

To this destruction he attributed the absence of the second brood which published accounts led him to expect. I recorded these facts in my Report for 1889, claiming positively that there was a single brood only at New Brunswick. My observations, carefully repeated in 1890 and 1891, simply confirmed this conclusion.

These observations were presented at a meeting of the Entomological Club of the A. A. S., and, though he could not gainsay my facts, Dr. Riley yet doubted the correctness of my conclusion, as his paper in *Science* also shows. I therefore resolved to repeat my work yet more carefully in 1892 and to make it conclusive if

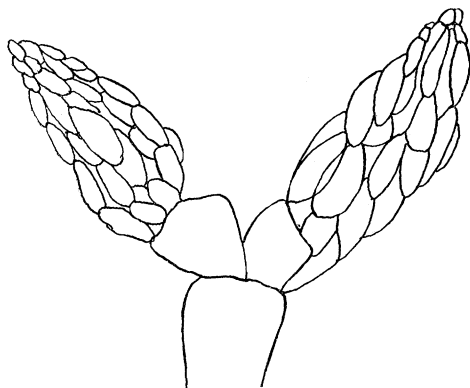


FIG. 2.

possible. The first signs of the beetles were noticed on May 17, in the form of small round holes eaten in a few leaves; on the 19th a few of the beetles were seen, and after that date they increased rapidly in numbers for some time. The weather for a few days was cold and wet, the insects were sluggish, and no eggs were observed until May 29. For special observation I selected a small tree between my home and the laboratory, which I passed several times daily, could see all parts of easily, and which was a prime favorite with the insects.

Eggs began hatching June 6, while yet oviposition continued. After the middle of the month the hibernating beetles diminished in number, and on the 30th not a beetle could be found. June 29 the first pupæ were formed and larvæ matured daily thereafter

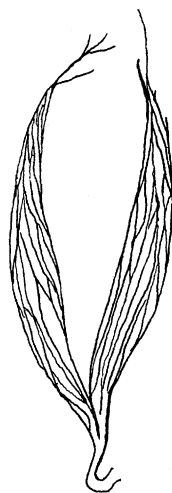


FIG. 3.

in greater abundance. At this date a very few unhatched egg-clusters were yet to be found, but of those collected, only one mass gave larvæ July 1. Since that date and up to date of writing (Aug. 1), there has not been a cluster of eggs on any tree that I have examined, and I have closely scanned many dozens, large and small. Early in July I gathered in over 200 pupæ and mature larvæ under the observed tree, and placed them in breeding-cages and jars. Adults began to appear July 8, and very rapidly thereafter in the open air as well as in my cages. It is interesting to note that on June 29, when I secured the first pupa, Dr. Riley

already had eggs of a second brood. The beetles bred by me fed readily and abundantly for nearly three weeks, and then more slowly, until at this time they refuse to feed entirely. During all this time there has not been a copulation nor an egg-mass in any jar, nor have I observed a copulation or an egg-mass in the open air. On July 30 I observed a disposition on the part of my insects to refuse food and to hide among the dry leaves. I therefore selected a considerable number of them of both sexes for examination. In all, the sexual structures were immature or undeveloped. In the male it was difficult to get the testes, because they were mere empty thread-like tubes. In the females the ovaries were mere bundles of tubes without even partially-developed eggs. I gathered rather more than forty specimens from the trees, and found the same state of affairs, except that in one specimen the ova had begun to develop. This morning I selected a few fresh and fat specimens—all females, as it proved—and though the abdomen was much distended, the distension was caused by the fully-dilated crop and stomach, and the ovaries were yet less developed than in any previously examined. Soon after the beetles appeared in May, I examined a number of them and found that in all the sexual structures were fully matured. In the males the testes were quite rigid coils, which were easily removed entire, while in the females the ovaries so completely filled the abdominal cavity that it was impossible to open it without detaching or crushing some of the eggs. The beetles earliest matured are now seeking winter quarters.

I consider my observations, now carried on for four years in succession, as conclusive of the fact that at New Brunswick, N.J., there is only a single brood of this species annually. I present herewith figures of part of one ovary (Fig. 1) of a beetle taken May 25, in which the oviduct and part of the developed eggs are removed; of the ovaries of a beetle taken July 30 on the trees, in which they were best developed of all those examined (Fig. 2); and of the ovaries of a specimen three weeks old (Fig. 3), with which all the others that were examined agreed in that they were at least no more developed. All the figures were made by the use of a camera with a Zentmayer binocular stand, 2-inch objective, a eye-piece, and drawing-board six inches from camera. The vagina is not shown in Fig. 3, but is as large as that shown at the base of Fig 2, and this is the only structure that has the full size. I have not considered it necessary to figure the male organs, though the difference between spring and summer beetles is equally striking. In none that I examined did I find anything like a developed testicle.

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Rutgers College, Aug. 1.

Wheat Rust and Smut.

As a general rule the Bulletins issued from the various State Agricultural Experiment Stations, while not notable for the amount of original matter they contain, are fairly accurate in their statements, and their recommendations are to be relied upon. Occasionally errors creep in, some of them the result of haste in compilation, others the result of not being conversant with the latest information on the subjects discussed. In the former category must be placed the statement made in Bulletin No. 83 of the Michigan Agricultural Experiment Station that wheat rust can be successfully treated by what is known as the Jensen hot-water method; that is, immersing the seed in water having a temperature between 132° and 135° F. Wheat rust has been long under investigation. It has caused a loss of about £2,000,000 sterling annually in Australia, and it is safe to say that there is not a country or a State where wheat is grown that has not suffered from its ravages. The fact is that while wheat *rust* is described and illustrated in the Bulletin in question, the treatment for prevention of wheat *smut* is given. It is needless to say that what is applicable to one is not to the other. Farmers who expect to prevent wheat rust by the hot-water treatment will be sorely disappointed. Perhaps their disappointment will result in making them question, without cause, however, the benefits to be derived from treating for smut. Between the two diseases there is a vast difference; one (*rust*) attacks the leaves, the other (*smut*) attacks the grain. In the latter case treatment of seed will be

beneficial. In the former it will do no good whatever. This is mainly because in the former infection takes place probably by means of spores disseminated by the wind, so that whole fields soon become infected. It cannot be denied that an effectual remedy for wheat rust is still a great desideratum.

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Washington, D. C., Aug. 5.

The Ancient Libyan Alphabet.

IN *Science*, July 15, Dr. Brinton has some remarks on this subject, which I have read with surprise. The old Libyan alphabet, he says, "appears to have been in common use among the Berber tribes of north Africa long before the foundation of Carthage (1), . . . and in its forms is almost entirely independent of the Phœnician letters (2). It is composed of consonants called *tifinar* (3), and vowel-points, known as *tidebakin*. The latter are simple dots (4), the former are the lines of a rectangle, more or less complete (5). Several of them are found in the oldest Etruscan inscriptions (6). . . . The writers who have given especial attention to this little-known subject are Faidherbe, Duveyrier, Halévy, Bissuel, and, recently, Dr. Collignon (7)."

To avoid repetition, and facilitate reference, I have numbered the points in this passage on which I should like to offer a few observations.

1 and 2. What authority has Dr. Brinton for referring this alphabet to pre-Carthagenian times, and for stating that its forms are almost entirely non-Phœnician? I have hitherto regarded the Punic origin of the Libyan letters as an established fact accepted by all epigraphists of weight, and notably by Mommsen, who unhesitatingly recognizes their Semitic descent: "The Libyan or Numidian alphabet now as formerly in use amongst the Berbers in writing their non-Semitic language is one of the innumerable offshoots of the primitive Aramæan type. In some of its details it seems even to approach that type more closely than does the Phœnician itself. We are not, however, therefore to conclude that the Libyans received it from immigrants older than the Phœnicians. It is here as in Italy, where certain obviously more archaic forms do not prevent the local alphabet from being referred to Greek types. All that can be inferred is that the Libyan alphabet belongs to the Phœnician writing older than the epoch when were composed the Phœnician inscriptions that have survived to our time" (*History of Rome*, iii., 1).

It follows that the Numidian ancestors of the Berbers received their writing system from the Carthaginians, earliest Phœnician settlers on the north African sea-board, and, consequently, that the Libyan alphabet had no currency "long before the foundation of Carthage." The archaic forms referred to by Mommsen were the forms in use in Tyre and Sidon in pre-historic times, whereas the extant Phœnician inscriptions date from historic times; hence the discrepancies between the latter and those preserved by the Berbers, most conservative of all peoples.

3. Not the consonants alone, but the whole system (mainly, of course, consonantal as being Semitic) is called "tifinar," or rather "tiffinagh." The sounds *gh* and *rh* interchange in the Libyan dialects (*Ghet* and *Rhet*; *Melghigh* and *Melrhurh*, etc.), so that it is not always easy to decide which is the original sound. But here there is no doubt that *gh* is organic; and Barth, for instance, always writes *Tefnagh*, plural *Tefnaghen*: "There was in particular a man of the name of Sâma, who was very friendly with me. On reading with him some writing in *Tefnaghen*, or the native Berber character, I became aware that this word signifies nothing more than tokens or alphabet. For as soon as the people beheld my books, and observed that they all consisted of letters, they exclaimed repeatedly, 'Tefnaghen — ay — Tefnaghen!'" (*Travels*, V., p. 116). There is, however, more in this word than Barth was aware of. When stripped of the common Berber prefix *te*, it reveals the "Finagh," i.e., "Phœnician," or "Punic" origin of the letters in their very name. Note the stress still falling on the root *fin*, as in *Pœni*.

4. F. W. Newman explains *Tidebâkka* (pl. *Tidebâkken*) to mean "a dot on or under the letter" (*Vocab.*), in fact any diacritical mark of the kind, and not merely vowel signs. Some, however,

are doubtless used to voice the consonants, as in Hebrew. Like other Semitic alphabets, Tefnagh had originally no vowels, but only three breathings, transformed in some systems (Greek, Italic) to pure vowels, in others (Cufic, Arabic) to semi-vowels and vocalic bases. But all this merely tends to strengthen the view that the Libyan is a Semitic alphabet.

5. This statement is to me unintelligible. In the published Libyan alphabets (Fr. Ballhorn, "Alphabete orientalischer und occidentalischer Sprachen," p. 8; Hanoteau, "Essai de grammaire de la langue tamachek," and others) curves occur quite as frequently as straight lines, while acute decidedly prevail over right-angles. Of the eight letters copied by Barth (l., p. 274) two only can be described as "more or less complete rectangles," forms which are certainly less common than, for instance, in Hebrew and Estranghelo.

6. It would be strange if resemblances did not occur between the Libyan and the characters of "the oldest Etruscan inscriptions," seeing that both have a common Semitic origin, the former directly through the Phœnician, the latter indirectly through the archaic Greek. But such resemblances obviously lend no color to Dr. Brinton's peculiar views regarding Libyco-Etruscan linguistic affinities.

7. Of the writers here referred to, Faidherbe and Halévy alone can be regarded as specialists. On the other hand, there are serious omissions, such as Dr. Oudney, who in 1822 first discovered the existence of the Berber alphabet; F. W. Newman, "Patriarch of Berber philology;" Mommsen and Hanoteau, as above; lastly, A. Judas, who was the first to clearly establish the Phœnician origin of these characters in a paper entitled "De l'écriture libyco-berber," contributed to the *Revue Archéologique* for September 1862.

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BOOK-REVIEWS.

Handbook for the Department of Geology in the U. S. National Museum. Part I. Geognosy.—The Materials of the Earth's Crust. By GEORGE P. MERRILL. Washington, Government Printing Office, 1892. 89 p. 12 pl.

THE U. S. National Museum is probably the greatest institution of its kind in this country. The museums located in New York, Cambridge, Boston, Philadelphia, and other large cities present to the residents of those places and to students many facilities for study. This is particularly the case with the American Museum of Natural History in New York and the Museum of Comparative Zoology in Cambridge. But neither one of these has been planned upon so extensive a scale, or is destined to attain such mammoth proportions, as the National Museum at Washington. The country at large is familiar with some things to be found at the museum from the numerous expositions at which displays of its treasures have been made; but no one who has not visited and lingered long in its great but crowded quarters at the National Capital can adequately realize the broad foundation upon which it is based, or the immense variety and scope of its collections. There are gathered together here materials which cover all human arts and all the natural sciences—anthropology in its widest sense, from the rude, chipped-flint implement of palæolithic man to the delicate *Sevres* china of civilized man; rocks and fossils from the most ancient formations to the most recent; animal forms from the minutest insect that flies to the hugest creature of land or sea. Scarcely an object, indeed, in which man has had aught to do, or to find interest in, but is to be found here.

The collections are not, either, lying idle. A large corps of curators is constantly at work, either arranging the old collections or studying and comparing the new. The results of these studies appear from time to time in the *Proceedings of the Museum*—a publication scarcely known to the public at large even by title, on account of its limited circulation—or else in the *Annual Reports of the Museum*, which are more widely known from being distributed as congressional documents. Unfortunately, these last usually appear from two to three years after the date they are stated to be reports for.

In the early days, when the Smithsonian Institution was the