Mounds of the Lower Mississippi Valley and Texas,' in SCIENCE, Vol. XXIII., pp. 583–4, leads me to say a few words on the subject. Mr. Farnsworth cites Mr. A. C. Veatch's article published in this paper, Vol. XXIII., p. 35, and goes on to state that the numerous mounds existing through the region above mentioned were formed by the upturning of trees. I will not question his authority in making the assertion, not having ever lived in the localities he cites; all I wish to give are a few facts concerning the 'Indian mounds' which I have met with in Kendall Co., Texas.

Within a radius of five miles of my old home there, I know of four mounds. They are all of the same shape—elliptical, and measure from twenty to forty feet long by ten to twenty wide by two to three high. They are about twice as long as they are wide, and level on top. Two of them are located on high, hilly ground, and the other two in valleys. They form no group, but are scattered widely over the country. They are made largely of stones about the size of a man's fist, which appear to have been in contact once with fire, and from the small percentage of earth they contain compared with the surrounding ground, they give one an impression that they were formed by the piling up of these rocks. Arrow-heads are common around them, for which the people in the locality attribute their existence to the Indians, and hold that they were used as places of sacrifices, or torture, or cremation.

I will refrain from expressing any opinion as to their probable origin, leaving that to wiser heads than mine, for only the interest I take in the subject induces me to contribute the above.

IRVING H. WENTWORTH.
MATEHUALA, S. L. P., MEXICO.

MEGASPORE OR MACROSPORE.

IT is often asked why some botanists use the term megaspore while others call the same object a macrospore. Since those who say macrospore are likely to say macrosporocarp, macrosporophyll, etc., instead of megasporocarp, etc., it is worth while to call attention to the comparative merits of *mega* and *macro*. *Mega,* from the Greek μέγας, means big, great, large; it is equivalent to the Latin *magnus* and is the opposite of *micro*. *Macro,* from the Greek μακρός, means long; it is *not* the opposite of *micro,* as was doubtless imagined by those who first used the term, macrospore, but is the opposite of βραχός, meaning short. No one would designate the larger spores of heterosporous plants as *long spores.* Why then should any one say the same thing in Greek? The misconception of the meaning of *macro*—a misconception which could never occur to a student of Greek—has become so established that we even have a genus, *Macrozamia.* The taxonomist doubtless thought he was constructing a word which should mean *large Zamia,* but the word means *long Zamia,* while the plant itself is of the short tuberous type. I should not suggest a change to *Megazamia,* although much more radical changes in generic names are made with far less provocation. Botanists dropped the term, *rhizocarp,* because it implied that the sporocarps were borne upon roots, an entirely inaccurate implication. The term, *macro,* except where it refers to length, is just as inaccurate. Let us say megaspore, megasporophyll, megasporocarp, megaphyllous, and, in short use *mega* wherever the idea is that of great size rather than great length.

CHARLES J. CHAMBERLAIN.

SPECIAL ARTICLES.

DINOSAURIAN GASTROLITHS.

THE occurrence of worn and polished quartz pebbles in such close association with plesiosaur skeletons of the Kansas chalk as to suggest that in life these reptiles were pebble swallowers was first noted by Professor Mudge and later by Williston.[1] More recently these observations of Mudge and Williston have been confirmed in the most conclusive manner by Mr. Barnum Brown,[2] who found siliceous pebbles almost invariably accompanying the plesiosaur skeletons, which

[1] Field Columbian Museum Publication (Chicago), No. 73, p. 75.

[2] SCIENCE, N. S., Vol. XIX., No. 501, pp. 184, 185, August 5, 1904.

occur in considerable number in the Niobrara shales of South Dakota. In some instances the pebbles were even found *en masse,* in one large specimen as many as a half bushel being present, ranging from the size of a walnut to four inches across.

From the regularity of appearance and association, Mr. Brown, as it seems to one familiar with the Dakotan Niobrara shales, is very correctly led to the conclusion that these pebbles served as 'stomach stones.' Such attrition stones, I was some years since informed, are habitually swallowed by the Florida alligators, and doubtless the habit of swallowing stomach stones, or *gastroliths,* as I shall conveniently call them, is and has been widespread amongst the reptilia, partly as in the birds.

Furthermore, Williston in his most recent contribution on North American Plesiosaurs[3] adds the following remarks to his earlier statement: "It was with a specimen of an elasmosaur (*E. Snowii*) that Mudge first noticed the occurrence of the peculiar siliceous pebbles which he described; and it was also with another, a large species yet unnamed from the Benton Cretaceous, that the like specimens were found described by me in 1892. That this habit was not confined to this type of plesiosaur, however, is certain, since I have also observed it in different species of *Polycotylus* and *Trinacromerum,* both relatively short-necked and long-headed plesiosaurs. Much doubt and even ridicule have been thrown upon this supposed habit, and the use of pebbles by these reptiles. But the cumulative testimony of writers, both on this and the other side of the Atlantic, is quite conclusive. It has been assumed that the plesiosaurs could not have utilized the pebbles as a means of digestion in a muscular stomach. Dr. Eastman, who has vigorously opposed the idea of the possession of such a bird-like structure on the part of the plesiosaurs, seems to have been quite unaware that the modern crocodiles have a real bird-like and muscular gizzard, and are so described by Dr. Gadow. The crocodiles have a similar habit, or at least such a habit has been imputed to them, and it is not at all unreasonable that, strange as it may seem, the plesiosaurs had a real, muscular bird-like gizzard, which utilized the pebbles in whatever way the crocodiles may utilize them."

Certainly in connection with the foregoing facts it is of more than passing interest that at least some of the sauropodous Dinosauria were stone-swallowers. For one can not help eagerly scanning the record for every indication of the true habits and structure of these extraordinary animals. The evidence for the use of gastroliths by the sauropods rests on at least one authentic instance—namely, that of a large sauropod observed at the northern end of the Big Horn Mountains by Mr. Charles Speer, of Billings, Montana. Mr. Speer found in immediate association with a considerable portion of the skeleton about two dozen quartz gastroliths, which, with various skeletal parts, he took back to Billings, where I saw all this material, September 19, 1902. These specimens were displayed in the window of the principal bank of Billings, of which Mr. Speer is cashier, and he has very courteously sent to the writer at the Yale Museum nine of these pebbles weighing a little over a kilogram in all, and varying from smaller forms to several inches in diameter. These flints vary from gray to brightly colored red and more or less mottled jasper, and include one very highly polished siliceous nodule quite filled with bryozoa and corals, and probably sponge spicules. This gastrolith shows the effects of secondary or *gastral wear,* its more depressed portions clearly displaying the original rougher true pebble surface. The finely, and even highly, polished and fresh surfaces of all the pebbles would, however, immediately arrest one's attention. In fact the entire surfaces are so surprisingly smooth and clear as to at first suggest a very recent origin, rather than ancient use. It is surmised, however, that immediately following the fossilization of the dinosaurian host, these gastroliths were incased in protecting calcite and clay, and that they were never subsequently disturbed till finally eroded out just previous to collection.

[3] *Am. Jour. Sci.,* Vol. XXI., March, 1906, p. 226.

Various rounded and notably smooth pebbles I observed when making the latter portion of the excavation from which I secured the type specimen of *Barosaurus,* in the summer of 1898, now appear to indicate that gastroliths accompanied that fossil, and it is very probable that many instances of true gastroliths have been overlooked.

The lizards, as I have been shown by Mr. A. Hermann, a most keenly observant lizard fancier, swallow pebbles when feeding on a pebbly cage floor; and he informs me that some of his species swallow very large pebbles for their size, these being soon passed. It can, of course, be that such pebble-swallowing is partly independent of stomach structure; but in view of the fact that the Dinosaurs retained and polished the pebbles, it is fair to assume that their gastrolithic habit establishes the presence of additional important structural analogies with the birds.

G. R. WIELAND.

DEPOSIT OF VENUS SHELLS IN NEW YORK CITY.

IN excavating for the new building for the United States Express Company, on Rector Street, between Sixth and Ninth Avenue elevated, Mr. Daniel E. Moran, C.E., found resting on the bed rock forty feet below the surface a small deposit of *Venus* shells, fragments of wood and some peaty matter. This deposit was covered by ten feet of glacial drift which in turn was buried under thirty feet of sand probably of post-glacial age. The fossiliferous deposit was apparently protected from the ice action in this spot by a local ledge or shelf of the bed rock.

The *Venus* shells resemble very closely those of the recent *V. mercenaria* Linn. but differ from them somewhat and along a line which seemed to identify them with the variety *antiqua* of Verrill from the Pleistocene deposits of Sankaty Head, Nantucket. The Manhattan specimens were compared with a number of these in the collections at Columbia University and the identification was found to be complete. The variety *antiqua* is an unusually massive and strongly sculptured variety, Professor Verrill's description being as follows:

> The shell is rather obtusely rounded posteriorly and is thickly covered with prominent concentric lamelliform ridges, which mostly extend entirely across the shell, but are often reflexed, appressed and more or less confluent over the middle region, where the ordinary variety is nearly smooth (except when young).

Professor Verrill mentions var. *antiqua* as occurring in the 'lower shell bed' at Sankaty Head, but my work there in the summer of 1904 showed that the typical specimens occur in the 'upper shell bed,' more nearly resembling recent forms as the 'lower shell bed' is reached.[1]

The 'upper shell bed' has a decidedly northern fauna probably driven south by the advancing ice sheet, and as the recent form and not *antiqua* is found in the lower beds containing a fauna of rather southern range, it seems as if *antiqua* is either a northern variety or else has developed from the common form as a result of the change to much colder conditions.

The identification of this *V. mercenaria* as the var. *antiqua* of Verrill correlates this Manhattan deposit with the upper beds at Sankaty Head and indicates the existence of these beds with their contained fauna as far west and south as the neighborhood of New York.

The wood fragments were examined by Dr. C. C. Curtis, of Columbia University, but the original structure was so altered as to make identification impossible beyond the fact that they were from a deciduous tree.

Some specimens of *Ilyanassa obsoleta* Say and an oyster fragment from the subway tunnel beneath the East River were recently received at the university from Mr. J. F. Sanborn. They were found 2,000 feet from the Brooklyn side in the mud or silt thirty feet below the bed of the river or seventy feet below tide water, the river being here about forty feet in depth. The oyster fragment is probably from a specimen of our common species *Ostrea virginiana* Lister, and the *Ilyanassa* shells are apparently identical with

[1] See 'Pleistocene Formations of Sankaty Head, Nantucket,' *Jour. of Geol.*, Vol. XIII., No. 8, November–December, 1905, p. 728.