

## EARLY TRACES OF MEN.

When quarrymen uncovered slabs of Connecticut sand stone, bearing impressions exactly like bird tracks, geologists reasonably inferred that, at the time the rock was forming and was as yet but wet sand, there existed gigantic birds or bird-like animals, which strode along these ancient sea shores much as beach birds do along the shores of to-day. The fact that traces of birds had never been found before in strata so ancient, much less the popular theory that birds were of later creation, did not invalidate the inference; one positive fact, as is well known, outweighs any amount of negative assertion, and the old theory had to give way.

When workmen, digging a canal near Stockholm, came upon a buried hearth with charcoal on it, exactly like those which uncivilized people now make and use, the natural inference was that some one of more than brute intelligence had lived there before the overlying earth was deposited. Had the hearth been slightly buried, say six feet below the surface, there would have been no question of its artificial origin; it would have been accounted the work of man as surely as if a human skeleton had been found lying beside it. Should the inference be considered less legitimate because there happened to be sixty feet of earth above the hearth? True, that accumulation of erratic blocks and sand and sea shells gave unmistakable evidence of great geological changes since the hearth was last used—glacial action, submergence of the land and its subsequent elevation,—all involving long periods of time; but that told not so much against the testimony of the hearth as against the belief that man was of more recent creation.

Now that such witnesses have been multiplied to an almost infinite number, forming a continuous chain from the earliest historic times far back into the tertiary period, the evidence is overwhelming; the "alleged" antiquity of man, as it is styled by those who have never investigated the matter, passes from the domain of hypothesis into the region of demonstrated fact. The vista of human antiquity opened up by these surprising discoveries is indeed vast, so vast that even those who have most patiently followed them and assisted in their development are overwhelmed with the thought of it. No wonder, then, that those to whom it comes as a sudden revelation should flatly refuse to admit its reality. As Mr. Evans remarks in the closing paragraph of his magnificent work on the ancient stone implements, weapons and ornaments of Great Britain, "it is impossible not to sympathize with those who, from sheer inability to carry their vision so far back into the dim past, and from unconsciousness of the cogency of other (than the fossils described in the work above mentioned) and distinct evidence as to the remoteness of the origin of the human race, are unwilling to believe in so vast an antiquity for man as must of necessity be conceded by those who . . . have fully and fairly weighed the facts which modern discoveries have unrolled before their eyes." Yet while we sympathize with the natural incredulity of those who lack the basis of intelligent judgment, we need not imitate their unreasoning assurance in contradicting the deductions of science while refusing to examine either the ground of their own convictions or the evidence of the different convictions of others.

The geological proofs of the antiquity of man, to which Mr. Evans alludes, are of threefold character:

1. The association of human bones with the bones of extinct animals, under conditions which prove them to be of equal age.

2. The signs of human action on the bones of extinct animals: the breaking of them to extract the marrow, after the manner of existing savages; the shaping and polishing of them for use and ornament; and more instructive still, the tracing on them of the outlines of mammoths and other animals now extinct or driven by change of climate to distant parts of the earth.

3. The discovery of wrought stone implements, weapons and ornaments under undisturbed strata demonstrably belonging to periods reaching as far back as the pliocene period, if not farther.

Detailed descriptions of these evidences, which are as marvelous in number as in variety and interest, may be found in the elaborate works of Lyell, Lubbock, Wilson, Evans and other English scholars, as well as in numerous French and German writings; or the evidences themselves may be studied *in situ*, and in numerous rich collections of archaeological specimens, by any one disposed to do so. The purposes of this article admit but the briefest mention of a few of the most ancient of these traces of early man.

First, for our own country. Perhaps the oldest skull yet discovered is the one found in the pliocene strata of Cable Mountain, California. Having no companion in its almost incredible antiquity, it was natural at the time of its discovery for men to ridicule the age accorded it, and to take refuge in the assertion that it never came from the place alleged, or, if it did, it must have come there by irregular means. But when many corroborating evidences of human existence during the pliocene period are found, as they have been, in the same strata under conditions which satisfy careful geologists that the strata had not previously been disturbed, the astonishing character of the testimony is not sufficient ground for flatly rejecting it. More recently, similar fossil evidences of perhaps a still earlier presence of man on our Pacific coast have been discovered. At a meeting of the San Francisco Academy of Science, in May last, Dr. Blake presented the Society with a number of perforated implements of serpentine, which had been taken from stratified rock near the summit of the coast range, 1700 feet above the sea. They were found, embedded in argillaceous shales, in digging away the side of a hill for the foundation of a house, and, says Dr.

Blake, were "evidently fashioned by the hand of man or some animal capable of using its anterior extremities so as to fashion objects to meet its wants, and apparently possessed of sufficient intelligence to use lines or nets for catching fish; as it would seem that these instruments must have been used as sinkers." Dr. Blake pronounces the rock in which these interesting specimens of primitive manufacture were discovered, to be of an age not later than the pliocene period; while Professor Whitney, the State Geologist, is of opinion that it is still more ancient. Anyhow, man appears to have antedated the upheaval of the coast range and the attendant geological changes; a remoteness in time which makes the fossil skeleton found at Natchez and New Orleans, and the human fragments under the Florida canals, seem comparatively modern. Yet at that distant period man had existed long enough to overspread a considerable portion of the earth, if not the whole of it, since traces of such primeval men have been found wherever they have been diligently sought for.

Scarcely a decade has passed since geologists began to admit the possibility of finding traces of men in glacial or preglacial strata; yet already human bones or unquestionable evidences of human handiwork have been found in the deposits of those early times, in connection with the remains of supposed prehuman animals, in England, Scandinavia, Belgium, France, Spain, Italy, Germany, India, Australia, and South America, as well as in our own country; and the more carefully the search has been conducted, the farther back the history of man has been pushed into the distant past. Every inch of the ground has been fought over, the firm conviction of the early investigators that man could not be so old a creature causing them to receive every discovery with downright disfavor. Such an upturning of all the recognized foundations of history seemed of necessity to involve some hidden error. But it did not. The facts are so numerous and intelligible that the most skeptical enquirers have been convinced, and now not a few of them hold high rank among the authorities of the young science of archaeogeology. Among these is the venerable Sir Charles Lyell, whose caution is not less remarkable than his courage. After studying some of the earlier discoveries of human fossils, he admitted their preglacial origin and thought we might expect to find the remains of man in the pliocene strata. Writing after the discovery of such pliocene remains, Sir John Lubbock set the time of the first beginning of the human race as far back as the miocene, or middle tertiary period; while Alfred Wallace carries the date still farther back, into the eocene period; this, however, on theoretical grounds, since the traces of men earlier than the pliocene period are few and somewhat questionable. In what is said to be miocene strata near Pontlevoy, France, a M. Bourgeois has found numerous wrought flints in a stratum containing the remains of a long extinct animal allied to the rhinoceros, and beneath a bed which contains the mastodon, the dinotherium and the rhinoceros. Similar evidences of man's presence and skill have been found in the miocene beds of Aurillac, with the remains of animals long since extinct; and at Pouancé, another observer, M. Delaunay, has discovered a bone of a herbivorous cetacean of the miocene period, which bears the marks of cutting instruments, such as must have been made when the bone was in a green condition. Doubtless these faint foreshadowings of man's presence in the middle tertiary will be strengthened by future discoveries, as the first evidence of his existence in the later tertiary and quaternary periods have been.

The time required for all the geological changes which have taken place since man demonstrably entered upon the struggle for existence is simply inconceivable. The glacial limit lately set to his history has been overpassed, and his dominion extended perhaps farther beyond it than it is back of the present. "We of the present generation," says Sir Charles Lyell, "when called upon to make grants of thousands of centuries in order to explain the events of what is called the modern period, shrink naturally at first from making what seems so lavish an expenditure of past time." Yet, however much the imagination may take alarm at the immensity of such periods, the sternest reason declares them to be necessary unless we stand ready to deny the orderly sequence of events. The same sort of evidence which proves the existence of man on earth six thousand years ago proves his presence here as many thousand centuries.

## BESSEMER'S ANTI-SEA-SICK SHIP.

The channel which separates England from France has, from time immemorial, been a bugbear to the traveling public of both countries. Innumerable are the books that have been written depicting the miseries of the passage from Dover to Calais, and equally multifarious are the proposals and plans published, having for their object to connect the two shores, and so not only abolish the wretched steamers now in use, but save the traveler from the discomforts of sea sickness and exposure to the weather. As near as we are able to discover, no less than thirty schemes have been advanced, including submarine tunnels, tubes laid on the bed of the channel, submerged roadways, embankments from coast to coast, steam packets of especial construction with improved harborage, and, lastly, a vast bridge which should span the twenty-two miles of dreaded water. All these ideas, involving as they do, not only a consummate engineering skill, but the expenditure of at the least of a hundred million dollars, are but dim visions of the future. At present Mr. Henry Bessemer, well known for his invaluable improvements in the manufacture of steel, steps forward with a saloon vessel, constructed on a principle which has already been applied to furniture, berths, and even state rooms. In short, Mr. Besse-

mer proposes to suspend an entire saloon, after the fashion of a lamp or compass, in gimballs. As there is in every vessel, when pitching or rolling, a neutral axis, on a point coincident with this axis Mr. Bessemer intends to hang his apartment.

The first point to overcome was the mobility of the load. A passenger could not be expected to sit perfectly still in a fixed position during the voyage, while, on the other hand, were he to move or promenade, the equilibrium of the apparatus would be lost. The inventor, finding, therefore, that he could not prevent motion by his means of suspension, concluded he could arrest it the moment it began. To this end he designed a saloon—the description of which we find in the *London Times*—70 feet in length, 30 feet in width, and 20 feet in height, carrying on the top a promenade deck at a height of seven feet above the ordinary deck of the vessel. The points of suspension of this saloon will be in a line with the keel of the vessel and coincident with the neutral axis of the ship when rolling. The saloon will be well lighted and ventilated, and will be fitted at each end with rooms for passengers. The governing power consists of a set of powerful hydraulic apparatus connected on the under side of the flooring, and so arranged that, as the vessel rolls to either side, the pressure or resistance afforded by the water is instantly brought into play and utilized in checking the motion. The device is controlled by a pair of very sensitive equilibrium valves actuated by a hand lever. At this lever stands a steersman who, with a curved spirit level before him, watches the slightest indication of the rolling of the vessel, and in an instant suppresses the tendency of the saloon to follow the motion of the ship.

The difficulty of pitching is overcome by increasing the length of the vessel so as to insure longitudinal stability. The principle of the saloon is, in fact, carried out in a vessel designed by Mr. E. J. Reed, for the channel passage. She will be 350 feet long, with 65 feet beam over her paddle boxes, and 7 feet 6 inches draft of water. The saloon will be placed amidships, in the position generally occupied by the engines. The latter will be of 750 horse power, nominal, and are expected to drive the vessel twenty knots per hour. The ship will be double-ended so as to enable them to enter and quit existing harbors, and at each extremity will be provided a very low free board, so that she may cut the waves instead of rising to them.

In order to demonstrate the feasibility of his scheme Mr. Bessemer has constructed a large working model on the grounds of his residence. The arrangement consists of a twenty foot length of the hull of a vessel of twenty foot beam sunk in a brick pit and carried on a longitudinal axis. In the ship is a saloon suspended as above described, and connected with it is a curved spirit level, with a graduated scale and pointer, the latter of which the steersman always keeps at the zero point. An oscillatory motion is given to the hull by a small engine connected to it with suitable gearing. This motion amounts to 14° each way, representing a total roll of 28° with ten oscillations per minute, but notwithstanding this the cabin does not indicate a deviation of more than from 1° to 1½° from the horizontal. Mr. Bessemer considers his idea but the germ of what may be thought out, and frankly admits that some other brain than his own may push on the work he has initiated.

We hardly think the plan will prove successful, and are convinced that Mr. Bessemer will find the short chopping sea of the channel, seemingly striking a vessel on all sides at once, far different from the regular oscillations produced in his model. Moreover, unless there is some mistake in the figures as we extract them from the *Times*, it seems impossible that a vessel 350 feet long should not pitch in a very decided manner. We have crossed the channel repeatedly in a ship 320 feet long, and in rough weather have experienced pitching by no means light. Again, if simple pitching and rolling were a vessel's only motion, the apparatus might answer, but such is not the case, unless, perhaps, in the long heavy and regular swells of the Atlantic. A chopping sea, which is, *par excellence*, that found in the channel in rough weather, produces a spiral, so to speak, movement of the ship, calculated to vanquish the strongest stomach, while the sometimes unaccountable angles taken by the decks cannot, we believe, be avoided by any device based on Mr. Bessemer's principle.

THE *London journals* state that that interesting young stranger, the hippopotamus recently born in the Zoological Gardens, is being brought up entirely by hand. Like children generally, he is giving considerable trouble to his keepers. As an instance of his juvenile precocity, it is mentioned that he can already remain under water twice as long as his mother.

It has been decided to pierce the tunnel of St. Gothard, in Switzerland, by means of lithofracteur; 25 tons of this explosive body have just been purchased by the engineers in charge of the work. Some idea of the extent of the undertaking and the exceptional hardness of the rock to be traversed may be formed from the fact that at least 1,500 tons of lithofracteur will be the total amount required.

A YOUNG Briton lately won a bet on spiders, in the following ingenious manner: He wagered that a spider which he would produce would cross a plate quicker than a spider to be produced by a friend. Each spider was to have its own plate. His opponent's spider, however, on being started, would not stir, whilst its rival ran with immense speed. The bet was consequently lost; and the loser soon found out the reason why: his friend had a hot plate.