drawn by the author. Is Dr. Shufeldt's insinuation a manly one, that I would leave the students to "choose from among the most trustworthy and best of the unacknowledged ones these eight, and accredit the author with them"?

The figures after Morse, Riley, Coues, Hornaday, Rymer Jones, Owen, 'and many others,' are among the 154 previously acknowledged in my other two earlier books.

To further illustrate Dr. Shufeldt's reckless manner of writing: he remarks that fig. 212, after Graber, "looks to my mind far more like the claw of a young lobster than the head of a cockatoo." The figure is a diagram sufficiently well drawn to answer the purpose intended.

One who did not have the book before him would naturally infer, from Dr. Shufeldt's statement, that the skeleton of the wild ass was the only mammalian skeleton figured, whereas there are illustrations of those of the cow, whale, cat, bat, and walrus, with sketches of the limbs and skulls of other forms.

There are other reckless charges of 'carelessness' which seem undeserved. The 'First lessons' was not hastily written. Spare time during a period of over two years was given to its preparation. The manuscript was read, revised, and reread; some chapters were read over several times; it was also read aloud to two children of fourteen and seventeen years, to make sure that it should be intelligible. The borrowed illustrations were chosen with care: they are necessarily uneven in character, where drawn by artists of unequal ability, and copied from authors of varying merit.

In closing let me say that I believe in searching, sharp criticism of text and illustrations; it tends to greater care and accuracy: but let it be fair, manly, and ingenuous; and let the critic be at least as guarded and exact in his statements as the author with whom he finds fault. A. S. PACKARD.

Providence, Oct. 30.

## The teaching of natural history.

Two works intended for 'beginners' in zoölogy have been criticised in recent numbers of *Science*, — Packard's 'First lessons in zoölogy' and French's 'Butterflies of the eastern United States.' These criticisms have been in the line of the prevailing fashion, in that the one which begins with microscopic animals, and shows such parts as can be seen only by the aid of first-class objectives, manipulated by first-class microscopists, is highly commended; while the other, which takes up animals that can be seen, and treats of parts and changes that can be observed by any student with the naked eye, is utterly condemned.

As a teacher of many years' experience with beginners in zoölogy, I hope you will let me be heard, though my remarks are not at all in the fashion.

The critic of French's work begins by saying, "The whole aim of the author seems to be to enable his reader to find out the name of a specimen in hand; and to this end his analytical key is fairly good, so far as the perfect insect goes, excepting, that as no tables are given for genera, families, etc., it would not help the student if species not included in the book were to turn up." The 'whole aim,' etc. Only $25\frac{1}{3}$ pages are devoted to the key, and the book contains over 400. 'To find out the name of a specimen.' This seems, in the eyes of the fashionable critic, an unpardonable sin. What does any one want the name for? I can but think that there are a few good reasons for knowing the name quite early in the progress of acquaintanceship with an animal or plant: 1°, it will enable the worker to read what is already known about it, and thus know whether he has discovered any thing new; 2°, if he has found out something new, he can tell or write the news, and say what he is talking or writing about; 3°, information fastened to something, be it only a name, can be kept in mind or in a note-book. The key analyzes only the 'perfect insect.' What work, either with or without a key, would enable one to determine either animals or plants at all stages? How would Coues's 'Key' or Gray's 'Manual' stand this test? For 'genera, families,' etc. The key does trace into the families, the genera, and the species; and all the families and genera are more or less fully characterized either in the key or in the body of the work. 'Species not included.' The book gives all the known species of the region: who could give the unknown ones?

I quote again from the critic. "Third, the whole aim of the author appears to be to enable the user to answer the question, 'What is the name of my butterfly?' — for pedagogical purposes, not even a worthy, far less the best end." Of course, he had said all this before, but the 'whole' is represented by the fraction $\frac{1}{1\,6}$. The author does not make it a 'worthy' and 'best end,' but he does make it just what it is, a worthy and best beginning; and from this good beginning he goes on to tell of its different stages of growth through egg, larva, pupa, and perfect form; of its food; and of its seasonal changes; thus helping the pupil to become a true, original investigator by discovering new facts of growth and development.

A little later in the criticism, the book is said not to contain all that has been published about every species. The critic has twice said it didn't contain any thing but key. I know of no dozen works which together contain so many important facts as this one; and, on account of its size, the publisher probably had the author pay for the plates. I am thankful that he has been good enough to give this much for 'pedagogical purposes.'

The criticism is finally clinched by this remark, 'It is but the rehabilitation of the dry husks of a past generation.' If there are any dry husks in science, it is well illustrated by many of the late works for beginners in botany and zoölogy in which the classification and characterization of orders, families, etc., are given, from bacteria to a buttercup in the one, and to man in the other, — dry husks, 1°, because classification is ever changing; 2°, it is a classification of unknown things, and necessarily so, as nearly all students in schools live away from the sea, and have no chance to work with good microscopes, and more than half of classification pertains to marine and microscopic forms; 3°, such condensed classification as is possible in a 300-page book is so faulty as to be useless or worse. Take the other method for determining classification, i.e., by the use of a key. The pupil begins with something to classify, and as soon as he reaches the name of an order, family, etc., has an example to illustrate it. He knows what he is studying, and has determined by actual observation the arrangement and parts of its organs. He has been changed from a book-worm to an original observer.

Listen to a prig who says he has worked himself into a naturalist by means of the plan advocated in most of the late books on botany and zoölogy. "How did you become so great a naturalist?" — "Why, you see, when I was about twelve years old, I received a free ticket to a lecture on natural history by Professor ——, and, as it was free, I of course went, and there I heard how a beginner should start. At this time I did not know the name of any animal. I properly despised those who did. I did not know a cat from a dog. When bitten, I simply cried, and ran home. I did not ask, I did not care whether it was a mosquito, a bumblebee, or a rattlesnake that bit me, or by which end I was bitten. I went home from the lecture, and purchased a compound microscope, a dissecting microscope, a set of dissecting instruments, a set of injecting instruments, a microtome, and forty bottles of hardening, staining, and mounting fluids. On account of the discounts, I was able to purchase them for two hundred dollars. Then I went and gathered some Protomonas, amoebae, and other protozoans, and from these I worked out the whole problem of life. I was very careful to take but little notice of the external organs, since great harm always arises from looking at outside parts. The proper way is always to begin with the insides. After this good and proper beginning, I soon became a great naturalist." This is all nonsense. No naturalist ever began in this way. As well try to make a child learn all about the letters and syllables which form a word — its root, derivation, and history, and all its prefixes and suffixes — before allowing him to use it, as to try the same plan in zoölogy. Prof. L. Agassiz said that all the great naturalists he ever knew, both in Europe and America, began their work by making and naming collections. The critic will say again 'that science had changed within the last eventful quarter-century.' Some things cannot be reversed, and this is one of them. Those who have recently had so much to say about teaching beginners are the ones who never have beginners to teach: they are university professors, with plenty of time at their command, scores of microscopes to work with, and, as students, only those who elect to take the subject because they have passed through all the necessary preliminary stages.

A TEACHER.

## For what purpose mosquitoes were created.

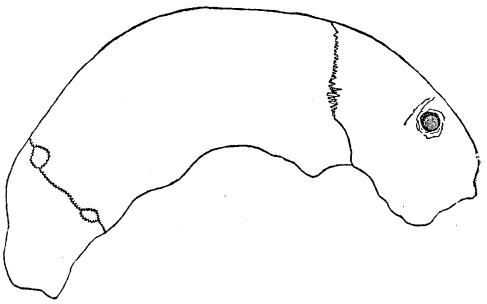
Your mention of Dr. Finlay's view that yellow-fever may be propagated by mosquito-bites reminds me of the following: In 1839, during a yellow-fever epidemic in Augusta, Ga., no case originated at Summerville, a neighboring suburb among the sand hills. There were then no mosquitoes at Summerville, which was approached by a rather circuitous route from Augusta. Some years after, a straight, broad road was built through swamps directly to the sand hills; cisterns were also built, and mosquitoes appeared and became an intolerable pest. During the yellow-fever epidemic of 1854 a number of cases originated at the sand hills, now abounding with mosquitoes. Mosquitoes often invade sections where they were previously unknown and make permanent settlement. Mr. Mimms of Aiken, S.C., told me that the first mosquito seen in that town came from the cars on the South Carolina railroad. They are abundant there now. Dr. I. P. Garrin satisfied the medical faculty and authorities of Augusta that the yellow-fever in 1839 reached the town in freight cars on this railroad. Dr. Roe, late of Alabama, informed me that once when quarantined for yellow-fever near Staten Island he collected a dozen or more varieties of mosquitoes from the holds of as many vessels there in quarantine from yellow-fever ports. They had evidently taken passage from the infected ports. I do not remember a locality subject to malarial fever that is not infested with mosquitoes.

HARRY HAMMOND.

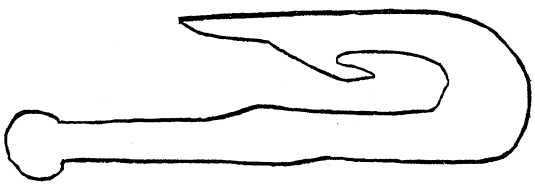
Beech Island, S.C., Nov. 3.

## A long skull.

I was much struck with the very long and narrow proportions of a skull in the collection of W. W. Adams of Mapleton, N. Y., and which was exhumed with others in Cayuga county. I had not time to make a thorough examination of it, but Mr. Adams has kindly sent me a photograph, and also an outline.



The photograph shows what to him was the most interesting feature, a circular hole, of a little over a quarter of an inch in diameter, in the anterior section, which he supposed to be made by a bullet, and which was doubtless the cause of death, from its general character. The proportions interested me more, and these the photograph does not clearly show. Impressed by the elongated character of the cranium, I sent to Mr. Adams for accurate measurements, and he gives the length as eight inches, and the width four and a half. The narrowest skull mentioned in Dr. Morton's 'Crania Americana' is that of a Cayuga chief, in which the longitudinal diameter was 7.8, and the parietal 5.1; the cephalic index being 65.4. In this Cayuga skull the cephalic index would be 5.625, if the measurements are exact, as I suppose they are.



I announced some time ago my discovery of the barb of a horn fish-hook, which supplemented the figure I furnished for Dr. Rau's 'Prehistoric fishing.' It gives me pleasure to say that Mr. J. L. Twining of Copenhagen, N. Y., has another of these rare articles, found near Watertown. It closely resembles Mr. Ledyard's specimen, but is more compressed.

W. M. BEAUCHAMP.

Baldwinsville, N.Y.