all of the "second form," their exuviæ of the "first form"! After attaining the "first form" and after pairing the same individual has reverted to the "second form." It is now clear that we are not dealing with a case of true dimorphism, such as is well known among insects and plants, but it appears probable that the two forms of the crayfish are alternating periods in the life of the individual, the "first form" being assumed during the pairing-season, the "second form" during the intervals between the pairing-seasons. It is to be inferred that before the animal is again capable of reproduction another moult will bring it again into the "first form."

The fact that large collections, made at one time and place, often contain only one or a great preponderance of one form of the male is now explained.

I have also before me a male specimen of *Cambarus propinquus*, Girard, from Wisconsin, belonging to the Peabody Museum of Yale College, which was taken in the act of moulting. The old shell is "first form," the soft shell emerging from it is "second form."

It is remarkable that two forms of the male have not been detected in any other genus of crayfishes.

Fritz Müller ('Für Darwin') has pointed out the existence of two forms of the male in the genera *Tanais* and *Orchestia*, which he considers as truly dimorphic forms. It is possible that these are to be explained in the same way as the two forms of the male *Cambarus*.

Such a change as this connected with the reproductive period is unparalleled, so far as I know, among the Invertebrata, and even among the Vertebrata; the cases of partial atrophy of the generative organs or shedding of antlers (as in the stag) after the rut is over are hardly comparable.

At the time I had the specimens alive my attention had not been drawn to the questions relating to the two forms of the males, so that I failed to make anatomical examination, and the specimens have now lain too long in alcohol to be serviceable for internal dissection. I hope, however, that naturalists who are more favourably situated will be able to throw more light on this subject.

I will add that the males of extraordinary size which I have seen are all of the "first form." Do these very old individuals cease to moult? Do they become permanently capable of reproduction?—*Amer. Journ. Sci.*, January 1884, p. 42.

Museum of Comparative Zoology,
Cambridge, Mass.,
Nov. 12, 1883.

On Visual Organs in Solen. By Dr. B. Sharpe.

Dr. Benjamin Sharpe called attention to a remarkably primitive form of visual organ that he had discovered in the siphon of *Solen ensis* and *S. vagina* (the common "razor-shell").

His attention was directed to the probable possession of visual

organs by observing a number of these animals which were exposed in large basins for sale at Naples. A shadow cast by his hand caused the extended siphons of the specimens on which the shadow fell, instantly to retract, while those not in the shadow remained extended. Repeating this experiment at the Zoological Station at Naples, and being fully convinced that the retraction was due to the shadow and not to a slight jar which might have been the cause, he was led to examine the siphon more closely, and he also made a series of vertical sections for the purpose of very minute study.

When the siphon of a large *Solen* is cut open and examined, a number of fine blackish-brown lines or fine grooves are seen. These are situated between and at the base of the short tentacular processes of the external edge of the siphon. As many as fifty of these little grooves were found to be present in some specimens, and some of them were from 1 to 1·5 millim. in length.

When a vertical section is examined these pigmented grooves are distinctly seen, and the cells of which they are composed are very different from the ordinary epithelial cells which cover the more pigmented parts. These latter cells are ordinary columnar epithelial cells with a large nucleus which is situated near the *tunica* on which it rests. The pigmented cells are from one third to one half longer than those just described, and consist of three distinct parts. The upper part, or that part furthest from the *tunica*, appears perfectly transparent and takes up about one ninth or one tenth of the total length of the cell; this part is not at all affected with the colouring-matter used in colouring the whole. The second part of the cell is deeply pigmented and consequently opaque; it is filled with a dark brown or almost black granulated pigment; this takes up about one half of the length of the cell. Below this is the third part of this cell, consisting of a clear mass, which takes a slight tinge when coloured; this is probably the most active part of the cell; in this is imbedded the large oval nucleus. This nucleus is sharply demarcated and is filled with a granulated matter, which takes a dark colour in borax carmine, as do, indeed, the nuclei of all the epidermal cells.

These *retinal cells*, if they may be so called, are similar to those described by P. Fraisse in 1881 (Zeitschr. f. wiss. Zool., Bd. xxv.), in the very primitive eye of *Patella cærulea*, the principal difference being that in *Patella* the transparent part at the top of the cell seems to be a little more extensive. This eye of *Patella* is open, being merely an invaginated part of the epidermis, and has no lens. In *Haliotis tuberculata* we find an open eye also, but with the addition of a very primitive lens. The next higher grade of eye seems to be that of *Fissurella rosea*, in which the eye is closed and possesses also a lens; now in these two latter forms, where we find a lens present, the retinal cells do not possess the transparent ends we find in *Patella* and *Solen*, but the pigment fills the upper part of the cell quite to the top. This would indicate, he thinks, that the transparent part took the place of a lens.

No special nerve-fibres could be detected passing to these pigmented grooves. Nerves passing to the eye of *Patella* were also wanting; while, on the other hand, distinct veins were found passing to the eye of *Haliotis* and *Fissurella*.

He further stated that this power of distinguishing a shadow would be of great use to the animal in the struggle for existence. The *Solen* lies buried perpendicularly in the sand, and allows the siphon to project a little above the surface. This projecting part would, probably, frequently be bitten off by fishes, were it not for the fact that the shadow of the enemy would give warning, so that the siphon could be withdrawn in time to save it from destruction. —*Proc. Acad. Nat. Sci. Philad.*, Nov. 6, 1883, p. 248.

On a Nematode Parasitic on the Common Onion.

By M. Joannes Chatin.

It is well known that the parasitism of the Nematoda is exerted not only at the expense of animals, a certain number of these worms attacking various plants, in which they give rise to more or less serious alterations. The Anguillula of mildewed wheat has been very long known; an allied species, parasitic on the coffee-tree, has been studied by M. C. Jobert; and other worms belonging to the same group are observed in Dipsaceæ, Mosses, &c., as I took occasion to state in a communication dating some years back.

The worm which forms the subject of the present note lives as a parasite in the common onion (*Allium Cepa*, Linn.), and becomes in it the cause of a disease of which I have been able to trace the different phases, thanks to the extreme kindness of M. Pasteur, who sent me, in May 1881, a portion of a bulb infested by these Nematodes. I have been compelled to defer the publication of the results of my researches on account of the time necessary for tracing the development and the mode of propagation of the worm, appreciating exactly its vital resistance &c. Even now I shall confine myself to a summary of the principal points of its history; the anatomical and embryogenic details &c. must find a place in a more extended work.

By its general characters and especially the construction of its digestive tube, as also by the organization of its reproductive apparatus, the Anguillula of the onion must be classed in the great genus *Tylenchus*, and every thing authorizes our thinking that it represents a species distinct from those which have hitherto been described.

It is in the larval state that the worm penetrates into the bulb, which it attacks at the level of the "fundamental axis;" then it spreads into the roots and to the base of the flowering stem, generally respecting the external tissues, but completely disorganizing the central tissue, even getting into the fibro-vascular bundles and reducing them to a brownish pultaceous mass, in which nothing but a few fragments of spiral vessels is soon to be observed.