July 5th.

MR. LEA, President, in the Chair.

Present thirty-seven members.

Mr. Lea presented the following, which was referred to a committee:

Description of four new species of Exotic Unionidæ.

Mr. Lea read letters which he had received from Dr. Lewis of Mohawk, New York, in which he mentions the astonishing number of dead shells of *Anodonta Lewisii*, Lea, in the canal, also the immense number of dead specimens of *Cyclas*, as they lie in beds from three to eight inches deep. He says he had taken two gallons of *living* specimens from an area of six by four feet. They do not burrow deeply in the mud, while the *Unio* goes down *two feet*. Mr. Lea compared this mass with the great deposit of fresh water gasteropods at Milk Pond, N. J. Dr. Lewis also collected specimens on the East Branch of the Unadilla, a small stream fourteen miles south west of Mohawk, and got about 200 *Anodonta Unadilla* DeKay=*An. edentula*, Say. Subsequently he visited Cedar Lake, a small body of water in Herkimer County, the south shores of which were composed of a greenish white marl, consisting of the remains of untold millions of shells. In the middle branch of the *Unadilla*, Dr. Lewis says, "I stopped just long enough to find one living specimen to be sure it was there. Dead shells were not rare, but I did not spend much time, only to learn the character of the stream, so as to be able to verify your opinion that *Anodonta Unadilla* was only a local variety of *An. edentula*, Say."

Mr. Lea also mentioned that he had received specimens in alcohol of *Unio Kleinianus*, Lea, from G. Hallenbeck Esq., of Columbus, Georgia, to which that ardent naturalist called his attention, as possessing a *branchial uterus in both lobes of the branchia on each side.* This very remarkable feature in the functions of the female of this species, constitutes the third which has been observed by Mr. Lea, two he had formerly shown to the Academy, namely, that of *Unio multiplicatus*, Lea, and *rubiginosus*, Lea.

July 12th.

Vice-President LE CONTE, in the Chair.

Present nineteen members.

Prof. Holmes exhibited a collection of fossils from the post-pliocene of South Carolina. He remarked:

If we examine the collection of remains of vertebrated animals taken from the post-pliocene or post-tertiary beds of South Carolina which I have the pleasure of exhibiting this evening to the members of the Academy, we will be surprised at the resemblance in many of the forms to corresponding parts of some of our domestic animals, as the horse, dog, hog, bull, etc., and the question may very naturally suggest itself—are the living horses, dogs, hogs, raccoons, opossums, deer, elk, tapirs, beavers, etc., and the one hundred and fifty species of mollusca now living on the coast, the descendants of the animals whose remains we find fossil in these beds,—or are these truly fossil remains, and not accidental occupants of this deposit?

My object is not to enter upon a discussion of these questions, but simply to exhibit the collection, and state the facts connected with their discovery, and the geological evidence of their being true fossils found in an extensive formation in the low country of South Carolina, included in a belt about ten miles wide, and occupying depressions in the great marl bed of the Eocene period.

Three distinct formations or beds are here supposed to belong to this post-pliocene age. First the marine beds, composed of a gray sandy clay in which are imbedded innumerable small shells, sometimes very comminuted, but of species now common and living on the coast; many of the large shells are

preserved in the position they occupied when living, having both valves entire and perfect, and presenting the appearance of having been destroyed suddenly by an avalanche of sand.

The second, is the blue or pluff-mud bed, composed of a stiff blue clay, containing silicious pebbles, and masses of conglomerates, water-worn and boulder-like, but no angular blocks, and also remains of marine and terrestrial animals. These pebbles and rolled conglomerates contain casts of the fossils common to the marl of the Eocene bed upon which the blue mud rests, and it has been ascertained that the silicious conglomerates are fragments of the marl, broken off, we infer, by the action of waves, and rolled upon the beach of a post-pliocene sea; they afterwards were imbedded in the blue mud, lost all their lime or calcareous particles, and became silicified.

The third or upper bed includes the peaty deposits, yellow sand and clays, which overlie the pluff-mud.

Sections of the three most important localities may be represented in the following diagrams:

Marine bed of the Wadmalarr.

Yellow Sand	15 feet.
Ferruginous sand with casts of shells	2 feet.
Red clay	2 feet.
Gray sand and mud with comminuted shells, fossils in fine preservation	3½ feet.

Ashley River beds.

Yellow sands with bands of Ferruginous clay	4 feet.
Blue mud resting on the white Eocene marl	1 foot.

Goose Creek beds.

Yellow sand	12 feet.
Blue mud	2 feet.
Ferruginous sand containing bones, etc	3 inches.
Yellow sand	3 feet.
Pliocene marl resting on the Eocene white marl	12 feet.

The fossil bones obtained from these strata are often in a fine state of preservation, especially those taken from the blue mud, which are generally petrified; those from the sands are likewise well preserved, but in the peaty or upper beds they are not so petrified, retain all their gelatine and appear to decompose rapidly. Most of the specimens in the collection now before you were some time ago submitted by me to your distinguished anatomist Professor Leidy, for determination. When they were returned I found a number labelled *recent*, which labels you will find still retained and attached to their respective specimens; at the same time the Professor wrote to say, "that they appeared to belong to recent species which had become accidental occupants of the same bed with the true fossils." I held the opposite opinion, and believed that they were true fossil remains, as I had myself collected them, not only from the banks and deltas of rivers, but a large number from excavations several feet below the surface, at a distance from any creek, pond or river, and in some cases from excavations below the high sandy land of cotton fields.

But a few weeks ago Dr. Klipstein, who resides near Charleston, in digging a ditch for the purpose of reclaiming a large swamp, discovered and sent me the tooth of a mastodon, one of the black specimens in the tray before you, with the request that I should go down and visit the place, as there were indications

of the bones and teeth of the animal still remaining in the sands which underlie the peat-bed. Accordingly, with a small party of gentlemen, we visited the Doctor, and succeeded not only in obtaining several other teeth and bones of this animal, but nearly one entire tusk, and immediately along side of the tusk discovered the fragment of *pottery* which I hold in my hand, and which is similar to that manufactured at the present time by the American Indians. The depth of the excavation was about three feet below the surface; bones of the deer and two teeth of a horse were also found.

This is not a drift-bed, but a deposite of the peat and sands of the post-pliocene formation. The marine beds with their characteristic shells lie immediately beneath, and is exposed on the high land which surrounds the swamp. If we take the one hundred and fifty species of mollusca, whose shells are so beautifully preserved in these beds, and place the entire group along side of a similar collection of the shells of the recent species living upon the coast, we will observe that they are identically the same in form, character and every other respect, except the following. There are among the fossils two shells whose analogues are not now living upon the sea coast of Carolina, but are common in the gulf of Mexico, and West Indian seas. *Strombus pugilis*, abundant on the coast of Florida and Cuba, is a fossil of the post-pliocene; and *Gnathodon cuneatum*, now living in the estuaries near Mobile, and along the northern coast of the Gulf is found fossil at a depth of eighteen or twenty feet under the city of Charleston, and in such numbers that cart-loads may be obtained from a single locality.

Again, we find two more species that are now extinct, or rather unknown to me in a recent state, one of which I have lately figured and described as *Cavolina Tuomeyii*, after my late friend and colleague Prof. Tuomey; the other is *Telledora lunulata*, Adams, a shell described as recent, from Carolina, but in fact a fossil in the post-pliocene and extinct.

Now let us compare this group of remains of the vertebrata with a similar group of living animals. Among the former we find teeth of the deer, raccoon, opossum and others well known to be living at the present time in South Carolina; but like the invertebrata we find two or three species which are no longer existing north of Mexico and South America—the *peccary*, the *capybara* and the *tapir*. Again, there are remains of the musk-rat and beaver, but these two animals are extinct in the low country of South Carolina; the beaver has indeed almost been extirpated to the east of the Mississippi river, and the musk-rat is confined to a region above the falls of the rivers of this State.

The mastodon, the megatherium, the mylodon and perhaps one or two others, are extinct.

That we may the better appreciate the interesting analogy existing between these two groups as regards the living and extinct species, we will place them in a tubular form, thus:

Fossil Remains.	Mollusca.	Vertebrata.
Species apparently the same as those now living and included in the fauna of South Carolina,	say 140	say 37
Species not included in the recent fauna of the State, but living within tropical latitudes,	say 2*	say 3⁂
Do. do. in northern latitudes,	2†	3‖
Species presumed to be extinct,	say 2‡	say 5¶

* Strombus pugilis and Gnathodon cuneatum.
† Mya arenaria, Pandora trilineata.
‡ Cavolina Tuomeyi and Telledora lunulata.
⁂ Tapir, Peccary and Capybara.
‖ Elk, Beaver, Musk-rat.
¶ Mastodon, Elephant, Megatherium, Mylodon, Castoroides.

The evidence which I propose to adduce for the correctness of my assertion that these are true fossils, will the better appear by the following extracts from a pamphlet issued a short time since, and which, in consequence of the great demand, has passed through two editions, and is now again out of print.

In a letter to Dr. Nott and Mr. Gliddon,* dated Feb. 10, 1857, Prof. Leidy writes:

"Some time since, Professor F. S. Holmes, of Charleston, submitted for my examination, a collection of fossil bones from a post-pliocene deposit on Ashley River, S. Carolina. Among remains of the extinct horse, the peccary, mylodon, megatherium, mastodon, hipparion, the tapir, the capybara, the beaver, the musk-rat, etc., were some which I considered as belonging to the dog, the domestic ox, the sheep and the hog. Prof. Holmes observes that these remains were taken from an extensive deposit, in which similar ones exist abundantly, and he further adds, that he cannot conceive that the latter should have become mingled with the former, since the introduction of domestic animals into America by Europeans. It is not improbable that the American continent once had, as part of its fauna, representatives of our domestic animals, which subsequently became extinct—though I am inclined to doubt it; but what we have learned of the extinct American horse, will lead me carefully to investigate the subject."

The opportunity for prosecuting this investigation, to some extent, I had the pleasure of affording Professor Leidy, in March last, a month after the date of the above letter. Dr. Hallowell and himself visited me in Charleston, and I accompanied them to Ashley ferry and Goose creek. The annexed extracts are from a paper of Professor Leidy's on this topic, written after his return home to Philadelphia, and he has also kindly sent me a number of very valuable drawings of fossil horse teeth, and other remains obtained from the Carolina beds †

"The interesting collection of remains of vetebrated animals, which form the subject of the following pages, for the most part have been submitted to the inspection of the author, by Prof. Holmes and Capt. A. H. Bowman, U. S. A., who collected them from the eocene, post-pliocene, and recent geological formations, in the vicinity of Charleston, South Carolina.

"The collections of these gentlemen consist of a most remarkable intermixture of remains of fishes, reptiles and mammals, of the three periods mentioned; and in many cases perhaps we may err in referring a particular species to a certain formation, more especially in the case of the fishes. The remains usually consist of teeth often well preserved, but frequently in small fragments, more or less water-worn, and most of the fossils are stained brown or black.

"By far the greater portion of the fossil remains are obtained from the post-pliocene deposit of the Ashley River, about ten miles from Charleston. The country in this locality is composed of a base of whitish eocene marl, containing remains of *squalodon—sharks and rays*—above which is a stratum of post-pliocene mud, about one foot in thickness, overlaid by about three feet of sand and earth mould.

"The post-pliocene mud contains great quantities of irregular, water-worn fragments of the eocene marl rock from beneath, mingled with sand, blackened pebbles, water rolled fragments of bones, and more perfect remains of fishes, reptiles and mammals, belonging to the post-pliocene and eocene fossils.

"On the shores of the Ashley River, where the post-pliocene and eocene formations are exposed, the fossils are washed from their beds, and become mingled with the remains of recent indigenous and domestic animals, and objects of human art, so that when a collection is made in this locality, it is sometimes difficult to determine whether the animal remains belong to the forma-

* Indigenous Races of the Earth; p. xix.

† Lithographs of these figures will appear in the volume, with Prof. L.'s paper.

tions mentioned or not. Generally, however, we have been able to ascertain where the fossils belong, which we have had the opportunity of examining, from the fact that the greater number were obtained from the deposits referred to in digging into them some distance from the Ashley River.

"The collections contain remains of the horse, ox, sheep, hog and dog, which I feel strongly persuaded, with the exception of many of those of the first mentioned animal, are of recent date, and have become mingled with the true fossils of the post-pliocene and eocene formations, where these have been exposed on the banks of the Ashley River and its tributaries. In regard to the remains of the horse, from the facts stated in the account given of them in the succeeding pages, I think it will be conceded that this animal inhabited the United States during the post-pliocene period, contemporarily with the *mastodon*, *megalonyx*, and the great broad fronted bison.

"Many of the mammalian remains are of recent animals, or at least are undistinguishable from the corresponding parts of the latter; and if they are not accidental occupants of the post-pliocene deposit, are highly interesting, as indicating their contemporaneous existence with many species and genera now extinct.*

"It appears to be quite well authenticated that the horse, which is now so extensively distributed, both in a wild and domestic condition, throughout North and South America, did not inhabit these continents at the time of their discovery by Europeans. With this fact in view, in conjunction with the circumstance that animal remains of late periods may become accidental occupants of earlier geological formations, we should require strong evidence to be advanced before it is admitted that the Horse belonged to an ancient fauna of the western world. At the present time the evidence appears to be sufficiently ample to justify the latter conclusion, and it is further sustained by the discovery, in the same part of the world, of the remains of two species of the closely allied genus *Hipparion*.

"Remains of the horse, discovered in Brazil, Buenos-Ayres, Chile, have been indicated by Dr. Lund, Prof. Owen, M. Weddell, and M. Gervais. These remains exhibit no well marked characters distinguishing them from corresponding portions of the skeleton of the recent horse, and from a comparison of the figures and descriptions which have been given of most of them, together with some remarks of the latter author, it is doubtful whether they belong to more than a single species, the *Equus neogæus* of Dr. Lund.

"Prof. Buckland and Sir John Richardson have described remains of the horse, discovered in association with those of the elephant, moose, reindeer, and musk-ox, in the ice cliffs of Eschscholtz Bay, Arctic America.

"In the United States, remains of the Horse, chiefly consisting of teeth, have been noticed by Drs. Mitchell,† Harlan,‡ and DeKay,§ but these gentlemen have neither given descriptions nor figures by which to identify the specimens. Some of the latter are stated to have been found in the vicinity of Neversink Hills, New Jersey; others in the excavation for the Chesapeake and Ohio Canal, near Georgetown, District of Columbia; and some in the latter tertiary deposit on the Neuse River, in the vicinity of Newbern, North Carolina. Dr. DeKay, in speaking of such remains, says, "they resemble those of the common horse, but from their size apparently belonged to a larger animal," and he refers them to a species with the name of *Equus major*.

"Dr. R. W. Gibbes‖ has given information of the discovery of teeth of the

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* Remains of the Tapir, Peccary and Capybara present a similar association of life to that now confined to South America.

† Catalogue of Organic Remains, 1826, 7, 8.

‡ Med. and Phys. Researches, 1835, 267.

§ Zoology, New York. pl. 1, Mammalia, 108.

‖ Proc. Amer. Assoc., 1850, 66.

horse in the pliocene deposit of Darlington, South-Carolina; in Richland District of the same State; in Skidaway Island, Georgia, and on the banks of the Potomac river. He further observes that he obtained the tooth of a horse, from eocene marl, in the Ashley river, South Carolina, but the researches of Prof. Holmes* indubitably indicate the specimen to have been an accidental occupant of the formation.

"Specimens of isolated teeth, and a few bones of the horse, from the post-pliocene and recent deposits of this country, have frequently been submitted to my inspection. Many of these I have unhesitatingly pronounced to be relics of the domestic horse, though I feel persuaded that many remains of an extinct species are undistinguishable from the recent one.

"Whether more than one extinct species is indicated among the numerous specimens of teeth I have had the opportunity of examining, I have been unable satisfactorily to determine. The specimens present so much difference in condition of preservation, or change in structure; so much variation in size, from that of the more ordinary horse to the largest English dray horse; and such variableness in constitution, from that of the recent horse to the most complex condition belonging to any extinct species described, that it would be about as easy to indicate a half dozen species as it would two.

Under the circumstances, I would characterize the extinct horse of the United States as having had about the same size as the recent one, ranging from the more ordinary varieties to the English dray horse, with molar teeth, frequently comparatively simple in construction, but with a strong disposition to become complex.

"Among the number of teeth of the horse in Prof. Holmes' collection labelled as coming from the post-pliocene deposit of Ashley River, there are several, which, from their size, construction and condition of preservation, I feel convinced are of recent date: and these no doubt became mingled with the true fossils of that formation where it is exposed on the Ashley River, in which position I personally found undoubted remains of the recent horse and other domestic animals, and objects of human art, mingled with remains of fishes, reptiles, and mammals, washed by the river from the banks, composed of eocene and post-pliocene deposits.

"Teeth of an extinct species of horse, however, undoubtedly belong as true fossils to the post-pliocene formations in the vicinity of Charleston. These are usually hard in texture, stained brown or black from the infiltration of oxide of iron, sometimes well preserved, but more frequently in a fragmentary condition and water-worn. Generally they are not larger than the teeth of the more ordinary varieties of the domestic horse, and sometimes are quite as simple in the plication of their enamel, but usually are more complex and sometimes exceedingly so.

"Figure 1 represents a first superior molar tooth, neither larger nor more complex in structure than the corresponding tooth of the recent Horse. This specimen, which is dense and jet black in color, was obtained by Prof. Holmes from a stratum of ferruginous sand, two inches thick, exposed on the side of a bluff, on Goose Creek, about twelve miles from Charleston.

"Having expressed a desire to see the locality from which the tooth just mentioned was obtained, Prof. Holmes afforded me the opportunity of doing so. The bluff is about thirty feet high; its base is formed of a pliocene limestone, about fifteen feet thick, and composed of the debris of marine shells: above this is the stratum of ferruginous sand, of post-pliocene age, containing numerous pebbles and rolled fragments of bone all blackened like the tooth obtained from the same position. Overlying the latter stratum, there is a layer of stiff blue clay, about two feet in thickness, and above this there are about twelve feet of sand and earth-mould.

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*Ibidem, 68.

"A similar blackened tooth was obtained from the same formation at Doctor's Swamp, John's Island.

"Figure 4 represents a very remarkably well preserved specimen of a lower molar above referred to from Georgia, where it was discovered by J. H. Couper, in association with equally well preserved remains of other extinct animals. The tooth is brown in color; and it neither differs in size nor form from its homologue in the recent horse.

"In the collection of fossils of Prof. Holmes, there is the specimen of an upper first large molar, labelled from Texas, represented in figure 5. The tooth is of the largest comparative size, and exhibits the highest degree of complexity in the folding of its enamel; in both of which characters it differs in such a remarkable degree from the corresponding tooth, represented in figure 5, from the post-pliocene formation of South Carolina, that it appears hardly possible that these two teeth should belong to the same species of horse.

"A remarkably well preserved specimen of an upper molar tooth, jet black in color, and an incisor, yellow and quite friable in texture, both belonging to the extinct horse, from North Carolina, have been submitted to my inspection by Prof. Emmons.

"Among the most interesting of the fossils discovered by Prof. Holmes, in the post-pliocene beds of the Ashley River, are two molar teeth of a species of the equine genus *Hippotherium*. These are the first remains of the latter discovered in America, and they indicate the smallest known species.

"Both specimens are from the upper jaw; and they are well characterized, not only by the isolation of the internal median enamel column, but also by the complex plication of the interior or central enamel columns.

"The larger specimen is firm in texture; has the enamel stained jet black, and the dentine and cement gray.

"I have personally had the opportunity of inspecting remains of the tapir, found in Texas, Louisiana, Kentucky, Mississippi, Indiana, Ohio and South Carolina, proving an extensive range of this animal at one time over the country of the United States.

"The specimens which were presented by Dr. Carpenter to the Academy of Natural Sciences of Philadelphia, on close comparison are not found to differ from the corresponding parts of the living *Tapirus americanus*.

"The post-pliocene deposit of the Ashley River contains a number of small fragments of molar teeth, and one nearly entire and unworn crown of a second lower molar, which have the same characters of form and size, as in the living tapir. Besides these, the same collections contain fragments of lower molars, and two nearly entire crowns of upper molars, having the exact form of the corresponding teeth of the *T. americanus*, but larger in size.

"Teeth of the beaver, jet black in color, have likewise been obtained from the post-pliocene deposit of Ashley River.

"The collections contain numerous specimens of blackened molar teeth, together with a few incisors and fragments of jaws, from the Ashley post-pliocene deposit, which neither differ in form nor size from the corresponding parts of the recent muskrat.

"Remains of *Lepus sylvaticus*—common gray rabbit—have been found in association with those of other rodents and of the extinct peccary near Galena, Illinois. A few specimens of molar teeth, black in color, apparently belonging to this species, were obtained from the post-pliocene beds of the Ashley River.

"Several small fragments of teeth of the *Megatherium*, in Prof. Holmes' collection, were obtained from the post-pliocene bed of the Ashley River. Previously to the discovery of those specimens, remains of the *Megatherium* had been found in no other locality of North America than in the State of Georgia.

"Two small fragments of lower molar teeth of *Mylodon Harlani* were obtained from the Ashley post-pliocene beds. One of the fragments is repre-

sented in figure 21, plate xvi. of 'A memoir on the extinct Sloth Tribe of North America,' by the author."

As regards the specimens of human art found as above, it must be remarked that it is only at this locality—Ashley Ferry—that we find such relics. Here at the base of a low bluff, is a beach of eocene marl; above the bluff is a farm-yard, and all the sweepings of the premises, consisting in part of old hoes, broken plough-shares, and fragments of crockery-ware, etc., are thrown into the river, and lie mingled with the fossils which are washed out of the bluff, and scattered over the surface of the beach below, which is exposed at low tide. At no other locality on this river, and there are several, viz.: Ramsay's, Clement's, Greer's, Middleton's, etc., where similar fossils are found, do we obtain relics of human art; at least, I have never found such.

The fossils from Ashley Ferry present, as a group, the same appearance as those procured inland at some distance from the river, by digging from three to five feet below the surface. Many specimens from the ferry were considered as recent by Professor Leidy; they appear quite fresh and unchanged in color, and their texture not in the slightest degree altered. To one familiar with the fossils of the South Carolina Post-Pliocene, this excites no surprise, as it is of common occurrence, more especially among the shells; for example, the olive shell—*Oliva literata*—is found as fresh and highly polished as the recent ones from the sea-beaches along the coast; and *Cardium magnum* retains often the delicate yellow and brown markings, common to the species.

The color or texture of a fossil, therefore, does not always absolutely determine its relative age; as Professor Leidy has himself remarked in a foot-note to his letter alluded to above, viz.:

"Fossilization, petrifaction, or lapidification, is no positive indication of the relative age of organic remains.

"The Cabinet of the Academy of Natural Sciences of Philadelphia contains bones of the megalonyx, and of the extinct peccary, that are entirely unchanged; not a particle of gelatin has been lost, nor a particle of mineral matter added, and, indeed, some of the bones of the former even have portions of articular cartilage and tendinous attachments, well preserved."*

From the foregoing it would appear that of the ancient fauna of America, which included representatives of many of our present domestic animals, some species have undoubtedly become extinct; but I confess I am not yet prepared to admit from any evidence yet adduced, or from my own examinations, that all of the living species are distinct from those found fossil in the post-pliocene. The teeth and bones of the rabbit, raccoon, opossum, deer, elk, hog, dog, sheep, ox and horse, are often found in these beds, and though associated with those known to be extinct, such as mastodon, megatherium, hipparion, etc., need not necessarily be referred to extinct races also; since their remains cannot be distinguished from the bones and teeth of the living species.

It has been just remarked that about ninety-five per cent., or nearly all of the one hundred and fifty shells of molluscous animals from these beds are specifically identical with the recent or living species of the coast,—two are found only at the south of this, and two are extinct. Of the vertebrates from the same bed, the tapir, peccary, raccoon, opossum, deer, musk-rat, rabbit, beaver, and elk have still their living representatives, generically, if not specifically; and even of the identity of species there seems to be no doubt, as no anatomical differences can be discerned. Two of these species, like the mollusca just alluded to, no longer live in South Carolina; the tapir and peccary are only found in South America and Mexico; the musk-rat, elk and beaver, though extinct on the Atlantic coast, are still living in the interior of the country. And though it has been acknowledged that the mastodon, megatherium, elephant, glyptodon, and two species of Equine genera, etc., are entirely extinct, yet the

* Indigenous Races of the Earth, p. xix.

discoveries made of the remains even of some of these, would indicate that they still existed at a period so recent, that, in the language of Professor Leidy, "it is probable the red man witnessed their declining existence."

The peccary, or Mexican hog, an animal common in Mexico, is not indigenous to the Atlantic United States; but his bones have been found associated with human remains in caves used as cemeteries by the Aborigines.* "A tomb in the city of Mexico," according to Clavigero, (?)† "was found to contain the bones of an entire mammoth, the sepulchre appearing to have been formed expressly for their reception." And "Mr. Latrobe relates that during the prosecution of some excavations, near the city of Tezcuco, one of the ancient roads or causeways was discovered, and on one side, only three feet below the surface, in what may have been the ditch of the road, there lay the entire skeleton of a mastodon. It bore every appearance of having been coeval with the period when the road was used."

Again I extract from Prof. Leidy's letter:‡

"The early existence of the genera to which our domestic animals belong, has been adduced as presumptive evidence of the advent of man at a more remote period than is usually assigned. It must be remembered, however, even at the present time, that of some of these genera only a few species are domesticated: thus of the existing six species of *Equus* (Horse) only two have ever been freely brought under the dominion of man.

"The horse did not exist in America at the time of its discovery by Europeans; but its remains, consisting chiefly of molar teeth, have now been so frequently found in association with those of extinct animals, that it is generally admitted once to have been an aboriginal inhabitant. When I first saw examples of these remains I was not disposed to view them as relics of an extinct species; for although some presented characteristic differences from those of previously known species, others were undistinguishable from the corresponding parts of the domestic horse, and among them were intermediate varieties of form and size. The subsequent discovery of the remains of two species of the closely allied extinct genus Hipparion, in addition to the discovery of remains of two extinct equine genera of an earlier geological period, leaves no room to doubt the former existence of the horse on the American continent, contemporaneously with the Mastodon and Megalonyx: and man probably was his companion."

The result of the whole seems to be, that of the animals found fossil in the post-pliocene beds, all the mollusca of the present day are undoubtedly a perpetuation of the same species; that of the higher order of vertebrata, the tapir, peccary, raccoon, opossum, deer, elk, and musk-rat are equally entitled to be considered the descendants of this ancient race. And if the claims of the mollusca to this distinction rest upon a secure basis, because they are peculiar to this country, and not obnoxious to suspicion of foreign immigration, it must be recollected that this is equally true of the above named animals.

Those which have hitherto been regarded as of recent and European origin, are the horse, sheep, hog, and ox; and it must be reserved perhaps for future consideration to determine how far the negative proof of the non-existence of these animals in the country at the time of its discovery may be regarded in each individual case sufficiently strong to settle the question of his extinction and reintroduction, when so many of his associates and contemporaries have succeeded in maintaining an unbroken line of descent down to the present day.

Professor Agassiz's Letter.

KEY WEST, Feb. 25th, 1858.

Professor F. S. Holmes:

MY DEAR SIR:—I have not forgotten my promise to write to you my impressions respecting your important discoveries of fossil mammalia in the post-

* Bradford's American Antiquities, p. 31.
† Bradford's American Antiquities, p. 227.
‡ Nott and Gliddon, Indigenous Races of the Earth, p. xviii.

pliocene beds of South Carolina. Indeed I have been thinking of them continually since I saw them, and nothing impressed me so deeply for many years past as the sight of these bones. I consider their careful study in all their relations as of the utmost importance for the progress of our science. It is true there is hardly anything of interest in the animals themselves, since they appear to be all well known types, but their simultaneous occurrence in the same beds, showing that they have lived together at a time when the white man had not yet planted himself upon this continent, render their association as undisputed. How does it happen, that horses, sheep, bulls and hogs, not distinguishable from our domestic species, existed upon this continent, together with the deer, the musk-rat, the beaver, the hare, the opossum, the tapir, which in our days are peculiar to this continent, and not found in the countries where our domesticated animals originated? The whole matter might seem to admit of an easy solution by supposing that the native American horse, sheep, bull, and hog were different species from those of the old world, even though the parts preserved show no specific differences; but this would be a mere theoretical solution of a difficulty which seems to me to have far deeper meaning, and to bear directly upon the question of the first origin of organized beings.

The circumstances under which these remains are found, admit of no doubt, but the animals from which they are derived, existed in North America long before this continent was settled by the white race of men, together with animals which to this day are common in the same localities, such as the deer, the musk-rat, the opossum and others only now found in South America, such as the tapir. This shows beyond the possibility of a controversy, that animals which cannot be distinguished from one another, may originate independently in different fauna, and I take it that the facts you have brought together are a satisfactory proof that horses, sheep, bulls and hogs, not distinguishable at present from the domesticated species, were called into existence upon the continent of North America prior to the coming of the white race to these parts, and that they had already disappeared here when the new comers set foot upon this continent; but the presence of tapir teeth among the rest show also that a genus peculiar to South America and the Sunda Islands existed also in North America in those days, and that its representative of that period is not distinguishable from the South American species.

It would be desirable in this stage of the enquiry to compare your tapir teeth with those of the species from Central America, which is considered distinct from the Brazilian species. This circumstance leads naturally to the question of the specific identity of all these animals with those now living in the same locality, and with the domesticated species. And here I confess the difficulty to be almost insuperable, or at least hardly approachable in the present state of our science, when the views of naturalists are so divided as to what are species among the genera bos, ovis, capra. For myself, I entertain doubt respecting the unity of origin of the domesticated horses. But whatever be the final result of this enquiry, this much is already established by the fossils you have collected, that horses, hogs, bulls and sheep were among the native animals of North America, as early as the common American deer, the opossum, the beaver, the musk-rat, etc. What remains to be settled respecting their specific identity is involved in the controversy now carried on between naturalists, who admit specific distinctions upon a very wide range of differences, and those who limit them within narrow boundaries. But the final solution of this point can in no way lessen the interest of your discoveries.

Should you publish anything upon this subject, let me have your notice, for I am deeply interested in the subject, as I always shall be, in everything you do.

Ever truly your friend,

L. AGASSIZ.