The antiquity of man in North America.

THE ANTIQUITY OF MAN IN NORTH AMERICA.

Over a considerable portion of the northern hemisphere the remains of man, or his works, have been found in association with bones of the extinct mammalia which characterised the Glacial epoch, and no evidence has been obtained that man at that time differed more from modern savages than they do among themselves. The facts which prove this antiquity were, when first put forth, doubted, neglected, or violently opposed, and it is now admitted that such opposition was due to prejudice alone, and in every case led to the rejection of important scientific truths. Yet after nearly thirty years' experience we find that an exactly similar prejudice prevails, even among geologists, against all evidence which carries man one little step further back into pre-Glacial or Pliocene times, although if there is any truth whatever in the doctrine of evolution as applied to man, and if we are not to adopt the exploded idea that the Palæolithic men were specially created just when the flood of ice was passing away, they *must* have had ancestors who *must* have existed in the Pliocene period, if not earlier. Is it then so improbable that some trace of man should be discovered at this period that each particle of evidence as it arises must be attacked with all the weapons of doubt, accusation and ridicule, which for so many years crushed down the truth with regard to Palæolithic man? One would think, as Jeremy Bentham said of another matter, that it was 'wicked or else unwise' to accept any evidence for facts which are yet so inherently probable that the entire absence of evidence for their existence ought to be felt to be the greatest stumbling-block.

No better illustration of this curious prejudice can be given than the way in which some recent discoveries of stone implements in deposits of considerable antiquity in India are dealt with. These implements are of quartzite, and are of undoubtedly human workmanship. They were found in the Lower Laterite formation, which is said to have undergone great denudation and to be undoubtedly very ancient. Old stone circles of a great but unknown antiquity are formed of it. It is also stated that the distinction between the Tertiary and post-Tertiary is very difficult in India, and the age of

these Laterite beds cannot be determined either by fossils, which are absent, or by superposition. Yet we are informed, 'The presence of Palæolithic implements *proves* that the rock is of post-Tertiary origin.'[1] Here we have the origin of man taken as fixed and certain, so certain that his remains may be used to *prove* the age of a doubtful deposit! Nor do these indications of great antiquity stand alone, for in the Nerbudda fluviatile deposits Mr. Hackel has found stone weapons *in situ* along with eleven species of *extinct* fossil mammalia.

Believing myself that the existence of man in the Tertiary epoch is a *certainty*, and the discovery of his remains or works in deposits of that age to be decidedly *probable*, I hold it to be both wise and scientific to accept all evidence of his existence before the Glacial epoch which would be held satisfactory for a later period, and when there is any little doubt, to give the benefit of the doubt in favour of the find rather than against it. I hold further that it is equally sound doctrine to give some weight to cumulative evidence; since, when a thing is not improbable in itself, it surely adds much to the argument in its favour that facts which tend to prove it come from many different and independent sources, from those who are quite ignorant of the interest that attaches to their discovery, as well as from trained observers who are fully aware of the importance of every additional fact and the weight of each fresh scrap of evidence. Having by the kindness of Major Powell, the able Director of the United States Geological Survey, been able to look into the evidence recently obtained bearing on this question in the North American continent, I believe that a condensed account of it will certainly prove of interest to English readers.

The most certain tests of great antiquity, even though they afford us no accurate scale of measurement, are furnished by such natural changes as we know occur very slowly. Changes in the distribution of animals or plants, modifications of the earth's surface, the extinction of some species and the introduction of others, are of this nature, and they are the more valuable because during the entire historical period changes of this character are either totally unknown or of very small amount. Let us then see what changes of this kind have occurred since man inhabited the North American continent.

The shell heaps of the Damariscotta River, in Maine, are remarkable for their number and extent. The largest of these stretches for about half a mile along the shore, and is often six or seven feet, and in one place twenty-five feet, in thickness. They consist almost exclusively of oyster shells of remarkable size, frequently having a length of eight or ten inches, and sometimes reaching twelve or fourteen inches. They contain fragments of bones of edible animals, charcoal, bone implements, and some fragments of pottery. The surface is covered to a depth of several inches with vegetable mould, and

[1] *Manual of the Geology of India*, p. 370.

large trees grow on them, some more than a century old. The special feature to which we now call attention is 'that at the present time oysters are only found in very small numbers, too small to make it an object to gather them; and we were credibly informed that they have not been found in larger quantities since the settlement in the neighbourhood. It cannot be supposed that the immense accumulations now seen on the shores of Salt Bay could have been made unless oysters had existed in very large numbers in the adjoining waters.'[2] Here we have evidence of an important change in the distribution of a species of mollusc since the banks were formed.

On the St. John's River, Florida, are enormous heaps largely composed of two freshwater shells, *Ampullaria depressa* and *Paludina multilineata*, which cover acres of ground and are often six or eight feet thick. Professor Wyman, who explored these heaps, remarks, 'It seems incredible to one who searches the waters of the St. John's and its lakes at the present time, that the two small species of shells above mentioned could have been obtained in such vast quantities as are seen brought together in these mounds, unless at the times of their formation the shells existed more abundantly than now, or the collection of them extended through very long periods of time. When it is borne in mind that the shell-heaps afford the only suitable surface for dwellings, being most commonly built in swamps, or on lands liable to be annually overflowed by the rise of the river, they appear to be necessarily the result of the labours of a few living on a limited area at one time. At present it would be a very difficult matter to bring together in a single day enough of these shells for the daily meals of an ordinary family.'[3]

On the Lower Mississippi, at Grand Lake, are shell banks of great extent which are now fifteen miles inland; while Nott and Gliddon describe similar banks on the Alabama River fifty miles inland, and they believe that Mobile Bay must have extended so far at the time the shells were collected. These beds are often covered with vegetable mould from one to two feet thick, and on this grow large forest trees. Equally indicative of long occupation and great antiquity is the enormous shell mound at San Pablo, on the bay of San Francisco, which is nearly a mile long and half a mile wide, and more than twenty feet thick. Numerous Indian skeletons and mummies have been found in it, showing that it had been subsequently used as a place of burial. Some mounds in Florida have growing on them enormous live oaks from thirteen to twenty-six feet in circumference at five feet from the ground, some of which are estimated to be about six hundred years old, indicating the minimum age possible for the heaps, but not necessarily approaching to their real age.

The extensive shell heaps of the Aleutian Islands have been care-

[2] *Second Annual Report of Trustees of Peabody Museum*, p. 18.

[3] *Fifth Annual Report of Peabody Museum*, p. 22.

fully examined and reported on by Mr. Dall, and are found to exhibit some remarkable and probably unique peculiarities. Complete sections were made across several of these, and they were found to consist of a series of distinct layers, each marked by some well-defined characteristics. In the upper layers only are there any mammalian remains, and these may be divided into three subdivisions. In the upper bed there are found seals, walruses, &c., aquatic and land birds, the arctic fox and dog, with well-made weapons and implements, awls, whetstones, needles, and lamps. In the next layer the dog and fox are absent, as are remains of large whales; and in the lower mammalian layer there are seals and small cetacea only, but no birds or land animals, and the weapons found are ruder. We then come to a considerable layer in which there are no mammalian remains whatever, but only fish-bones and molluscan shells, with rude knives, lance heads, &c. Below this is a bottom deposit consisting entirely of the shells of echini, and containing no weapons, tools, or implements of any kind, except towards the surface of the layer, where a few hammer stones are found, round pebbles with an indentation on each side for the finger and thumb. Echinus' eggs are now eaten raw by the Aleuts, and it is the only eatable part of the animal. It takes forty or fifty full-sized echini for a meal. Some of the heaps cover five acres, and from a careful estimate founded on experiments, and taking the probable numbers of a colony which could have lived on such a spot, Mr. Dall calculates that it would take about 2,200 years to form such an accumulation. A similar estimate applied to the upper layers brings the time required for the accumulation of the entire series to 3,000 years, but that is on the supposition that they were formed continuously. This, however, was evidently not the case. Each layer indicates a change of inhabitants with different habits and in a somewhat different phase of civilisation, and each such change may imply the lapse of a long period during which the site was abandoned and no accumulation went on. These shell heaps may, therefore, carry us back to a very remote antiquity.

We next come to remains of man or his works found in association with the bones of extinct mammalia. The great mastodon skeleton in the British Museum found by Dr. Koch in the Osage Valley, Missouri, had stone arrow heads and charcoal found near it, but the fact was at the time received with the same incredulity as all other evidences of the antiquity of man. This animal was found at a depth of twenty feet, under seven alternate layers of loam, gravel, clay, and peat, with a forest of old trees on the surface, and one of the arrow heads lay under the thigh-bone of the mastodon and in contact with it. About the same date (1859) Dr. Holmes communicated to the Philadelphia Academy of Natural Sciences his discovery of fragments of pottery in connection with bones of the mastodon and megatherium on the Ashley River of South Carolina.

Such cases as these remove all improbability from the celebrated Natchez man, a portion of a human pelvis from the loess of the Mississippi, which contains bones of the mastodon, megalonyx, horse, bison, and other extinct animals. This bone was stated by Sir Charles Lyell 'to be quite in the same state of preservation and of the same black colour as the other fossils.' Dr. Joseph Leidy agrees with this statement, yet he and Professor C. G. Forshey maintain that it is 'more probable' that the human bone fell down the cliff from some Indian grave near the surface. Sir Charles Lyell well remarks that 'had the bone belonged to any other recent mammal such a theory would never have been resorted to.' The admitted identity of the state of preservation and appearance of the human and animal bones is certainly not consistent with the view that the one is recent, the other ancient, the one artificially buried near the surface, the other in a natural deposit thirty feet below the surface.

Of a similar character to the above is the basket-work mat found in a rock-salt deposit fifteen to twenty feet below the surface in Petit Anse Island, Louisiana, two feet above which were fragments of tusks and bones of an elephant. The salt is said to be very pure, extending over an area of 5,000 acres, and the formation of such a deposit requires a considerable change of physical conditions from those now existing, and thus of itself implies great antiquity.[1]

These indications of the great antiquity of American man are now supported by such a mass of evidence of the same character that all the improbability supposed at first to attach to them has been altogether removed. As an illustration of this evidence I need only refer here to the Report on the Loess of Nebraska, by an experienced geologist, Dr. Samuel Aughey, who states that this deposit, which is now believed by the best American geologists to be of Glacial origin, and which covers enormous areas, contains throughout its entire extent many remains of mastodons and elephants, and that he himself had found an arrow and a spear head of flint at depths of fifteen and twenty feet in the deposit. One of these was thirteen feet below a lumbar vertebra of *Elephas americanus*.]

We now take a decided step backwards in time, to relics of human industry within or at the close of the Glacial period itself. About twenty years ago a well was sunk through the drift at Games, a few miles south of Lake Ontario, and at a depth of seventeen feet there were found lying on the solid rock three large stones enclosing a space within which were about a dozen charred sticks, thus closely resembling the cooking fires usually made by savages. Mr. G. K. Gilbert, of the U.S. Geological Survey, obtained the information from the intelligent farmer who himself found it, and after a close examination of the locality and the drift deposit in its relation to the adjacent lakes, comes to the conclusion that the hearth must have been used

[1] Foster's *Prehistoric Races of the United States*, p. 56.

'near the end of the second Glacial period,' and at the time of the separation of Lake Ontario from Lake Erie.' When Mr. Gilbert gave an account of his researches on this matter at the meeting of the Washington Anthropological Society, November 16, 1886, two other gentlemen reported finds of similar character. Mr. Murdock, of the Point Barrow Station, near the extreme north-west corner of the continent, in making an excavation for an earth thermometer, found an Eskimo snow-goggle beneath more than twenty feet of frozen gravel and earth capped by a foot of turf. This being near the shores of the Arctic Sea may be a comparatively recent beach-formation and of no very great antiquity; but the remaining discovery was more important. Mr. W. J. McGee, a gentleman who has specially studied the Glacial and post-Glacial formations for the U.S. Geological Survey, described the finding by himself of a spear head in the quaternary deposits of the Walker River Cañon, Nevada. These beds consist of several feet of silt and loose material at the top, then a layer of calcareous tufa lying upon twenty to thirty feet of white marl, containing remains of extinct mammalia, and resting unconformably upon somewhat similar beds of earlier date. The spear head was found with its point just projecting from the face of the marl about twenty-six feet below the surface. Before removing the implement, he carefully studied the whole surroundings, and finally came to the conclusion that it had been embedded in the marl during its formation. The beds were deposited by the ancient Lake Lahonton. They have been thoroughly investigated by able geologists, and have been referred to the close of the Glacial period, or about the same time as the hearth described by Mr. Gilbert. The spear head is three and a half inches in length, finely made, and well preserved.

About a hundred miles north-west of St. Paul, in Central Minnesota, a thin deposit has been discovered containing numerous worked quartzite implements. They occur at a depth of from twelve to fifteen feet in an old river terrace of modified drift, and the deposit marks an ancient land surface on which the implements are found, and which must have been deposited at about the close of the last Glacial epoch.[5] Mr. N. H. Winchell, State geologist of Minnesota, has found similar chips and implements in the upper part of the same deposit; and also human bones in the eastern terrace bluffs at Minneapolis, in a formation of about the same age as the above.

The same writer reports a still more remarkable discovery of a fragment of a human lower jaw in the red clay and boulder drift, but resting immediately on the limestone rock. This red clay belongs to the first or oldest Glacial period, and we thus have the proofs of man's

[5] 'Vestiges of Glacial Man in Minnesota,' by F. E. Babbitt, *Proc. of Am. Assoc.* vol. xxxii. 1883.

existence carried back not only to the end of the Glacial epoch, but perhaps to its very commencement.[6]

We now come to the very interesting discoveries of Dr. Charles C. Abbott, of Trenton, New Jersey. In the extensive deposits of gravel in the valley of the Delaware, fresh surfaces of which are continually exposed in the cliffs on the river's banks, he has found large numbers of rude stone implements, almost identical in size and general form with the well-known palæolithic implements of the valley of the Somme. These have been found at depths of from five to over twenty feet from the surface, in perfectly undisturbed soil, and that they are characteristic of this particular deposit is shown by the fact that they are found nowhere else in the same district. Large boulders, some of very great size, are found throughout the deposit, and in one case Dr. Abbott found a well-chipped spear-shaped implement immediately beneath a stone weighing at least half a ton. Professor N. S. Shaler, of Cambridge, Massachusetts, after examining the locality and himself obtaining some implements *in situ*, says, 'I am disposed to consider these deposits as formed in the sea near the foot of the retreating ice-sheet when the sub-Glacial rivers were pouring out the vast quantity of water and waste that clearly were released during the breaking up of the great ice-time.' Dr. Abbott however adduces facts which seem to prove that some part of the deposit at all events was sub-aërial, for he states that the very large boulders often have immediately under them a foot or more of soil between the lower surface of the stone and the gravel, and that this layer often extends some distance laterally, showing that it formed a land surface on which the boulders rested, and which was subsequently removed by water action, except where thus protected. At any rate we may accept Professor Shaler's conclusion:—'If these remains are really those of man, they prove the existence of inter-Glacial man on this part of our shore.' That the implements *are* of human workmanship is quite certain, and the fact stated by Professor Shaler himself that 'they are made of a curious granular argillite, the like of which I do not know in the place,' is an additional proof of it. The further fact that the remains of man himself have been discovered in the same deposit completes the demonstration. First a human cranium was found of peculiar characteristics, being small, long, and very thick; then a tooth; and, lastly, a portion of a human under jaw, found at a depth of sixteen feet from the surface, near where a fragment of mastodon tusk had been found some years before. In recording this last discovery the curator of the Peabody Museum remarks: 'To Dr. Abbott alone belongs the credit of having worked out the problem of the antiquity of man on the Atlantic coast,' so that this gentleman appears to stand in a somewhat similar relation to this great question in America as did Boucher de Perthes in Europe. His researches

[6] *Annual Report of the State Geologist of Minnesota*, 1877, p. 60.

are recorded in the first, second, and third volumes of the Reports of the Peabody Museum.

The interesting series of researches now briefly recorded has led us on step by step through the several stages of the quaternary at least as far back as the first great Glacial period, thus corresponding to the various epochs of Neolithic and Palæolithic man in Europe, terminating in the Suffolk flints, claimed to be pre-Glacial by Mr. Skertchley, or the earliest traces of human occupancy in Kent's Cavern, of which Mr. Pengelly states that 'he is compelled to believe that the earliest men of Kent's Hole were inter-Glacial if not pre-Glacial.' It now remains to adduce the evidence which carries us much further back, and demonstrates the existence of man in Pliocene times. This evidence is derived from the works of art and human crania found in the auriferous gravels of California, and in order to appreciate duly its weight and importance, it is necessary to understand something of the physical characteristics of the country and the nature of the gravels themselves, with their included fossils, since both these factors combine to determine their geological age.

The great lateral valleys of the Sierra Nevada are characterised by enormous beds of gravel, sometimes in thick deposits on the sides or filling up the whole bed of the valley, at other times forming detached hills or even mountains of considerable size. These gravel deposits are often covered with a bed of hard basalt or lava, having a generally level but very rugged surface, and hence possessing, when isolated, a very peculiar form, to which the name 'table mountain' is often given. These tabular hills are sometimes a thousand or even fifteen hundred feet high, and the basaltic capping varies from fifty to two hundred feet thick. The gravels themselves are frequently interstratified with a fine white clay and sometimes with layers of basalt.

Geological exploration of the district clearly exhibits the origin of this peculiar conformation of the surface. At some remote period the lower lateral valleys of the Sierra Nevada became gradually filled with deposits of gravel brought down from the higher and steeper valleys. During the time this was going on there were numerous volcanic eruptions in the higher parts of the range, sending out great showers of ashes, which formed the beds now consolidated into pipe-clay or cement, while occasional lava streams produced intercalating layers of basalt. After this had gone on for a long period, and the valleys had in many places been filled up with débris to the depth of many hundred feet, there was a final and very violent eruption, causing outflows of lava which flowed down many of the valleys, filled the river beds, and covered up a considerable portion of the gravel deposits. These lava streams, some of which may be now traced for a length of twenty miles, of course flowed down the lower or middle portion of each valley, so that any part of the gravel remaining uncovered would be that most

remote from the river bed towards one or other side of the valley. This gravel, being now the lowest ground as well as that most easily denuded, would of course be eaten away by the torrents and mark the commencement of new river beds, which thenceforth went on deepening their channels and forming new valleys which undermined and carried away some of the gravel, but always left steep slopes and cliffs wherever the lava flow protected the surface from the action of the rains. Hence it happens that the existing rivers are often in very different directions from the old ones, and sometimes cut across them, and thus isolated table mountains have been left rising up out of the surrounding plain or valley. What was once a single lava stream now forms several detached hills, the tops of which can be seen to form parts of one gently inclined plane, the surface of the original lava flow, now a thousand feet or more above the adjacent valleys. The American and Yuba valleys have been lowered from eight hundred to fifteen hundred feet, while the Stanislaus river gorge has cut through one of these basalt, covered hills to the depth of fifteen hundred feet.

While travelling by stage, last summer, from Stockton to the Yosemite Valley, I passed through this very district, and was greatly impressed by the indications of vast change in the surface of the country since the streams of lava flowed down the valleys. In the Stanislaus Valley the numerous 'table mountains' were very picturesque, often running out into castellated headlands or exhibiting long ranges of rugged black cliffs. At one spot the road passed through the ancient river bed, clearly marked by its gravel, pebbles, and sand, but now about three or four hundred feet above the present river. We also often saw rock surfaces of metamorphic slates far above the present river bed, thus proving that the original bed-rocks of the valley, as well as the lava and gravels, have been cut away to a considerable depth since the epoch of the lava flows. The ranges of 'table mountains' now separated by deep valleys more than a thousand feet below them, could easily be seen, by their perfect agreement of slope and level, to have once formed part of an enormous lava stream spread over a continuous surface of gravel and rock.

These great changes in the physical conditions and in the surface features of the country alone imply a great lapse of time, but they are enforced and rendered even more apparent by the proofs of change in the flora and fauna afforded by the fossils, which occur in some abundance both in the gravels and volcanic clays. The animal remains found beneath the basaltic cap are very numerous, and are all of extinct species. They belong to the genera rhinoceros, elotherium, felis, canis, bos, tapirus, hipparion, equus, elephas, mastodon, and auchenia, and form an assemblage entirely distinct from those that now inhabit any part of the North American continent. Besides these we have a tolerably abundant series of vegetable remains, well

preserved in the white clays formed from the volcanic ash. These comprise forty-nine species of deciduous trees and shrubs, all distinct from those now living, while not a single coniferous leaf or fruit has been found, although pines and firs are now the prevalent trees all over the sierra. Professor Lesquereaux, who has described these plants, considers them to be of Pliocene age with some affinities to Miocene; while Professor Whitney, the State Geologist of California, considers that the animal remains indicate at least a similar antiquity.

These abundant animal and vegetable remains have mostly been discovered in the process of gold-mining, the gravel and sand of the old river beds preserved under the various flows of basalt being especially rich in gold. Numerous shafts have been sunk and underground tunnels excavated in the auriferous gravels and clays, and the result has been the discovery not only of extinct animals and plants, but of works of art and human remains. The former have been found in nine different counties in the same gravels in which the extinct animals occur, while in no less than five widely separate localities, underneath the ancient lava flows, remains of man himself have been discovered. In order to show the amount of this evidence, and to enable us to appreciate the force or weakness of the objections with which, as usual, it has been received, a brief enumeration of these discoveries will be made. We will begin with the works of art as being the most numerous.

In Tuolumne County from 1862 to 1865 stone mortars and platters were found in the auriferous gravel along with bones and teeth of mastodon ninety feet below the surface, and a stone muller was obtained in a tunnel driven under Table Mountain. In 1870 a stone mortar was found at a depth of sixty feet in gravel under clay and 'cement,' as the hard clay with vegetable remains (the old volcanic ash) is called by the miners. In Calaveras County from 1860 to 1869 many mortars and other stone implements were found in the gravels under lava beds, and in other auriferous gravels and clays at a depth of 150 feet. In Amador County stone mortars have been found in similar gravel at a depth of forty feet. In Placer County stone platters and dishes have been found in auriferous gravels from ten to twenty feet below the surface. In Nevada County stone mortars and ground discs have been found from fifteen to thirty feet deep in the gravel. In Butte County similar mortars and pestles have been found in the lower gravel beneath lava beds and auriferous gravel; and many other similar finds have been recorded. It must be noted that the objects found are almost characteristic of California, where they are very abundant in graves or on the sites of old settlements, having been used to pound up acorns, which formed an important part of the food of the Indians. They occur literally by hundreds, and are so common that they have little value. It seems therefore absurd to suppose that in scores of cases, over a wide area of country and over

a long series of years, gold-miners should have taken the trouble to carry down into their mines or mix with their refuse gravel these articles, of whose special scientific interest in the places where found they have no knowledge whatever. It is further noted that many of these utensils found in the old gravels are coarse and rudely finished as compared with those of more recent manufacture found on the surface. The further objection has been made that there is too great a similarity between these objects and those made in comparatively recent times. But the same may be said of the most ancient arrow and spear heads and those made by modern Indians. The use of the articles has in both cases been continuous, and the objects themselves are so necessary and so comparatively simple, that there is no room for any great modification of form.

We will now pass on to the remains of man himself. In the year 1857 a fragment of a human skull with mastodon débris was brought up from a shaft in Table Mountain, Tuolumne County, from a depth of 180 feet below the surface. The matter was investigated by Professor Whitney, the State geologist, who was satisfied that the specimen had been found in the 'pay gravel,' beneath a bed three feet thick of cement with fossil leaves and branches, over which was seventy feet of clay and gravel. The most remarkable discovery, however, is that known as the Calaveras skull. In the year 1866 some miners found in the cement, in close proximity to a petrified oak, a curious rounded mass of earthy and stony material containing bones, which they put on one side, thinking it was a curiosity of some kind. Professor Wyman, to whom it was given, had great difficulty in removing the cemented gravel and discovering that it was really a human skull nearly entire. Its base was embedded in a conglomerate mass of ferruginous earth, water-worn volcanic pebbles, calcareous tufa, and fragments of bones, and several bones of the human foot and other parts of the skeleton were found wedged into the internal cavity of the skull. Chemical examination showed the bones to be in a fossilised condition, the organic matter and phosphate of lime being replaced by carbonate. It was found beneath four beds of lava, and in the fourth bed of gravel from the surface; and Professor Whitney, who afterwards secured the specimen for the State Geological Museum, has no doubt whatever of its having been found as described.

In Professor Whitney's elaborate Report on the Auriferous Gravels of the Sierra Nevada, from which most of the preceding sketch is taken, he arrives at the conclusion that the whole evidence distinctly proves 'that man existed in California previous to the cessation of volcanic activity in the Sierra Nevada, to the epoch of greatest extension of the glaciers in that region, and to the erosion of the present river cañons and valleys, at a time when the animal and vegetable creations differed entirely from what they are now,

and when the topographical features of the State were extremely unlike those exhibited by the present surface.' He elsewhere states that the animal and vegetable remains of these deposits prove them to be of 'at least as ancient a date as the European Pliocene.'

Professor Whitney enumerates two other cases in which human bones have been discovered in the auriferous gravel, and in one of them the bones were found by an educated observer, Dr. Boyce, M.D., under a bed of basaltic lava eight feet thick; but these are of but little importance when compared with the preceding cases, as to which we have such full and precise details. The reason why these remarkable discoveries should have been made in California rather than in any other part of America is sufficiently apparent if we consider the enormous amount of excavation of the Pliocene gravels in the long-continued prosecution of gold-mining, and also the probability that the region was formerly, as now, characterised by a milder climate, and a more luxuriant perennial vegetation, and was thus able to support a comparatively dense population even in those remote times. Admitting that man did inhabit the Pacific slope at the time indicated, the remains appear to be of such a character as might be anticipated and present all the characteristics of genuine discoveries.

Even these Californian remains do not exhaust the proofs of man's great antiquity in America, since we have the record of another discovery which indicates that he may, possibly, have existed at an even more remote epoch. Mr. E. L. Berthoud has described the finding of stone implements of a rude type in the Tertiary gravels of the Crow Creek, Colorado. Some shells were obtained from the same gravels, which were determined by Mr. T. A. Conrad to be species which are 'certainly not later than Older Pliocene, or possibly Miocene.' The account of this remarkable discovery, published in the *Proceedings of the Academy of Natural Sciences of Philadelphia*, 1872, is not very clear or precise, and it is much to be wished that some competent geologist would examine the locality. But the series of proofs of the existence of man by the discovery of his remains or his works going back step by step to the Pliocene period, which have been now briefly enumerated, takes away from this alleged discovery the extreme improbability which would be held to attach to it at the time when it was made.

It is surely now time that this extreme scepticism as to any extension of the human period beyond that reached by Boucher de Perthes, half a century ago, should give way to the ever-increasing body of facts on the other side of the question. Geologists and anthropologists must alike feel that there is a great, and at present inexplicable, chasm intervening between the earliest remains of man and those of his animal predecessors—that the entire absence of the 'missing link' is a reproach to the doctrine of evolution; yet with

strange inconsistency they refuse to accept evidence which in the case of any extinct or living animal, other than man, would be at least provisionally held to be sufficient, but follow in the very footsteps of those who blindly refused even to examine into the evidence adduced by the earlier discoverers of the antiquity of man, and thus play into the hands of those who can adduce his recent origin and unchangeability as an argument against the descent of man from the lower animals. Believing that the whole bearing of the comparative anatomy of man and of the anthropoid apes, together with the absence of indications of any essential change in his structure during the quaternary period, lead to the conclusion that he *must* have existed, as man, in Pliocene times, and that the intermediate forms connecting him with the higher apes probably lived during the early Pliocene or the Miocene period, it is urged that all such discoveries as those described in the present article are in themselves probable and such as we have a right to expect. If this be the case, the proper way to treat evidence as to man's antiquity is to place it on record, and admit it provisionally wherever it would be held adequate in the case of other animals; not, as is too often now the case, ignore it as unworthy of acceptance or subject its discoverers to indiscriminate accusations of being either impostors themselves or the victims of impostors. Error is sure to be soon detected, and its very detection is often a valuable lesson. But facts, once rejected, are apt to remain long buried in obscurity, and their non-recognition may often act as a check to further progress. It is in the hope of inducing a more healthy public opinion on this interesting and scientifically important question that this brief record of the evidences of man's antiquity in North America has been compiled.

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