ART. XL. — *On the existence of the Mastodon in the deep-lying gold placers of California;* by B. SILLIMAN.

DURING several visits to the gold regions of Tuolumne county, California, in the summer of 1867, I obtained evidence leading to the conclusion that the Mastodon, and perhaps the Elephant, existed prior to the great volcanic disturbances and outpourings of lava which occurred throughout the Sierra Nevada mountains pending or at the close of the epoch in which the deep-lying placers were produced.*

It is well known that this epoch of volcanic activity has been regarded as marking the period of the Pliocene, dividing it from the Post-Pliocene and existing epoch, by a well-marked horizon. Among the animals whose remains have been found in this ancient auriferous detritus of California, preceding the epoch of volcanic activity, are "the rhinoceros, an animal allied to the hippopotamus, an extinct species of horse, and a species allied to the camel and resembling the *Megalomēryx* of Liedy."†

The remains of mastodon and elephant are found abundantly in the superficial detritus of the gold region, over an extended area, but until now they have never been certainly identified as occurring under the basalt, which covers the ancient gold drift and forms the highly characteristic ranges known as "Table Mountains."

Near Jamestown, a village in Tuolumne county, extensive explorations have been made during the past fourteen years, in the deep-lying gold detritus, by tunnels driven in beneath the basaltic capping, at a level low enough to open the bed of the ancient rivers, in the channels of which rests the gold-bearing gravel. These tunnels are from a few hundred feet in length to three thousand feet or more ("New York tunnel" 3,500 feet), and they are from two hundred to three hundred feet below the nearly level surface of the basalt. They are driven as nearly as possible at right angles to the supposed course of the ancient stream, and in order to drain off the water by gravity, the grade commences often 150 feet or more beneath the lip of the "rim rock" or margin of the old valley, aiming to come out in, or just beneath, the ancient channel or river bed. Underneath the basalt is a mass of stratified, almost horizontal, generally thin-bedded, detrital matter, alternating with clay and argillaceous zones, the thinly laminated beds containing often veget-

* For a notice of the nature of these remarkable deposits, see a paper by the author, in this Journal for July, 1865 [II], xl.

† Geological survey of California, vol. I. (Geology) p. 251.

able stems and impressions of leaves, indicating deposition in quiet water, while other portions are made up of coarse gravelly masses, compacted often into firm coherent "cement," as the miners call it. From the ancient river bed to the top of the basaltic capping of Table Mountain, is certainly not less than three hundred feet, probably somewhat more.

It is beneath this mass of matter, partly aqueous and partly volcanic in its origin, that the remains of mastodon herein mentioned have been found. My attention was first called to them by discovering the portion of an *os illium* in the collection of A. B. Preston, Esq., local Judge of Jamestown, which he assured me had been found in driving the so-called Humbug Tunnel under Table Mountain, at a point 1,500 feet in from its mouth. Associated with it was the point of a tusk, which I also secured. Both these specimens are now in the collection of the Peabody Museum at Yale. Although I obtained the the plainest possible testimony of eye witnesses to the fact that these bones were taken from beneath the basalt, I should not venture to mention the fact in support of the opinion that the mastodon existed in the Pliocene period, without farther and more satisfactory evidence.

This I was fortunate enough to obtain from Mr. D. T. Hughes, now engaged in exploring a tunnel upon the southwest side of the same mountain, which was formerly known as the Maine Boy's Tunnel,* but now called after Mr. Hughes. Mr. H. informed me, that at a point about 1,600 feet in the tunnel named, bones existed, believed by him to be those of mastodon or elephant, and which had been uncovered some time since, but were at the time of my visit inaccessible, owing to the falling in of that portion of the work. I immediately visited the place, and made all the examination possible at the time, but could not then nor on a later occasion gain access to the bones. At my request explorations were resumed in the direction likely to uncover them, and I made arrangements to return to the locality whenever the miners should again reach these interesting remains, but up to the date of my leaving California (January, 1868), I was advised that this point had not yet been reached, and all I could do was to urge Mr. Hughes to use all diligence in the search and communicate to me by letter a full notice of the facts as they should develop themselves. On the 24th of March I had the pleasure of receiving from him the following letter.

* For a section of the Maine Boy's Tunnel see Geological survey of California, Geology, vol. i, p. 249, where also, pp. 243–253, may be found a fuller account of the Table Mountain and accompanying phenomena, than our space permits us to give herewith.

Letter from D. T. Hughes to B. Silliman, dated Jeffersonville, February 22, 1868.

"In compliance with your desire that I should write to you whenever I should reach the bones, I have now to state that I have reached them at last, and I regret very much that you were not here to examine them as they lay. The bones were very much decayed, indeed so much so that I found it impossible to obtain any of them whole, with the exception of four grinders, which I have in a very good state of preservation. The remains of this large animal were found 1,650 feet in under the Table Mountain, and four and a half feet above the ledge or bottom slate, imbedded in a stratum of sand overlaying a deposit of gold-bearing gravel, and scattered over a space twenty feet long by ten or twelve feet wide. A large portion of these bones were so soft that I could penetrate right into them with my fingers, while other pieces were a little harder, and looked very interesting. Some of the cavities were lined with yellow iron pyrites, and so bright, that when first exposed to the light of the candles, they glitter like diamonds. I have numerous fragments of different bones which bear handling very well when thoroughly dried. The two tusks lay together, imbedded in the same stratum of sand, and very much decayed also. I endeavored to remove them entire, or in medium sized pieces, so that I could put them together again, but I was unsuccessful and found nothing that would hold them together. Both of the tusks were slightly curved, and large pieces of the points had been broken off, apparently. Each tusk measured, as I found them, seven feet and one inch in length, and if whole would probably have measured ten feet. They were not exactly round, measuring three feet from the end that enters the socket six inches in one diameter and five and a quarter inches in the other.

The grinders, as before mentioned, are in a very good state o preservation. The two posterior grinders each measure six inches in length and three and a half inches wide, and the two exterior measure each four and a half inches in length and two and three-fourths inches wide. The enamel on the posterior ones is very perfect, but the exterior grinders are very much worn, apparently. I found it impossible, because of their softness, to get the dimensions of any of the other bones, which I regretted very much.

Enclosed you will find a rough sketch of three of the teeth (with portions of the jaw attached.) The two grinders you see togther are in the same position as when I dug them out. The sketches are not drawn to an exact scale, but will convey an idea of the grinders as they are. The other drawing is the side view of the posterior grinder. * * * *

From Mr. Hughes' description and the accompanying drawings there is no room to doubt that the bones discovered are those of the mastodon, and it appears probable that nearly the entire skeleton of a full sized animal was entombed in the sands resting immediately upon the ancient auriferous gravel beneath

the Table Mountains, and of course anterior in age to the period of volcanic activity and overflows of lava, which have hitherto been considered as marking the close of the Pliocene era, a catastrophe which appears to have exterminated the other members of the Pliocene fauna.

If the mastodon survived the catastrophe which exterminated the hippopotamus, rhinoceros, tapir, &c., and continued through the Post Pliocene, to the appearance of man, it yet remains to be proved that man was his companion prior to the dawn of the existing epoch.

New Haven, March 25, 1868.