was that one of these songs was almost invariably repeated until he himself became tired of it before he changed to another.

The difficulty of expressing a bird's notes by words is well known, but the following attempt may give some idea of the different songs of my cardinal: —

I. *Hoit*,— *whoit*,*whoit*, *whoit* (eleven times); *hoit*,— *whoit*, *whoit*, *whoit* (eleven times).

II. *Wheù*, *wheù*, *wheù*, *wheù*, *wheù*.

III. *Tchew*, *tchew*, *tchew*, *tchew*, *tchew*.

IV. *Bird'ie*, *bird'ie*, *bird'ie*,— *tchew*, *tchew*, *tchew*, *tchew*.

V. *Bird'ie*,— *bird'ie*, *bird'ie*, *bird'ie*, *bird'ie*, *bird'ie*.

VI. *Whoy'it*, — *whoy'it*, *whoy'et*, *whoy'et*, *chichichichichichi* (a jingling trill, so long continued that it apparently ended only when the singer became "out of breath").

The notes of many cardinal grosbeaks are clear and tender — far sweeter than the mellowest notes of fife or flageolet.

One of my most welcome bird-guests last summer was a summer tanager, whose favorite singing station was the summit of a tall scrub pine-tree in a corner of my yard. All day long, from May till August, no matter how hot the sun, he sang, robin-like, this song: *Ter-whit'-ter-way*, — BRING *him* HERE; *ter-whit'-ter-way*, — BRING *him* HERE (repeated incessantly, with very strong emphasis and rising inflection on the "here"). Another male of the same species, whose nest was in a neighboring pine grove, answered thus: BRING-*him*-HERE, *chip'-way*, BRING-*him*-HERE, BRING-*him*-HERE.

This beautiful tanager and the red-eyed virio are midsummer and midday songsters. Perhaps it is because they are representatives of tropical families that they do not mind the intense heat of the dog-days, but sing cheerily, the former from the tip-top of some tree taller than those about it, his glowing red plumage receiving, it may be, increased refulgence from the burning rays of the sun, the latter, of modest olive-green and whitish garb, as he busily gleans his insect food among the shady leafage of the forest trees.

The subject of midday songsters brings me again to John Burroughs, who, always charming and usually accurate in his descriptions of bird-life, sometimes (like the rest of us) makes mistakes. The bird involved is the grass finch, for which he prefers the name vesper sparrow (since adopted by the American Ornithologists' Union), and all he says of it is true and eminently characteristic except the statement that "his song is most noticeable after sundown, when other birds are silent,"— which does not accord with my own experience in midland Virginia, where, in extensive fields of a large farm, numbers were heard singing sweetly through the hottest part of the hottest day of a hot summer,— the time being about 1 o'clock P.M., the date July 4, 1887, and the temperature 103° in the shade!

But the habits of birds do vary, and one day's observations, in the same locality, may quite contradict those of a previous occasion; therefore, only repeated observations, under varying circumstances of time and place, can give us an approximately correct knowledge of the habits of any species.

LETTERS TO THE EDITOR.

**** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

On request in advance, one hundred copies of the number containing his communication will be furnished free to any correspondent.

The editor will be glad to publish any queries consonant with the character of the journal.

How are Young Spiders Fed?

IN my rambles for botanical specimens in the last three years, many new and curious things have been thrust upon my attention in the insect world, and these I have recorded for future use. One fact in particular struck my attention, and I herewith submit it to the readers of *Science*, partly to record the fact, and partly to ask if any other readers of your excellent periodical have ever observed a similar fact.

We have been taught by the best works on spiders that the young of spiders derive their food mostly from the atmosphere. The "Encyclopædia Britannica" confirms this view.

On the 19th day of June, 1891, I discovered, in a ploughed field, an enormous spider of the *Lycosidæ* species, which was 1½ inches long. She presented a very curious appearance, being covered with scores of tiny spiders from one end of her body to the other. When I touched her with a weed-stem the young spiders scampered off at a lively rate, only to return when left to themselves. The spinnarets and abdomen of the mother-spider were greatly distended. Suddenly, there was a copious flow of white liquid which the young greedily devoured. Examining the fluid under my microscope, I was fully convinced that this was veritable milk, and that this spider, at least, nursed her young, instead of bringing them up on atmospheric moisture. I should be glad to know if any readers of *Science* have ever observed a similar occurrence.

JOHN W. SANBORN.

Naples, N.Y.

Palæolithic Man: A Last Word.

THE world was growing old apace, just as it is now, when Man first entered upon the scene here in the valley of the Delaware. Over the hills and along every lowland water-course forests grew, died, fell, and decayed, helping to make that deep deposit of soil which now covers the gravel and sand that agencies no longer active had spread over the surface of the land. Just what was the outlook that presented itself when the first Man or Men looked about them,. we can only conjecture. Mr. McGee claims that the evidence favors the view that the soil had formed, the forests were old, pines had succeeded oaks, and oaks succeeded pines, and the elk, deer, and bear were the chief sources of food-supply to the wandering hunter that, reaching out from his native land, came, saw, and conquered the valley of the Delaware. But is this true? Has he or has any one so carefully studied the soil-making period that all doubt is dissipated and shown that the Indian of historic time can only trace his ancestry back to so recent a time as when the brute creation that still lingers on our frontiers was its sole occupant? If the reader, curious in such matters, will look into the literature of this subject, he will find that the evidence has been produced time and again to show that with the very commencement of this soil-making period, are so intimately associated abundant traces of a tool-making creature — a man — and in such a manner associated, that the suggestion that all such objects of human origin are "intrusive," has no real weight.

Sections of undisturbed soil, sand, and gravel are not difficult to make and when we find that as a result of a large series of such, we have a uniform result, we are bound, if reasonable men, to accept such as the truth. Now this has been done, as I have said, and the fact obtained that relics of man of a very rude character underlie those of a more elaborate one. In an earlier publication I have ventured to call the former "fossil implements" and the later ones "Indian relics;" although, of course, they were all made, I believe, by the same people, but at different times. The apparent contradiction that rude and elaborate alike are found on the disturbed surface has no bearing upon the question. What the plow or spade has displaced has no longer an archæological significance, save as to its import as a tool or weapon of a particular character. A stone axe is an axe wherever and however found, but if it has been tossed about the fields or washed by a freshet from its original resting-place, what more can we say than that it is an axe? On the other hand, if in a section through the soil and underlying sand we find rude argillite implements and the very rudest pottery, and above them, *wholly in the soil*, axes,.celts, pipes, and pottery of more artistic finish; find this not once, but always; then we have the right to, indeed cannot honestly do otherwise, assert that the deeper, sand-encompassed objects antedate those which occur only in the over-lying soil. This holds good in archæological research in any part of the world, and is just as true as that in building a city to-day, we are building upon the ruins of an Indian village, or at least on ground where once the Indian passed and re-passed, even if he did not tarry long.

But can we go back a step farther? If we can do so elsewhere on the globe, I hold that it is warranted to do so here and for the same reasons. The geologists to effectively prevent this must show that the earth previously was uninhabitable; that the phy-

sical conditions, the climate, the fauna and flora alike forbid it, and this has not been done. Man lives in less hospitable regions now than when the Trenton gravel was laid down; the climate at the close of the glacial period was not more severe than that obtaining to-day in the Arctic circle. The reindeer, musk-ox, seal, and walrus sustain man to-day in Arctic America, and why should they not have done so in the Delaware valley, when a prominent feature of this fauna, as their bones in the gravel testify, they once were? There is an Arctic flora in existence now; so why not here in the distant long-ago of Glacial times; and forests, we know, can flourish at the very edge of a glacier.

This whole matter is not so exclusively a geological question as the votaries of that science declare. The archæologist has this surface soil and the sand and gravel beneath it clearly within the range of his domain, and he is no archæologist whose training falls short of ability to study intelligently the history of these superficial deposits.

As yet, concerning the gravel deposits of the Delaware valley, the geologists have merely put in a denial, which should not weigh against the careful researches of those who have given years to the study of this subject. What is needed in these overcrowded latter days is a proof that palæolithic man is an impossibility. When this is forthcoming, and not until then, will the student of early man in America haul down his flag.

As to the present controversy, here is the whole matter in a nutshell:—

I.

The stones are inspected,
And Holmes cries "rejected,
  They're nothing but Indian chips"
He glanced at the ground,
Truth, fancied he found,
  And homeward to Washington skips.

II.

They got there by chance
He saw at a glance
  And turned up his nose at the series;
"They've no other history,
I've solved the whole mystery,
  And to argue the point only wearies"

III.

But the gravel *is* old,
At least, so I'm told;
  "Halt, halt!" cries out W. J.,
"It may be very recent,
And it isn't quite decent,
  For me not to have my own way."

IV.

So dear W. J.
There is no more to say,
  Because you will never agree
That anything's truth
But what issues, forsooth,
  From Holmes or the brain of McGee.

CHARLES C. ABBOTT, M.D.

Water Rattlesnake in Captivity.

IN your issue of Nov. 11, there was an interesting account by R. W. Jones of a rattlesnake that would not eat. I had the care, this year, of a water rattlesnake (*Crotalus adamanteus*), which, after some trouble, I persuaded to eat. It was sent from Florida to the Toronto Natural History Society, in September, 1891; and at first we intended to put him in a cellar for the winter, and let him hibernate; but I thought a warmer place would be more likely to suit him, and so leave was obtained from the authorities to keep him in a large conservatory at the horticultural gardens. He had a glass-sided case to live in, 3 feet long and 15 inches wide, and was himself about 3 feet long.

I put a bull-frog in with him one day, but he took no notice of it, beyond just touching it with the tip (or tips, to be quite correct) of his tongue. I then tried him with a brown rat (he had now been about three months without food); when he saw the rat he grew quite excited, and struck at him twice. I waited about half an hour, expecting the rat to die, but the bite seemed to have no effect, so I left the rat in the case. As this was a Saturday, I did not see him again until Monday, and I then found the rat still alive; but with a bad bite on the side of its head, and the snake had two holes, made by the rat's teeth, through its rattle. The gardener told me that they had a fierce battle on Sunday afternoon, but they now seemed each afraid of the other. I killed the rat, and left the body in the snake's case, but he would not eat it. I next put a white mouse in his case, but of this he took hardly any notice. About the end of March I shot two goldfinches, and placed the dead bodies in his case. On visiting him again in a day or so, I was delighted to find that one of the goldfinches had disappeared. After this I supplied him frequently with dead birds, and about once a month he condescended to eat; but the birds he eat were always small ones, such as goldfinches, chipping sparrows, and warblers; he never ate any as large as the English sparrow or purple finch, several of which I put in his case; and he never fed while any one was looking at him.

His rattle was permanently injured by the rat's attack, and ever after sounded only a feeble and subdued kind of alarm. He changed his skin once during the summer; and, after the change, the tints of the beautiful diamond pattern on his back were extremely bright and vivid.

I could not get him to feed at all after the beginning of August, and he died in October, 1892, having been in captivity for a little over a year, for the first six months of which he went entirely without food. I gave him a shower-bath occasionally, which he seemed to enjoy, and was, I think, more ready to feed after he had been well moistened in this way.

I have now another and larger specimen of this rattlesnake to take care of. It was received from Florida in October last, and is quartered for the winter in a very warm and comfortable green-house. He has not as yet eaten anything, but I may be able to send you, next year, some report as to how he behaves.

I. B. WILLIAMS.

Toronto, December.

Intelligence in the Lower Orders.

SOMETHING over a year since a young lady of my acquaintance had an experience with a beetle, which, I think, showed a very marked degree of intelligence in the insect; and, as such instances are somewhat rare, I venture to send you an account of it.

This beetle was a specimen of *Pelidnota punctata* Linn., which was given to her in September. At first she kept it in a small box, feeding it with grass, leaves, and small pieces of fruits, such as peaches, pears, etc. Occasionally she would give it a drop of water to sip. It would sometimes bite a little out of a leaf, would eat the fruits, and would take water eagerly.

From the first she would take the insect in her fingers several times a day and stroke or caress it, also putting it to her lips and talking to it all the while she handled it. When she put it to her lips it would brush its antennæ over them with a gentle, caressing motion.

When she left her room she would shut the "buggie" up in its box. One day, about two weeks after she received it, she was called out suddenly and neglected this precaution. She was absent a considerable length of time, and when she returned the insect was not in its box nor anywhere to be seen. Fearing that she might injure it, she stood still and called "buggie, buggie," when it came crawling from its retreat toward her.

After this, she would frequently leave it free in the room when she went out, and when she returned, if the insect was not in sight, she would call it, and it would crawl or fly to her. As this was continued, it would more and more frequently fly to her instead of crawling, until at last it flew nearly every time it was called. When it came in this way, she would put it to her lips or to her nose, and the insect would appear to be pleased, moving its antennæ gently over her lips, or taking the end of her nose between them and touching it with a patting motion.