series of rocks of the South Valley Hill, these must be the slates referred to, even if 'hydromica slates is a contradiction in terms.'

While the undersigned certainly does not intend to be a champion for the term 'slate' instead of 'schist' for these rocks, good reason for the use of that term lies in the slaty character of many of these hydromicas as distinguished from the contorted and schistose character of the micaceous rocks of other regions.

The writer's use of the expression 'hydromica slate' in describing the Edge Hill and Barren Hill rocks (the 'altered primal slates' of Rogers), is thought preferable to the term 'hydromica schist,' since large portions of that formation are slaty rather than schistose. The greater part of the formation is a slaty sandstone or quartz slate, and, where outcropping in Chester county, is so designated by Dr. Frazer. It might naturally be taken for granted that the writer believes, with Dr. Frazer, that the hydromica schists and slates of the South Valley Hill of Chester county are about contemporaneous with this quartz slate or Edge Hill rock.

In order to prevent future misapprehension, it may here be stated, that the writer has been led to the conclusion that the two formations are distinct, and that both Professors Rogers and Frazer have confounded two rock series belonging to different geological horizons, — the one, Cambrian; the other, Silurian. The analogue of the Edge Hill rock is believed to occur in Chester county, on the south side of the hydromicas of the South Valley Hill. The facts leading to this conclusion have been gathered during some extended field-work in Chester county, and will shortly be published. Meanwhile, the remarks upon the primal slates made in the Franklin institute lecture should be understood as referring solely to the Edge Hill rocks proper, and not to the South Valley Hill schists or slates, which are but poorly defined in the vicinity of Philadelphia.

H. CARVILL LEWIS.

The specific distinctness of the American and European brine shrimps.

In Professor Smith's notice of our 'Monograph of phyllopod Crustacea,' he states, that, in the portion relating to the above subject, 'there is certainly confusion,' and quotes two paragraphs relating to the females alone, and finally remarks, "but differences like these in statements of observation betray inexplicable carelessness."

After quoting the two paragraphs relating to the *females alone*, it seems to us a careful critic would have also taken pains to have quoted the longer paragraph relating to the males, which directly follows the first paragraph quoted by our critic. To allow the two paragraphs relating to the females to be so widely separated was an oversight on the part of the author, who, however, thought that he had taken a good deal of pains to show the specific distinctness of the American and European species. Two sets of females from different localities, named by different persons, were examined at different times; and this explains how the two paragraphs became placed too far apart in the author's copy. It would have been better, of course, if the author had added a few words, and dogmatically stated that the two species were undoubtedly distinct. He preferred not to do, or omitted to do, this, but gave in considerable detail, and in as judicial a way as possible, the facts of the case. At first it was 'difficult to find good differential characters' between the females, and those found are but slight ones. The females of any of the species of Artemia, Branchinecta, or Branchipus, do not exhibit good specific characters; but the males do, as the author attempted to show. If the author failed in directness of statement on this subject, or led to any confusion in any one's mind, he sincerely regrets it: on the other hand, he doubts whether there were, in the case, reasons for the charge of 'inexplicable carelessness.'

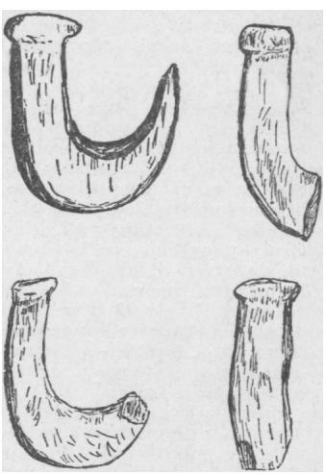
The paragraph which Professor Smith would have done well to have quoted is the following one: —

"Upon comparing a good many males from Great Salt Lake with several, both stained with carmine and unstained, received from Cagliari, Sardinia, through Prof. J. McLeod of Ghent, the European A. salina is seen to be considerably stouter, the head wider, the eye-stalks longer and larger, and the eyes larger. The frontal button-like processes of the first joint of the claspers are nearly twice as large as in the American species, and a little more pointed, while the claspers themselves are larger and stouter. The legs and sixth endites are of about the same form. The most apparent difference is in the caudal appendages, or cercopods, which in A. salina are several times larger than in A. gracilis, being in the Sardinian specimens nearly three times as long and much larger than in our species. In this respect, the genus shows a close affinity to Branchinecta. However, in a lot of A. salina ♀ from Trieste, the cercopods are very much shorter than in the Sardinian females, and only a little longer than in our American specimens. These appendages do not differ in the two sexes."

A. S. PACKARD, Jun.

Bone fish-hooks.

Recently, while digging in a shell-heap near Narragansett Pier, Rhode Island, I found among broken arrow-points, and fragments of bone, pottery, and shells, a nicely worked bone-hook, and also the shanks of three other apparently similar hooks; while in a neighboring shell-heap two more fragments were found.



The perfect hook measures a little more than one inch in length, and a little less than one inch across from the shank to the point, the latter being nearly as long as the former. The shank is flattened and notched at the end, forming a sort of head, somewhat similar to the fish-hooks of the present day. This hook, although much shorter, resembles a hook from Long Island described and figured by Mr. Charles C. Abbott on p. 208 of his work on Primitive industry. Of this he says, "Objects of this character are exceedingly rare, either as found on the surface, or in shell-heaps. While of so simple a form, bone fish-hooks of this pattern do not appear to be common in any locality in eastern North America."

Figures are here given of the perfect hook, and the

fragments of three others which appear to be precisely similar. MARGARETTE W. BROOKS.

Nov. 1, 1883.

Supposed glacial phenomena in Boyd county, Ky.

A part of the work devolving upon us who have recently been tracing the southern boundary of the glaciated area in America, has been to follow up the reports of glacial phenomena south of our line.

Boyd county, Ky., having been referred to by a number of authorities as such a locality, I was naturally led to visit it a short time since; and I found, to my satisfaction, that that region was never directly glaciated.

Boyd county is in north-eastern Kentucky, bordering upon West Virginia, and upon the remarkable bend of the Ohio River where it receives the waters of the Big Sandy. Through the attention of Mr. John Campbell of Ironton, O., and Mr. J. H. Means of Ashland, Ky., I was assisted in making a pretty thorough examination of the region. Upon going back about two miles into Kentucky from the Ohio River, opposite Ironton, we find ourselves in a valley two miles wide, running parallel with the Ohio River, and two hundred and twenty feet above it. This valley extends for many miles, reaching the river towards the west at Greenup, and continuing some miles, at least, above Ashland. It is known as Flat Woods. The level is remarkably uniform; and the hills upon either side of it rise about two hundred feet, with numerous lateral openings towards the Ohio. When upon the farther side, and looking northward, one sees the rocky bluffs of the old channel rising so like those facing the river itself, that he can scarcely resist the illusion that he is in the present valley of the stream. The supposed glacial phenomena consist of numerous water-worn pebbles of quartz and quartzite scattered along the whole range of this old valley. Most of the pebbles are small, and perfectly rounded, though some were a foot or more in diameter; and one observed was about two feet and a half through, and only slightly worn. These pebbles are not found upon the hills back from this channel, on the Kentucky side, nor, according to Mr. Campbell, who is a most competent witness, anywhere in Lawrence county, O., back from the river. Plainly enough, they are the result of water-transportation. Whether they were deposited at the very early period when the Ohio flowed at the level of two hundred and twenty feet higher than now, and regularly occupied this old channel, or whether they were brought into place during the existence of the glacial dam which I have supposed at Cincinnati, I will not venture to say; though the latter theory would seem more in accordance with the facts published by Professor White concerning the old channel followed by the Chesapeake and Ohio railroad, extending from the Kanawha River to the mouth of the Guyandotte in West Virginia. The elevation of the Kanawha-Guyandotte channel is nearly the same as that of the one I am describing, and this seems to be a prolongation of that. At any rate, the pebbles can only be indirectly referred to glacial action.

Now that attention is directed to this class of investigations, it would seem to be important for Professor Lewis to give through your columns, or somewhere else, publicity to his investigations of the facts supposed to indicate glacial action in Pennsylvania farther south than the boundary-line indicated by our investigations two years ago.

G. F. WRIGHT.

Oberlin, Nov. 5, 1883.

Elliptic elements of comet Pons-Brooks.

While the orbit by Professor Boss, published in SCIENCE, No. 34, represents observation so well that there can be no doubt of the identity of the two comets, still it is of interest to know how closely elements derived from observations of the present comet alone agree with those of the Pons comet.

The arc of anomaly already passed over is only about twelve degrees, — a condition very unfavorable to the precise determination of elements, and inadequate to determine a reliable periodic time.

On account of this, in the solution of the equations, Δe was considered as a known quantity, and finally an assumed value substituted for it.

I find the following corrections to Professor Boss's elliptic elements from the normal places given below: —

$$\begin{array}{llrrl} \Delta\pi & = & -194.0'' & - & 78{,}768.\ \Delta e \\ \Delta\Omega & = & +\ 19.5'' & + & 289{,}233.\ \Delta e \\ \Delta i & = & -\ 57.5'' & + & 55{,}256.\ \Delta e \\ \Delta T & = & -\ 0.065235 & - & 108.39\ \Delta e \\ \Delta q & = & +\ 0.000716 & - & 0.04\ \Delta e \end{array}$$

Assuming the eccentricity to be 0.954996, which closely approximates to the true value on the hypothesis of identity, we have for Δe, -0.000274.

The resulting corrections to the preliminary elements are, —

$$\begin{array}{lcl} \Delta\pi & = & -172.4'' \\ \Delta\Omega & = & -\ 59.7 \\ \Delta i & = & -\ 72.6 \\ \Delta T & = & -\ 0.035537 \\ \Delta q & = & +\ 0.000727 \\ \Delta e & = & -\ 0.000274 \end{array}$$

and the corrected elements are, —

$$\begin{array}{lcl} T & = & 1884,\ \text{Jan.},\ 25.66046 \\ \Omega & = & 254^\circ\ 07'\ 48'' \\ \pi & = & 93\ 18\ 50 \\ \omega & = & 199\ 11\ 02 \\ i & = & 74\ 02\ 05 \\ lg\, q & = & 9.889708 \\ e & = & 0.954996 \end{array} \Big\} 1883.0$$

After obtaining the preceding results, the equations were solved for the value of Δe, with the result $\Delta e = -0.000032$; but no use was made of this.

Normal places, 1883.0.

Mean date, Greenwich mean time.	α	δ	No. of observations.
	h. m. s.		
Sept. 8.5 . . .	16 30 38.75	63° 49′ 12.5″	28
" 22.5 . . .	16 25 17.65	60 45 52.3	16
Oct. 6.5 . . .	16 30 28.52	57 42 35.9	8
" 20.5 . . .	16 45 00.31	54 50 37.4	6

These normal places are represented by the corrected elements, as follows: —

	$C - O.$	
	$\Delta\alpha \cos\delta.$	$\Delta\delta.$
I.	$-0.5''$	$+1.3''$
II.	-1.2	-0.1
III.	$+4.4$	$+0.9$
IV.	-0.8	-1.2

The last two places depend entirely upon Albany filar-micrometer observations.

In order to form some idea of the accuracy attained in modern observations of faint comets, the following table of comparisons, with the corrected elements, may be of interest. The comparisons are not very