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ON THE REMAINS OF MAN, AND WORKS OF ART IMBEDDED
IN ROCKS AND STRATA,

AS ILLUSTRATIVE OF THE CONNEXION BETWEEN ARCHÆOLOGY AND GEOLOGY.

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THE beautiful, though quaintly expressed, idea of Sir Thomas Browne, that "*Time conferreth a dignity upon the most trifling thing that resisteth his power,*" is suggestive of the connexion existing between Archæology and Geology ; for as the antiquary, from a fragment of pottery, or a mutilated statue, or a defaced coin,—objects intrinsically valueless, but hallowed by the lapse of ages,—is enabled to determine the degree of civilization attained by a people whose origin and early history are lost in remote antiquity ; so the geologist, from the examination of a pebble, or a bone, or a shell, may ascertain the condition of our planet, and the nature of its inhabitants, in periods long antecedent to all human history or tradition. And as the archæologist is often perplexed in his endeavours to decypher an ancient manuscript, from the original characters having been partially obliterated by later superscriptions ; in like manner the geologist is frequently embarrassed while attempting to interpret the natural records of the physical history of the globe, from the obscurity occasioned by the successive mutations which the surface of the earth has undergone.

The investigation of the past is alike the object of both ; but the antiquary limits his inquiries to the remains of man and his works, for the purpose of tracing the development of the human mind, in the various phases of society, from

the dawn of civilization, and through the historic ages, down to the present time : his speculations, therefore, comprise but a comparatively brief period—the few thousand years that have elapsed since the creation of man and the animals which are his contemporaries. The geologist, on the other hand, directs his views to the character and causes of the changes, that have taken place throughout the organic and inorganic kingdoms of nature ; from the period when “the earth was without form and void,” through the innumerable ages chronicled by the relics of the races of animals and plants which have successively appeared, and flourished awhile, and become extinct : his investigations also embrace the consideration of the physical revolutions which have swept over the earth’s surface during the human epoch, and of those that are still in progress.

In the ancient sedimentary rocks, the remains of the animals and plants which inhabited the land, the rivers, and the seas, when those strata were deposited, occur in such abundance and variety, that the naturalist can readily determine the characters of the terrestrial and marine faunas and floras which prevailed in those remote eras. The elementary principles of geology are now so generally disseminated, that I take it for granted every intelligent person is aware that all the rocks and strata composing the dry land were originally in a softened or fluid state, either from the effects of water or from exposure to a high temperature ;—that the strata are accumulations of mud, sand, or other detritus, the sedimentary deposits of streams, rivers, and seas, combined with the durable remains of animals and plants which lived either on the land or in the water ;—that these beds of organic and inorganic materials have been consolidated by chemical and mechanical agency, and subsequently been elevated from beneath the waters, at various periods, by those physical forces which are constantly in action in the profound depths of the earth, and of which the earthquake and the volcano are the paroxysmal effects ;—and that such transmutations of the sea and of the land are perpetually taking place.

Throughout the entire series of the secondary and tertiary formations, though the most recent of the latter contain relics of species now existing, no traces of the human race have been discovered. It is only in the deltas, estuaries,

and alluvial and turbary deposits, of comparatively modern times,—in the detritus accumulating in the beds of the present seas,—in the recent tracts of limestone forming on the sea-shores,—and beneath the cooled lava currents erupted from volcanoes still in action,—that the remains of man and works of art have hitherto been found imbedded.

The contrast presented by the contents of modern deposits with those of the earlier formations, is thus eloquently enunciated by Sir Humphrey Davy in his interesting work, “The last Days of a Philosopher :”—“Were the consolidated depositions of sand and mud, now forming in the depths of the ocean, to be elevated above the waters and become dry land, how entirely different would they be in their characters from any that have preceded them ! Their chief features would be the works of man—hewn stones, and statues of bronze and marble, and instruments of iron ; and human remains would be more common than those of animals on the greatest part of the surface. The columns of Pæstum or of Agrigentum, and the bridges of iron and granite of the Thames, would offer a striking contrast to the bones of the crocodiles and colossal saurians, in the older rocks ; or even to those of the mammoth or elephant in the diluvial strata. And whoever reflects on this subject, must be convinced that the present order of things, and the comparatively recent existence of man as the master of the globe, are as certain as the destruction of a different order, and the extinction of numerous animal forms, of which no living types now remain on the surface of our planet.”

It is these modern deposits that constitute the fields of research which the antiquary and the geologist may explore with mutual advantage ; for they abound in objects of the highest importance, relating to the interesting problem as to the contemporaneous existence of the human race, and certain species and genera of animals now only known by their fossil remains.

The idea that a concise view of the present state of our knowledge as to the occurrence of the relics of man and works of art in the mineral kingdom, might be acceptable to this learned society, first suggested itself to my mind from a perusal of the treatise of M. Boucher de Perthes, entitled, “Antiquités Celtiques et Antédiluviennes ;” in which the author has deteriorated the value of his antiquarian labours

by vague and erroneous conclusions, which but a slight acquaintance with the elements of geology would have enabled him to avoid ; for the mineralogist will perceive at a glance that the so-called antediluvian works of art, figured and described by M. Boucher de Perthes, are nothing more than accidental forms of pebbles and stones, similar to those that occur in strata of immense antiquity, and which can never have been fashioned by the hand of man.

In this essay I propose to consider,—

Firstly,—The conditions under which the relics of man and his works may become imbedded and preserved in the strata now in progress of formation ;

Secondly,—The occurrence of human bones, and instruments, and coins, in deposits of modern date ;

Thirdly,—The presence of similar remains in more ancient sediments, associated with those of extinct animals ; and

Lastly,—The probability of discovering indications of the existence of the human race in the earlier tertiary formations.

I.—*On the Imbedding of Human Remains in the Strata now in Progress of Formation.*

Notwithstanding the feeling of respect for the remains of the dead which appears to have prevailed in all ages, and that has given rise to the various modes of interment adopted by different nations from the earliest periods, and thus consigned the countless skeletons of successive generations to the grave, and mingled their dust with the superficial soil,—yet, incalculable numbers of human remains must have been at all times engulfed in the beds of lakes, and rivers, and seas, by ordinary casualties. And as the bones of man differ in no respect in their structure and chemical composition from those of mammalia, they must undergo the same changes when subjected to like physical conditions ; hence the skeletons of men and animals deposited in the same stratum will be found in a similar state of mineralization. Fossil human bones, therefore, may occur in an earthy or a porous state, like those of mammalia imbedded in loose sand or earth ; or of a dark brown colour, from an impregnation of iron, and retaining a large proportion of animal matter, as are those of the Moa, Irish Elk, and Mastodon, found in morasses and turbary deposits ; or they may be permeated by carbonate of lime and have the medullary cavities lined with spar, like

the bones of Carnivora found beneath the stalactitic floors of caverns ; or petrified by solutions of iron or other minerals, as are the remains of the extinct quadrupeds in many of the tertiary limestones, and those of the colossal reptiles in the Wealden deposits. They may also be invested with stalactite if buried in fissures or caves of limestone ; or with travertine if exposed to the action of streams highly charged with carbonate of lime, like the so-called petrifying springs of Derbyshire ; or impacted in ferruginous conglomerate, if deposited with implements of iron, or in a soil charged with chalybeate waters ; and these effects may be produced in the course of a very brief period ;—a few years, or even months, will often suffice for the formation of a compact, durable mass, in which bones, pottery, and coins, and other substances may be imbedded.

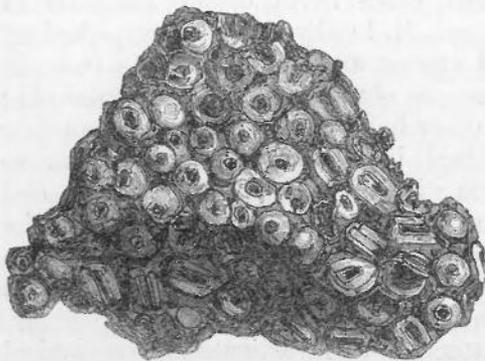
Although instances of such productions must be familiar to every antiquary, it may be instructive to notice a few examples that have come under my own observation, because they serve to illustrate the nature and origin of certain specimens, which have been regarded by authors of deserved celebrity as genuine petrifications, of immense antiquity. Thus the eminent mineralogist, Kirwan, quotes from Schneider's "Topog. Min."—"that one hundred and twenty-six silver coins were found enclosed in flints at Grinoe, in Denmark, and an iron nail in a flint at Potsdam."¹ The first edition of Mr. Bakewell's Introduction to Geology,² contains the following circumstantial narrative by Mr. Knight Spencer. "In 1791, two hundred yards north of the ramparts of Hamburgh, in a sandy soil, M. Liesky, of that city, picked up a flint, and, knocking it against another, broke it in two ; in the centre of the fracture he observed an ancient brass pin ; and on picking up the other half, he found the corresponding mould of the pin so laid bare. He presented them to Thomas Blacker, Esq., in whose possession they now are, and who has shown them to the writer of this letter." In the "Gentleman's Magazine," and other periodicals, there are notices of similar discoveries of keys, nails, coins, &c. in flints and blocks of solid stone.

During my early attempts to investigate the geological structure of the South-East of England, I one day received a note from a South-Down farmer, informing me of the

¹ Phillips's Mineralogy, 2nd edit., Article *Flint*, p. 12. ² Published in 1813, p. 338.

discovery of a large iron nail in the centre of a flint which he had accidentally broken. I immediately rode a distance of some twenty miles to inspect this "wonderful curiosity," and was not a little surprised to find my correspondent's statement apparently borne out; for he placed in my hands a large rolled stone, closely resembling externally the usual flint boulders of the ploughed lands of chalk districts, and which had been split down the middle; on one side was imbedded a large iron nail, and deeply impressed on the opposite surface the corresponding mould. A slight inspection detected the nature of this specimen: it was not a flint, but an aggregation of fine siliceous sand that had been converted into compact sandstone by a solution of iron derived from the nail, which had served as a nucleus to the sand that had gradually accumulated around it. The facts described by Kirwan and Knight doubtless admit of the same explanation; the narrators having mistaken a sandstone of modern formation for a genuine flint nodule. When residing at Brighton, I obtained many specimens of recent ironstone from the fishermen, who dredged them up from the British Channel. Cannon-balls, horse-shoes, nails, chains, fragments of bolts, bars, anchors, &c., formed the nuclei of these masses; some of which were exceedingly interesting from the variety of shells, zoophytes, and other marine productions promiscuously impacted in the same block of stone.³

I have here a specimen which has puzzled many a geologist.



Ferruginous Conglomerate of beads and knife-blades.

It is a ferruginous conglomerate of glass beads and sand; it was obtained a few years since from a Dutch vessel, laden with beads, knives, &c., that was stranded off the Sussex coast, near Hastings, about a century ago, and wholly covered by a thick bed of silt

³ The cement of the shell-conglomerate now rapidly forming in the bed of the sea off Brighton is also ferruginous. See *Medals of Creation*, Vol. I., p. 374.

and sand; the cementing material was, of course, derived from the oxidation of the iron or steel knife-blades.

Of the rapidity with which the aggregation and consolidation of loose materials take place at the bottom of the sea, a striking proof was afforded in Capt. Dickenson's gallant and successful operations, by means of a diving-bell, to recover the treasures of a richly-laden vessel,—the "Thetis,"—which was wrecked and sunk, in twenty fathoms water, off Cape Frio, to the east of Rio de Janeiro, in a bay bounded by granite cliffs. The floor of the ocean-bed was found to be composed of micaceous and quartzose sand, consolidated into what may be termed regenerated granite; the superincumbent pressure of the water, aided by the huge materials of the wreck of the frigate, and enormous blocks of granite, which, under the influence of the swell, acted with tremendous momentum, like the steam-hammers of a foundry, in a few weeks compressed the sand, wood, and iron, and the gold and silver coins, into solid masses of rock, which were broken up with difficulty to extract the impacted dollars.

It is unnecessary to adduce other examples of the nature and extent of the deposits which are in progress at the bottom of the present seas; but in passing to the next topic, I would solicit particular attention to the fact, that vast subaqueous accumulations of the relics of man and his works, must have been going on for ages, and imparting a character to the strata of the human epoch, of which no traces whatever are observable in the ancient formations.

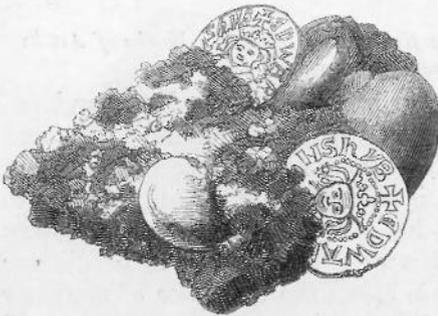
II.—*On the Occurrence of the Remains of Man and Works of Art in modern superficial Deposits.*

From the phenomena thus briefly considered, the archæologist will be prepared to meet with the remains of man and his works in deposits which, though but of recent origin in a geological sense, are of immense antiquity in relation to human history and tradition; suggesting the interesting question as to the remoteness of the period to which our present retrospective knowledge of the existence of mankind extends. In this division of the subject, my observations will be restricted to a few illustrations from the historic period.

Coins.—Coins, from their durability, and the facility with which the accomplished numismatist can determine their date, even when the inscription is obliterated, are the most

instructive relics of human art that occur in the mineral kingdom. In the conglomerates accumulated in the beds of streams, lakes, and rivers, and in the masses of ferruginous sandstone dredged up from the sea, coins are not unfrequently enclosed. From the blocks of regenerated granitic stone formed around the sunk treasures of the Thetis, previously mentioned, many thousand dollars were extracted.

The following instance of the preservation of coins in a fluviatile conglomerate, the date of which can be precisely determined, is one of the most interesting examples of this kind with which I am acquainted. In the year 1831, some workmen employed in deepening the river Dove, where it winds round the base of the rock on which stand the mouldering ruins of the once regal castle of Tutbury, and forms the boundary-line that separates Staffordshire from Derbyshire, they observed, among the loose gravel spread over the bed of the stream, many small silver coins; and continuing their labours, discovered, at the depth of ten feet, large masses of a very hard ferruginous conglomerate, which, on being broken, were found to be studded with hundreds of similar pieces of money. On the discovery becoming known in the neighbourhood, scores of peasants hastened to the river, and at one time not less than three hundred persons were engaged in searching for the treasures. But those who were successful had great difficulty in detaching the coins from the stone in which they were impacted; for the money having lain for upwards of five centuries in the bed of the



Silver Coins of Edward I. in Ferruginous Conglomerate,
Tutbury.

river, the water had gradually deposited successive layers of sand and gravel, till the heterogeneous mass was converted into a compact rock, of which the coins constituted an integral part.

The coins collected amounted to many thousands. They comprised sterlings of the Empire, Brabant, Lorraine, and Hainault; and the Scotch money of Alexander III., John Baliol, and Robert Bruce; and a complete English series of Edward I.

There were likewise examples of all the prelatical coins of Edward I. and II., and of the first and second coinage of Henry III., and of the most early of Edward II. "On the whole," says a contemporary writer, "a finer museum of early English, Scotch, and Irish coins was never before, under any circumstance, opened to the inspection of the antiquary."

The nature of this numismatic conglomerate is seen in this small specimen, which I have fortunately rescued from destruction. It contains two silver coins of Edward I., so exposed as to show part of the effigy and superscription of the obverse.

The history of this accumulation of money, and consequently the age of the conglomerate, is clearly made out. In the reign of Edward II. (A.D. 1322), the forces of the Earl of Lancaster, then in open rebellion, being compelled to retreat from the royal army, crossed the Dove, which at that time was scarcely fordable, and in the haste and panic that prevailed, the military oak-chest, banded with iron, was sunk in the river. On the decay of the wooden chest, the coins it contained became intermingled with the gravel and sand; and the iron bands decomposing, supplied the cement by which the loose materials were converted into a ferruginous breccia, as hard and durable as the ancient conglomerates which contain the teeth and bones of species of animals that have long since been obliterated from the face of the earth.

In the Thames, beneath the superficial mud and silt, a layer of breccia or conglomerate, in which Roman coins and pottery are imbedded, is spread over many parts of the river channel. This concrete is composed of pebbles, sand,



Ferruginous Conglomerate. Bed of the Thames.

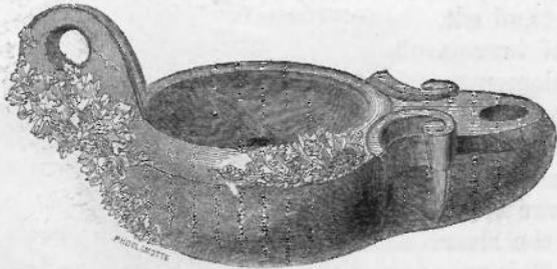
and mud, consolidated by ferruginous infiltration. In this example, for which I am indebted to the liberality of Mr. Roach Smith, there are exposed the half of a denarius of *Severus* or *Caracalla*, and a small brass of *Tetricus*. I have also specimens

containing coins of the Lower Empire, that were collected from the bed of the Thames by Henry Brandreth, Esq., in whose possession I saw gold and silver Roman coins in a mass of conglomerate, dredged up many years since near London Bridge.

Skulls and other parts of the skeletons of domestic animals, as the dog, cat, sheep, have been found in this modern fluviatile deposit, in the same mineralized state as fossil bones in tertiary strata of a similar character.

The beds of all the rivers flowing through the large cities of Europe must contain deposits of this nature, and abound in the remains of man and his works. A Roman skull, thickly invested with travertine, that was dredged up from the Tiber some years since, and is now in the British Museum, is an earnest of the relics which lie buried beneath the yellow waters of that celebrated river. Were the bed of the Tiber effectually explored, there can be no doubt that layers of crystalline limestone and conglomerate abounding in objects of deep interest to the archæologist as works of art, and to the geologist from the physical conditions under which they have been preserved, would be brought to light.

Pottery.—The remains of earthen vessels are even more durable than coins; and fragments of ancient pottery occur, not only mixed with other relics in deposits, but in some places on the shores of the Mediterranean, as the chief constituents of calcareous limestone disposed in regular layers, the artificial materials having been cemented together



Roman Lamp, found near Naples, partially incrustated with spar.

by an infiltration of travertine. Urns, vases, &c., buried in calcareous or argillaceous strata, are often incrustated with tufa, or studded with crystals of carbonate or sulphate of lime, as on this Roman lamp, which was dug up near Naples, by my friend, Sir Woodbine Parish.

Fossil Human Skeletons.—About forty years ago, great interest was excited by the unexpected discovery of several human skeletons, male and female, in hard limestone, on the north-east coast of the Isle of Guadeloupe; and a specimen found on board a French vessel, captured by one of our cruisers, and presented to the British Museum, afforded English naturalists an opportunity of investigating the nature and age of this first known example of the bones of *Man* in a fossil state. An excellent memoir by the eminent mineralogist and geologist, Charles Konig, Esq., of the British Museum, published in the “Philosophical Transactions for 1814,” fully elucidated the nature of these relics.

The annexed sketch, fig. 1, represents this celebrated



Fig. 1. Fossil Human Skeleton, from Guadeloupe, in the British Museum. (The original is 4 feet long.)



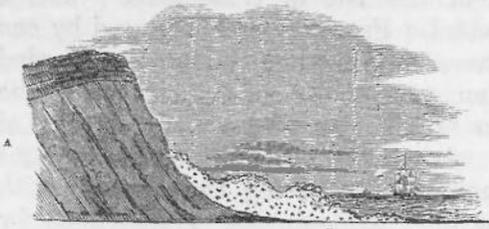
Fig. 2. Human Skeleton in Limestone, from Guadeloupe. (The original is 3 feet long.)

fossil; and fig. 2, another and more interesting specimen, which is preserved in the Museum at Paris. In the latter, the skeleton is in a bent position; and part of the lower jaw with teeth, together with a considerable portion of the upper and lower extremities of the left side, are preserved.

These fossil remains were extracted from a sloping bank of limestone, that extends from the base of the steep cliffs of the island to the sea-shore, and is almost wholly submerged at high tides, as shown in the annexed diagram.

This limestone is composed of consolidated sand, and

the detritus of shells and corals of species that inhabit the neighbouring sea. Land-shells, fragments of pottery, stone arrow-heads, carved wooden ornaments, and detached human



PLAN OF THE CLIFF AT GUADALOUPE.

A. Ancient Rocks. B. Modern Limes'one in which the human skeletons were imbedded.

bones, are occasionally found therein. The rock is therefore identical in its origin and composition with the calcareous and arenaceous limestones now forming on the seashores of many countries.

As, for example, on the northern coast of Cornwall, where extensive tracts of drifted sand have been converted into sandstone by the slow infiltration of water, charged with calcareous and ferruginous matter.⁴ In intertropical climes, where the waters of the sea are often turbid with the detritus of shells and corals, the sand-drift, thrown up on the strand, undergoes a rapid transmutation of this nature. Along the shores of the Bermudas, limestone is produced by this process of sufficient hardness and durability for the construction of buildings, ere the inclosed shells have lost their colour and polish.⁵

In the Isle of Ascension, which is frequented by turtles for the purpose of depositing their eggs in the loose sand, to be hatched by the heat of the sun, so rapidly does this lapidification take place, that groups of eggs are often found in the consolidated limestone, containing the hatched remains of the chelonian reptiles that had thus been entombed alive.⁶ This conglomerate consists of the water-worn detritus of corals and shells, with fragments of lava and scoriæ, rendered solid by infiltration of carbonate of lime.

These facts, if duly considered, will enable us to receive without surprise the result of an accurate investigation of all the circumstances relating to the fossil human skeletons of Guadaloupe; namely, that though imbedded in compact rock, and with the bones permeated by crystallized carbonate of lime, they are the relics of some individuals of a tribe of Gallibis, slaughtered by the Caribs, in a conflict that took place near the spot not more than 150 years ago; the

⁴ Wonders of Geology, vol. i., p. 93.

⁵ Ibid., p. 84.

⁶ Ibid., p. 90.

sand of the sea-shore, in which the slain were interred, having subsequently become indurated by the process above described.⁷

Fossil human skeletons have also been found in solid calcareous tufa, near the river Santa, in Peru. Bones belonging to some scores of individuals were discovered in travertine, containing fragments of marine shells, which retained their original colour; yet this bed of stone is covered by a deep vegetable soil, and forms the face of a hill, crowned with brushwood and large trees.

Edifices.—The changes which are continually taking place in the relative level of the land and water from the subsidence of extensive tracts of country at one period, and their subsequent elevation, are phenomena so well known, that I need not dwell upon the subject; and I will therefore only remind the archæologist of the inexhaustible treasures of past ages, which must sooner or later be exposed to view, in the deposits that have been formed during the human epoch.

Nor can it be regarded as improbable, that in the beds of the present seas, the edifices and works of nations, whose history is altogether unknown to existing generations, are entombed and preserved. The exquisite stanzas of Mrs. Hemans, on the hidden “Treasures of the deep,” are as true as they are beautiful:—

“ What wealth untold,
Far down, and shining through their stillness lies :
They have the starry gems, the burning gold,
Won from a thousand royal argosies.

Yet more—the depths have more—their waves have roll’d
Above the cities of a world gone by :
Sand hath fill’d up the palaces of old,
Sea-weed o’ergrown the halls of revelry.”

In connexion with this topic, I would refer to the engulfing of buildings, and even entire cities, by the effects of earthquakes and volcanic eruptions; of which the catastrophe that overwhelmed Stabia, Herculaneum, and Pompeii, affords an illustration never to be forgotten; for after the lapse of nearly seventeen centuries, the city of Pompeii was disinterred from its silent tomb, in that marvellous state of conservation, so graphically described by one of our most

⁷ See Wonders of Geology, 6th edit., vol. i., p. 87.

eminent living authors.⁸ “All vivid with undimmed hues—its walls fresh as if painted yesterday—not a tint faded from the rich mosaic of its floors—in its forum the half-finished columns, as left by the workman’s hands—before the trees in its gardens the sacrificial tripod—in its halls the chest of treasure—in its baths the strigil—in its theatres the counter of admission—in its saloons the furniture and the lamp—in its tricliniæ the fragments of the last feast—in its cubicula the perfume and the rouge of faded beauty—and everywhere the skeletons of those who once moved the springs of that minute but gorgeous machinery of luxury and of life.”⁹

III.—*On Human Remains associated with those of extinct Animals in the ancient Alluvial Deposits.*

Although the relics of man and his works have been found in many places associated with the bones of extinct species of animals, yet the circumstances under which such collocations have occurred have generally, upon a rigid examination, failed to establish the synchronism of the human and quadrupedal remains. Assemblages of this nature have been observed in various ossiferous caverns in England, and on the Continent, and in South America. It will suffice for my present purpose to select the following instance, which has lately been communicated to the Geological Society of London, because it presents an epitome of the various facts which bear on this problem.

Every one knows that near Torquay, in Devonshire, there is a chasm or fissure in the limestone strata, named ‘Kent’s Hole,’ which has long been celebrated for the quantities of fossil bones belonging to extinct species of bears, hyenas, lions, tigers, &c., that have from time to time been dug up from its recesses. These remains occur in a bed of reddish sandy loam, which covers the bottom of the chasm, or cavern, to a thickness of twenty feet. The teeth and bones are for the most part in an excellent state of preservation. The principal chasm is 600 feet in length; and there are several lateral fissures of less extent. A bed of hard, solid stalagmite, from one to four feet thick, is spread over the ossiferous loam, and covered with a thin layer of earth, with here and

⁸ Sir Edward Bulwer Lytton’s “Last Days of Pompeii.”

⁹ An extended review of all the facts relating to the submergence of cities.

edifices, and tracts of country, will be found in Sir Charles Lyell’s Principles of Geology.

there patches of charcoal mixed with human bones, and coarse earthen vessels.

On breaking through the sparry floor, the red loam, containing teeth and bones, is brought to view ; *and imbedded in it, and at a depth of several feet, and intermingled with remains of extinct bears and carnivora*, there have been discovered several flint knives, arrow and spear-heads, and fragments of pottery. The stone implements are of the kind usually found in early British tumuli, and doubtless belong to the same period ; yet here they were unquestionably collocated with fossil bones of immense antiquity, and beneath the impermeable and undisturbed floor of the cavern, which was entire till broken through by the exploration that led to the exhumation of these relics. This discovery gave rise to many curious speculations, because it was supposed to present unequivocal proof that man, and the extinct carnivora, were the contemporary inhabitants of the dry land, at the period when the ossiferous loam was deposited : but the facts described do not appear to me to warrant this inference. Kent's Hole, Banwell Cave, and indeed all the ossiferous caverns I have examined, are mere fissures in limestone rocks that have been filled with drift while submerged in shallow water, and into which the limbs and carcasses of the quadrupeds were floated by currents ; for the bones, though broken, are very rarely waterworn, and consequently must have been protected by the muscles and soft parts. Upon the emergence of the land, of which the raised beds of shingle afford proof, the fissures were elevated above the waters, and gradually drained ; the formation of stalactites and stalagmites, from the percolation of water through the superincumbent beds of limestone, then commenced, and continued to a late period.

If, when Kent's Hole first became accessible, and while the floor was in a soft or plastic state, and before the formation of the stalactitic covering, some of the wandering British aborigines prowled into the cave, or occasionally sought shelter there, the occurrence of stone instruments, pottery, bones, &c., in the ossiferous loam, may be readily explained ; for any hard or heavy substances, even if not buried, would quickly sink beneath the surface to a depth of a few feet, and afterwards become hermetically sealed up, as it were, by the crust of stalagmite that now forms the solid pavement.

Certain caves in Aquitaine contain masses and layers of a stalactitic conglomerate, composed of bones of men and carnivora, and fragments of pottery. The origin and formation of this breccia are attributed by M. Desnoyer to the remains of some of the aboriginal Celtic tribes, who frequented these caves, or were buried there, having become blended with the mud, gravel, and debris of the extinct animals, already entombed ; the mass, by a subsequent infiltration of stalagmite, having been converted into a solid aggregate.

From what has been advanced, the archæologist will therefore perceive that the occurrence of the remains of man with those of extinct species of animals, in a deposit that is covered by a thick layer of solid rock, must not be regarded as certain proof that the human bones are of as high antiquity as those of the quadrupeds with which they are associated.

But another source of fallacy as to the presumed high antiquity of human skeletons found in sedimentary deposits, requires a brief comment. It not unfrequently happens that, from the subsidence of tracts of country, or the undermining of cliffs and headlands, or by the falling in of the roofs of caverns, the superficial soil is overwhelmed and buried beneath the strata on which it was originally superimposed. The contents of sepulchral mounds and the remains of domestic animals may thus be engulfed in very ancient deposits, at considerable depths beneath the present terrestrial surface. Such was the case described by Sir Charles Lyell, of part of a human skeleton found imbedded in a ravine on the banks of the Mississippi, with bones of the Mastodon.¹⁰

The following instance, mentioned by Mr. Bakewell, holds out a salutary caution as to the necessity of the most scrupulous investigation of all the circumstances connected with a discovery of this nature.¹ "A thick bed of coal on the estate of the Earl of Moira, in Ashby Wolds, which is covered by strata of ironstone, coal, sandstone, &c., is worked at the depth of 225 yards. In an adjoining locality the same bed was reached at the depth of 97 yards ; and in this stratum the skeleton of a man was found *imbedded in the solid coal*, which apparently had never been disturbed." No traces could be

¹⁰ A Second Visit to the United States, vol. ii., p. 196.

¹ Bakewell's Introduction to Geology, 5th edition, p. 21.

perceived that the spot had ever been dug into, or that any trials for coal had been made ; but the noble proprietor, at Mr. Bakewell's suggestion, directed passages to be cut in various directions, and at length the indications of a former shaft were discovered, though the coal had not been worked. Into this shaft the man must have fallen, and the body been pressed and imbedded in the loose rubbly coal by a superincumbent column of water, previously to the falling in of the pit.

Human remains imbedded with those of the fossil Elk of Ireland.—Of the extinct terrestrial mammalia of the British Isles, the gigantic Deer, commonly known as the fossil Irish Elk, is one of the most remarkable, from its magnitude and the abundance and excellent state of preservation of its remains. This noble animal was ten feet in height from the ground to the top of its antlers, which are palmated and measure fourteen feet from the extremity of one horn to the other. The bones of the Irish Elk occur in the beds of marl which underlie the peat-bogs, and are generally very perfect, being stained more or less deeply by tannin and iron, and sometimes partially incrustated with pale blue phosphate of iron : even the marrow occasionally remains in the state of a fatty substance, which will burn with a clear lambent flame. Groups of skeletons have been found crowded together in a small space, with the skulls elevated and the antlers thrown back upon the shoulders, as if a herd of deer had fled for shelter, or been driven into a morass and perished on the spot.²

Stone hatchets and fragments of pottery have been found with the bones of this creature, under circumstances that leave no doubt of a contemporaneous deposition. In the county of Cork, the body of a man, in good preservation, the soft parts being converted into adipocire, was exhumed from a marshy soil, beneath a peat-bog eleven feet thick : the body was enveloped in a deer-skin of such large dimensions as to lead to the conclusion that it belonged to the extinct Elk.³

A rib of this animal has been found in which there is a

² Skeletons of Mastodons have been found in the United States in like circumstances ; and very recently remains of the colossal struthious birds of New Zealand, the Moa, or Dinornis, have been

discovered by my eldest son, Mr. Walter Mantell, in a morass under similar conditions.

³ Jamieson's Translation of Cuvier's Theory of the Earth.

perforation evidently occasioned by a pointed instrument while the individual was alive; for there is an effusion of callus or new osseous substance, which could only have resulted from a foreign body having remained in the wound for a considerable time; such an effect, indeed, as would be produced by the head of an arrow or a spear.⁴

Human bones have likewise been found associated with the remains of the extinct gigantic wingless birds (the *Moa* or *Dinornis*) of New Zealand, under circumstances that appear to leave no doubt of their having been contemporaneous;⁵ but as the extinction of this family of colossal bipeds, like that of the Dodo, probably took place but a few centuries ago, those remains of man and works of art that are associated with the skeletons of the Irish Elk, may be regarded as by far the most ancient vestiges of the human race hitherto discovered. For although Indian arrow-heads and pottery have been dug up from the alluvial clay containing the bones of Mastodons, in the United States of North America, yet the evidence on this point is not conclusive. The same remark applies to the account of human crania having been found in the ossiferous caves of the Brazils, and with bones of the extinct gigantic Edentata of the Pampas.

IV.—*On the Probability of discovering traces of the Human Race in the ancient Tertiary Formations.*

The facts brought forward in the course of this argument, demonstrate the existence of Man at that remote period when the Irish Elk, and other extinct species and genera of terrestrial mammalia, whose remains occur in the superficial alluvial deposits, inhabited the countries of Europe; and as the Irish Elk was contemporaneous with the Mastodon, Mammoth, and the Carnivora of the caverns, it seems not improbable that sooner or later human remains may be discovered coeval with the bones of those animals. The question therefore naturally arises, whether the evidence at present obtained warrants the inference that traces of man's existence will be found in the far more ancient tertiary formations.

⁴ A species of Ox (*Bos longifrons*) now extinct, was unquestionably an inhabitant of Britain during the Roman period, for its horns and bones have been found in several places associated with Roman remains; as at Colchester in 1849.—Vide Archaeological Journal.

⁵ By Mr. Walter Mantell, of Wellington. See a Memoir on the Fossil Birds of New Zealand, Geological Quarterly Journal, 1849 and 1850; and Pictorial Atlas of Organic Remains, Art. Fossil Birds of New Zealand, 1850.

And here it may be necessary to explain, that the geological term *Tertiary* comprises all the strata that have been deposited subsequently to the last secondary formation, the *Chalk*. The Tertiary systems, therefore, unite the present organic kingdoms of nature with the past; for while the most ancient, the *Eocene* deposits, contain the remains of a few secondary species, they have likewise many of genera now existing, associated with peculiar types.

But notwithstanding the occurrence of bones of living genera of animals—as the dog, fox, pig, sheep, ox, horse, &c.,⁶ in tertiary strata, incomparably more ancient than the deposits containing the Irish Elk, yet no vestiges of man or of his works have been detected.

The proofs adduced of the remarkable characters impressed on the deposits that have been formed since the various races of mankind were distributed over the earth's surface, forbid the supposition that the absence of such vestiges can be attributable to their subsequent obliteration. While, therefore, we may reasonably expect to find fossil human remains in strata of much higher antiquity than those in which they have hitherto been observed, it does not seem probable that traces of man's existence will be met with in the most ancient tertiary formations.

It was for the express purpose of placing this fact in the most striking point of view, that, in a previous part of this discourse, I dwelt somewhat at length on the nature and organic remains of the deposits that have been accumulated during the human epoch. Notwithstanding, therefore, the occurrence in the Eocene system of existing genera and species of mammalia—even of that race which approaches nearest to man in its physical organization, the *Quadrumanæ*, or monkey tribes—I conceive we have no just grounds for assuming that physical evidence will be obtained, by which the existence of the human race, and consequently of the present order of things, may be traced back to that remote era; for I entirely concur in the opinion expressed by Professor Whewell, “that the gradation in form between man and other animals, is but a slight and unimportant feature in contemplating the great subject of man's origin. Even if we had not revelation to guide us, it would be most unphilosophical to attempt to trace back the history of man, without

⁶ See Wonders of Geology, vol. i., p. 215.

taking into account the most remarkable facts in his nature—the facts of civilization, arts, government, speech, his traditions, his internal wants, his intellectual, moral, and religious constitution. If we will attempt such a retrospect, we must look at all these things as evidence of the origin and end of man's being; and when we do thus comprehend in one view the whole of the argument, it is impossible for us to arrive at an origin homogeneous with the present order of things. On this point the geologist may therefore be well content to close the volume of the earth's physical history, and open that divine record which has for its subject the moral and religious nature of man."⁷

I cannot conclude this imperfect attempt to assist the Archæologist in determining the age and mode of formation of the rocks and strata in which the remains of man and his works may be found imbedded, without adverting to the deeply-regretted absence of a highly-gifted and distinguished member of this Institution,⁸ whose profound geological and archæological knowledge, and impressive eloquence, would have thrown around the subjects that have been submitted to your consideration, an interest and importance I have vainly essayed to impart. In breathing a fervent prayer that one so beloved for the kindness of his heart, and his generous bearing towards every cultivator of science, and so highly respected for his eminent abilities and acquirements, may be speedily restored to his friends, and to the sciences his labours have so greatly advanced, I feel assured that I am expressing the earnest wish of every member of the Archæological Institute.⁹

⁷ Anniversary Address to the Geological Society of London.

⁸ The Dean of Westminster, The Very Rev. Dr. Buckland.

⁹ I subjoin the following note, as corroborating the views expressed in the text; it is from an interesting paper by D. Wilson, Esq., entitled, "Inquiry into the Evidence of the existence of Primitive Races in Scotland prior to the Celtic;" communicated to the Ethnological section of the British Association, at Edinburgh, August, 1850:—"In the museum of the University of Edinburgh, there are the remains of a fossil whale, that were dug up in the Blair Drummond Moss, at a distance of seven miles above Stirling Bridge, and fully twenty miles from the nearest point of the river Forth, where by

any possibility a whale could now be stranded; yet along with these relics was found a rude harpoon of deer's horn, proving that the fossil whale pertains to the historic era, and pointing to a period more recent than the first colonization of the British Isles. In the same moss other fossil whales have been found; two of them accompanied with similar indications of the primitive arts of the aborigines. Other discoveries of a like nature justify the conclusion, that at a period nearly as remote as historic chronology will permit us to assume, there must have been a human population spread over the British Isles. Their rude canoes, for the most part formed out of an oaken trunk, have been found in various parts of the country many feet below the accumulated alluvium,