of motility.

6. In the amœboid state, singly or in groups, these bodies may be observed to move on the surface of the host.

7. In infected soil young alfalfa seedlings develop galls in which plasmodia are found.

8. In older galls similar plasmodia are present which ramify through the tissues of the gall. Previous to spore formation the parasite becomes massed in cavities formed by the destruction of the host tissue.

9. The resting spores are formed in these cavities, apparently by division of the parasite into many cells.

10. The content, cytoplasm and nuclei, of the resting spores in the dormant condition, corresponds to that of the plasmodium in the stage immediately preceding spore formation.

The presence of a plasmodium as the vegetative stage of the parasite and the entire absence of a mycelium at any stage suggest that possibly the organism should be removed from the genus *Urophlyctis*.

ORVILLE T. WILSON
UNIVERSITY OF WISCONSIN

[1] Magnus, P., "Ueber in knolligen Wurzelauswuchsen der Luzerne lebende Urophlyctis," *Ber. der Deut. Bot. Gesell.*, 20, 291–96, 1902. One plate.

A PRELIMINARY NOTE ON THE FOOD HABITS AND DISTRIBUTION OF THE TEXAS HORNED LIZARDS

RANDOM examinations of stomach contents, made by various workers during the past forty years, have indicated that *Phrynosoma cornutum*, the Texas horned lizard, is of great economic importance. To determine its status as a valuable animal, an examination of four hundred and eighty-five stomachs has been made. As only a small per cent. of the animals found in the field were captured and killed, several facts—besides the principal one—concerning this animal have been disclosed.

The Texas horned lizard, unlike the other species of the genus, is distinctly not a desert form. Its area of distribution is quite extensive, going northward into Kansas, southward

far into the Mexican table land, and westward into Arizona; but, clearly, the area of its greatest abundance is the north and south strip of Texas known as the Black and Grand prairies. This strip of country includes the cities of Fort Worth, Dallas, Waco, Austin and San Antonio—in fact all of the large cities of the state except Houston and Galveston; and is preeminently the best part from an agricultural standpoint. Within this area, where conditions are at all favorable, the *Phrynosoma* population averages at least thirty to the acre. This is despite the fact that for a number of years these lizards have been captured and sold to visitors from the east.

The life history has not been well worked out, but the newly hatched young begin to appear by the first of August; so that it is safe to say that the ordinary agricultural operations such as spring and fall plowing, do not interfere with the life cycle. The natural enemies are few and unimportant, being mainly road runners and opossums.

The stomachs examined included the following forms: four species of ants; four species of weevils (very few boll weevils); four species of bees (mainly miner bees); eight species of beetles; three species of stink bugs; nymphs of grasshoppers and allied Orthoptera; five species of flies; and a few caterpillars, some of which have not yet been identified. The noxious forms found overwhelmingly outnumbered the useful forms.

Agricultural ants were found in 80 per cent. and stink bugs in 60 per cent. of the stomachs. Neither of these is much subject to the attacks of birds. Obviously this enhances the value of *Phrynosoma*. Incidentally, there was a remarkable consistency or homogeneity in the contents of the individual stomachs. For example, in one case, nearly all of the forms present would be Hymenoptera; in another, nearly all would be Heteroptera, etc. This could mean that individuals acquire a taste for sour food, or fatty food, etc.; or, what is more likely, that the same individual requires from time to time certain special elements in its food.

From the data thus far assembled, it can be safely affirmed that the horned lizards of Texas are of tremendous importance to agriculture in that region; and may, perhaps, play as important a part there as does the common toad in the better watered regions of the United States.

W. M. Winton

The Rice Institute,
Houston, Texas

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

SECTION D—MECHANICAL SCIENCE AND ENGINEERING. II

The Highways of Hawaii: H. K. Bishop.

Before the days of county government, the central government of Honolulu, under the superintendent of public works, improved many highways with first-class water-bound macadam, in many instances with a telford base. Under the county form of government, the county took charge of the maintenance of the roads already built and the construction of all new ones. It is needless to say that this system has proven unsatisfactory and unproductive of good results in general.

In 1910 and 1911, by legislative action, provision was made by the territory, to raise funds by means of a bond issue and to put the work of road improvement under this issue in the hands of a commission, to be known as the Loan Fund Commission. The writer was engaged in September, 1911, by the Hawaii Loan Fund Commission to prepare plans and specifications and to superintend the construction of the belt road improvement on the Island of Hawaii. The belt road, which is the main highway of the island, approximately parallels the coast line at a greater or less distance entirely around the island, a distance of approximately 250 miles.

In the work of improvement on Hawaii, the general plan adopted was to use water-bound macadam with a telford base in the wet sections, and bituminous macadam in the dry sections. It was also planned to give the water-bound macadam a surface application of bituminous material when the macadam had become sufficiently compacted to make such a treatment successful.

The greatest need of Hawaii is some form of territorial aid to the counties similar to that adopted by the majority of the states of the Union. Hawaii is also in need of some form of centrally controlled highway department which will insure the standardization of road work and a