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XXXIII.—*On the Antiquity of Man, and the Discovery of Fossil Mammalia in Devonshire and Scotland.* By RALPH RICHARDSON, F.R.S.E.; Hon. Secy., R.S.G.S.; Vice-President. (Plate IX.)

(Read 4th November 1886.)

ONE of the most interesting provinces of geology is that which records the history of fossil mammalia. To the general public no department of our science, or, may I say, of *any* science? is so interesting or important as this, for the question of the antiquity of Man is of course included in such researches. Need I add that so attractive a field of inquiry has found many distinguished occupants from the days when, in 1825, Dr Buckland picked up a rhinoceros tooth and a flint blade in Kent's Cavern, near Torquay, to these later times, when we stand in the full light of the researches and discoveries of Lyell, Evans, Lubbock, Prestwich, Pengelly, and many more.

During last session we had a most admirable description by Mr James Simpson and Mr John Henderson of mammalian remains discovered by Mr Macfie of Dreghorn in a rock fissure on his estate near Edinburgh. These remains consisted of bones of the horse, wolf, and fox, but the greater number were those of the reindeer, the bones being gnawed and split up in a manner suggestive of the hyæna. Now, the very fact that such a "find" as this proved that in our own neighbourhood such animals as the reindeer and wolf, and probably also the hyæna,

once dwelt, was sufficient to arrest attention, the more so that such animals have long been extinct in Britain. Of course we accept the conclusion that, under climatic conditions very different to those with which this district is presently acquainted, the reindeer and wolf, and probably the hyæna, once lived in this part of Scotland—but it was not ever so. Men did not always accept such an obvious conclusion as this. Even so late as last century some of the most intelligent and acute minds in Europe refused to read the records of the rocks in the simplest and only sensible way. Voltaire, in his “Dictionnaire Philosophique,” launched all his weapons of ridicule and wit at the heads of geologists, although he drew down upon his own the just censure and satire of our Professor Playfair, who remarked: “We can excuse in a poet and a wit that ignorance of the facts in mineralogy which concealed from him the extreme absurdity of his assertion.”

To show the high-tide level of the intellect of France during last century regarding discoveries of fossil mammalia, I shall simply cite Voltaire's remark in the dictionary to which I have alluded (article on *Coquilles*), upon a discovery made not far from Paris about that time. Voltaire writes in his usual scoffing tone:—

“Some years ago a discovery was made, or thought to be made, of reindeer and hippopotamus bones near Etampes, and from this it was concluded that the Nile and Lapland had formerly been on the road between Paris and Orleans. It would have been better to suspect that some naturalist had once had in his cabinet the skeletons of a reindeer and a hippopotamus. Hundreds of cases like this demand prolonged investigation before we believe them.”

This extraordinary assertion on the part of Voltaire, that the fossil bones may have dropped out of the cabinet of some travelling naturalist, appears very strange to us now. As soon should we believe that Mr Macfie or his predecessors had deposited in the rock fissure in the Pentlands the bones of the reindeer, horse, wolf, and fox which Messrs Simpson and Henderson told us about last session. Such a statement as that of Voltaire would now be scouted as grossly absurd, yet we find it embalmed in his so-called “Philosophic Dictionary,” and published in every edition of his voluminous works.

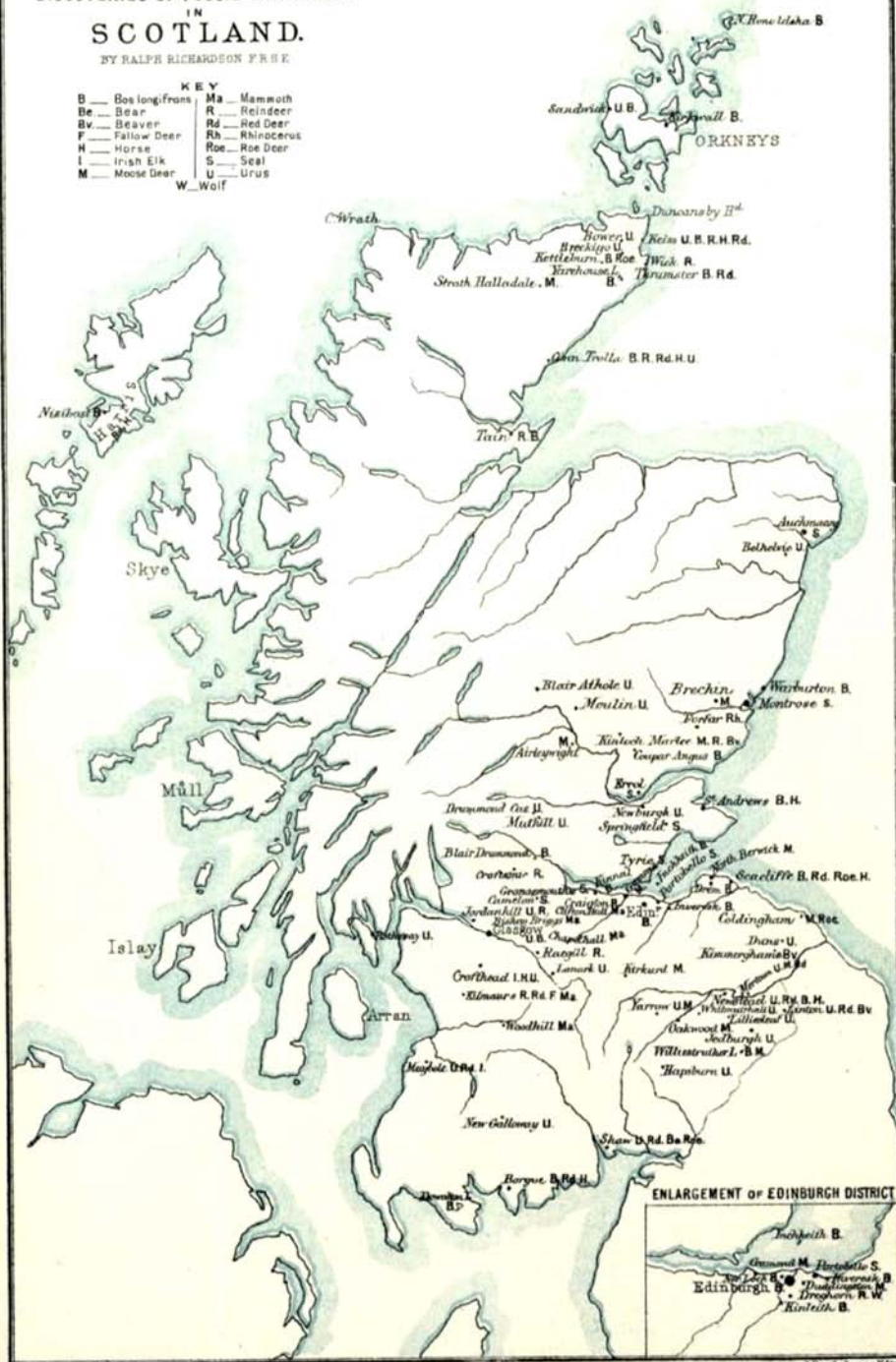
It is only of a piece, however, with another marvellous statement of Voltaire, that the shells found at high levels on the Alps did not indicate the previous presence of the sea there, but may have been dropped by the innumerable crowd of pilgrims (wearing shells in their hats) on their way to Rome from every quarter of the Christian world. Truly the great sceptic,

MAP SHOWING DISCOVERIES OF FOSSIL MAMMALIA

IN SCOTLAND.

BY RALPH RICHARDSON F.R.S.E.

KEY	
B	Bos longifrons
Bc	Bear
Bv	Beaver
F	Fallow Deer
H	Horse
I	Irish Elk
M	Moose Deer
Ma	Mammoth
R	Reindeer
Rd	Red Deer
Rh	Rhinoceros
Roe	Roe Deer
S	Seal
U	Ursus
W	Wolf



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who deprived religion of all its beauty, had no hesitation in dragging religion "head and shoulders" into the domain of science. A more preposterous idea than this of the pilgrims dropping the shells, or the naturalists dropping the skeletons, never entered into the mind of man; and what makes the offence all the worse is that, in so far at least as the discovery of shells at high levels is concerned, correct conclusions had been adopted by the Pythagorean school of philosophy five centuries before Christ, and were enunciated by the poet Ovid in his "Metamorphoses." Translated by Dryden, Ovid's lines (which will remind you of Tennyson's "There rolls the deep where grew the tree") are worth quoting to show the correct ideas regarding some parts of our science which obtained among the ancients, and the depth of ignorance displayed by Voltaire many centuries later. Dryden translates Ovid as follows :—

"The face of places and their forms decay,
And that is solid earth that once was sea ;
Seas in their turn, retreating from the shore,
Make solid land what Ocean was before.
And far from strands are shells of fishes found,
And rusty anchors fix'd on mountain ground.
And what were fields before, now wash'd and worn
By falling floods from high, to valleys turn,
And crumbling still descend to level lands ;
And lakes and trembling bogs are barren sands ;
And the parch'd desert floats in streams unknown,
Wondering to drink of waters not her own."

I propose this evening to turn to some account a visit which I paid to Kent's Cavern near Torquay, Devonshire, last spring, and to describe the cave and its contents ; and then to glance at the discoveries of fossil mammalia which have been made in Scotland. In this way we shall form some idea of the result of the investigation of this most interesting and important province of geology, in so far, at least, as Devonshire and Scotland are concerned.

First, then, as to Kent's Cavern. You must all have heard of that famous cavern, and you must all know the name of its famous investigator, William Pengelly. Still, it is only by a visit to the cavern itself, and to the museum of the Torquay Natural History Society, in which are stored many of its extraordinary contents, that we can realise, in anything like an adequate degree, the marvellous history and character of Kent's Cavern. Just as Hutton, Hall, and Playfair felt an inexpressible sensation of awe in looking at the strata at St Abb's Head, and peering, as it were, into the abyss of time these strata revealed, so anyone visiting Kent's Cavern and seeing what was taken out of it as displayed in Torquay Museum, must feel that a his-

tory is being opened to his eyes, beside which the most ancient human records are brief and tame.

Kent's Cavern is situated about a mile from Torquay in Devonshire, and extends underground for about an eighth of a mile as yet explored, although the probability is it extends much further. It occurs at the base of a small hill of limestone of the Devonian formation, and is 230 feet above the sea-level. Limestone is a rock which lends itself by the chemical action of water to the formation of caverns, and in the limestone of the Torquay district numerous caves occur. But none of these unfolds the story of the past like Kent's Cavern, so I shall next proceed to tell you how special attention came to be given to it.

Let me premise, however, that it is not a newly discovered cave. As I saw with my own eyes when within it, one "Robert Hedges, of Ireland," judging by his inscription, visited it in "1688." In fact, it has for centuries been a local curiosity and a favourite place of resort to the adventurous. Before the excavations of Mr Pengelly they must have penetrated into it with much difficulty, but now one can walk easily from end to end. The interior of the cavern is wonderfully dry, and the temperature during both summer and winter remains about 52°. Yet there are evidences, in the rounded form of parts of the interior, that the cave had once been swept by currents of water; and a clue is thus obtained to its formation.

A Roman Catholic priest, resident at Torquay, named MacEnery, was the first to recognise the palæontological value of Kent's Cavern, or "Kent's Hole," as it was then termed. He visited it in 1824 and 1825, and dug up a number of fossil remains, and wrote an account of his researches. MacEnery died in 1841, and the fossils and his account of them came into the hands of Mr Pengelly, who was then, I believe, and is still, honorary secretary of the Torquay Natural History Society. That Society appointed in 1846 a committee, of which Mr Pengelly was one, to continue the researches on a limited scale, but Mr Pengelly informs us that the "scientific world" received the discoveries very sceptically. He says: "They simply scouted them. They told us that our statements were impossible, and we simply responded with the remark, that we had not said that they were possible, only that they were true."¹

On the opposite shore of Torbay from Torquay is the village of Brixham, and there, in 1857, in limestone too, a similar cavern to that of Kent's was discovered, and there also fossil

¹ See Mr Pengelly's Lectures on this subject, delivered under the auspices of the Glasgow Science Lectures Association, on 22d December 1875, and 24th January 1877. (Collins, Glasgow. 1876 and 1877.)

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bones were found. Scientific opinion was shaken. A Scotsman, Dr Falconer, took up the subject, and prevailed upon both the Royal and Geographical Societies of London to investigate the Brixham cave. These societies formed a committee for the purpose, of which Mr Pengelly was a member, and he had the superintendence of the excavations, and found at Brixham precisely what had been found in Kent's Cavern. In 1864, the British Association, at its meeting at Bath, appointed a committee, and gave a grant of money to investigate Kent's Cavern, and Mr Pengelly was secretary of that committee. From 1865 to 1875 Mr Pengelly went to Kent's Cavern every day of his life (as he expresses it), excepting those rare instances when he was from home; and the result of this ceaseless industry on his part is the accumulation of a mass of evidence which proves that Kent's Cavern is one of the most interesting and important places, palæontologically, which is to be found on the surface of the globe.

Let us see what the deposits of this wonderful cavern were found to consist of, and let us at least glance at the strange history they reveal. After digging down sufficiently deep to make sure he had got to the lowest layer of the *débris* of ages he found piled up there, Mr Pengelly discovered that the first and lowest deposit consisted of a *breccia* of unknown depth, composed of "subangular and rounded fragments of dark-red grit." In this *breccia* were found "remains of bear, parts of two jaws containing teeth of lion, three teeth in part of a jaw of fox," and there too was found "evidence of man in rude massive flint tools." "A flint flake and a perfectly angular and sharp flint chip were found three feet deep in the *breccia* mingled with the remains of the bear. The flake is undoubtedly the most ancient human relic that, up to this time, the cavern has yielded."¹

The *breccia*, or lowest deposit, is overlaid by a *crystalline stalagmite*, and these two deposits Mr Pengelly groups under the title "Ursine," as the remains found in them are almost exclusively those of bears.

We now ascend to the next group, which Mr Pengelly terms the "Hyænine" group or period, as the deposits which I shall next bring under your notice "embrace the hyæna in prodigious quantity." Overlying the *crystalline stalagmite* already mentioned, we find a deep deposit of "light-red clay loam, with about 50 per cent. of limestone," which Mr Pengelly terms *cave earth*, and which abounds with remains of "the cave lion, lynx (?), wild cat, cave hyæna, wolf, fox, Arctic

¹ "The Ancient Cave-men of Devonshire" (anonymous pamphlet sold at Kent's Cavern by the guide).

fox (?), glutton, badger, cave bear, grizzly bear, brown bear, mammoth, the woolly rhinoceros, horse, wild bull, bison, Irish deer, reindeer, hare, cave pika, water vole, field vole, bank vole, beaver, and *machairodus latidens*." Indications of man were also evident in this cave earth, for flint implements, flakes, a stone-hammer or crusher, whetstones, a bone pin, and two bone harpoons, besides charcoal and charred bones, were found in it.

The deposit, however, which overlaid the cave earth was the most abundant in its evidences of man. This was "a *black band*, composed mainly of small fragments of charred wood, and commonly about four inches thick." "It was, without doubt," says Mr Pengelly, "the hearth of the old cave-men." Three hundred and sixty-six flint implements, flakes and chips, a bone awl, a bone needle or bodkin, a bone harpoon, burnt bones, and burnt wood were found in this black band.

Above this black band came a second deposit of stalagmite, which, as it differed from the underlying one, Mr Pengelly calls *granular stalagmite*. He says it "varies from a mere film to 5 feet in thickness." When I visited the cavern, the guide pointed out a place where this stalagmite was 5 feet, *i.e.*, 60 inches in thickness. He also informed me that competent authorities had stated that an inch of stalagmite would take 1000 years to form. Consequently the 60 inches of it before us represented, he thought, 60,000 years. All this information would, under ordinary circumstances, have probably been received without remark; but when we reflect that human remains are found (as I have shewn) beneath these 60 inches of stalagmite, the question instantly arises, "Can man be 60,000 years old?" Nay, indications of man were discovered here, as I mentioned, not merely in the black band below this stalagmite, but in the breccia below the crystalline stalagmite which underlies the cave earth. We thus find the antiquity of man enormously increased, seeing that his remains are discovered beneath *both* stalagmites. It is not for me to attempt to say how long these stalagmites took to form, but the formation of stalagmite is, it must be admitted, a very slow process indeed.

At the extremity of the cavern is a railed-off enclosure, in which we observed some magnificent examples of stalagmites and stalactites. Of course, the former were fed by the latter, drop by drop from the limestone ceiling of the cave. The longest stalagmite was 52 inches long, and the longest stalactite 39 inches. My guide said that although he had observed these stalagmites and stalactites for twenty-one years, he never had seen any change in them. In Kent's cavern the remains of man are found under, first, a sheet of stalagmite (crystalline), on which rests the cave earth, on which rests the black band. That

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man was the companion of the bear, hyæna, and mammoth, seems evident by the discoveries made in this cavern. Yet how long was this ago? How

“Many millions of ages have gone to the making of man?”

sings the poet.¹ The geologist turns to the dust of centuries, and tries to bid the earth speak, but, alas! on some questions it remains dumb. We can tell the deposits, we can describe their contents, we can point out where such and such an indication of man was found, but we cannot estimate the centuries or the cycles which have flown since man did battle with the cave-bear and the mammoth, or wrested this very cave from the hyæna or the wolf. We see his weapons, we can examine his domestic implements, nay, the very charred remains of his fires are still lying before us, but no voice comes from the embers, no light shines out of the darkness.

It is with feelings such as these that we leave Kent's Cavern—for its story is told. A deposit of *black mould* covers the granular stalagmite, but it belongs to Romano-British and pre-Roman portions of British history, and does not appeal like the others to the great question of the antiquity of man. At the same time, Mr Pengelly thinks this black mould “takes us back at least 2000 years,” and forms our first “chronological stepping-stone” here. Older than it was the granular stalagmite, and older than the stalagmite was the black band which was “more especially the dwelling-place of the ancient cave men.” But as I mentioned before, a still more ancient race of men lived in the days of the breccia, which is divided from the black band by the cave earth and crystalline stalagmite. Yet to show how uncertain geologists are in estimating past time, I need only quote Mr Pengelly, who says: “The black mould must be worth as a minimum 2000 years, and it may be worth 20,000.” Again, in estimating the rate of growth of the granular stalagmite, he says: “Were we sure that the rate of accretion had been uniform, that would give 5000 years for an inch of the stalagmite.” Thus the 60 inches would represent 300,000 years, and we must remember that the remains of man are found beneath it. This far exceeds the comparatively modest 60,000 years indicated by my guide.

Then there is another question touched by Mr Pengelly, which interests us in connection with this cavern. I refer to the character of the human implements discovered, and to the question whether they exhibit the cave men as of a high or low intellectual type. As Mr Pengelly puts it: “Was the primal man a savage or a civilised being?” To which he replies, “I

¹ Tennyson, “Maud,” iv.

cannot answer this ; but I know that the farther I have pursued man into antiquity, the ruder he has turned out to be." Mr Pengelly adds, however, two remarks which are not usually made, and I think are well worthy of consideration, viz. :—

1. The cave men might possibly be descended from ancestors vastly superior, and if so, their ancestors must be sought in a still more remote antiquity.

And 2. Discoveries such as those in Kent's Cavern do not settle the question of the antiquity of man in general, but only of the antiquity of man in Devonshire, which, adds Mr Pengelly, was, in all probability, far away from the cradle of the human race. Devonshire was possibly tenanted by people less civilised than in places nearer the cradle of the race.

There is yet a third consideration which is not mentioned by Mr Pengelly, but which is worth stating, viz., that much as we are inclined to look down upon these old cave men and their implements and habitations, there are human beings still living, ay, within our own country, using implements of the same rude kind, and tenanted habitations quite as dark and grimy as Kent's Cavern. And, what is still more extraordinary, these people, some, as I have said, of our own country, are not a degraded race although they use rude implements and dwell in darkness ; but, on the contrary, many of them display an intelligence, an urbanity, and a dignity, which even the most civilised and polished dwellers in the most luxurious and well-equipped homes could not excel.

I make these remarks by the way, and not with the view of casting any doubt upon the extraordinary antiquity of the ancient cave men of Kent's Cavern. The accumulations resting upon their remains furnish sufficient evidence of their great antiquity ; and the long-extinct animals whose bones are now found mixed with theirs, tell of a period beside which our historical record is but a feeble span.

When we turn from crowded sepulchres such as Kent's Cavern near Torquay, or the Brixham Cave (a new cavern there is being successfully explored by Mr Else, Curator of the Torquay Museum), or such as the caverns in North Wales, near Tremeirchion in the Vale of Clwyd, described last November by Dr Hicks and Mr Davies to the Geological Society of London,¹ when we turn, I say, from vast palæontological fields such as these to Scotland, we find a very great falling off in fossil

¹ "Q. J. G. S.," vol. xlii. p. 3.—The animal remains found in these North Wales caves comprised those of the lion (*Felis leo*, *var spelæa*), wild cat, spotted hyæna (*H. crocuta*, *var spelæa*), wolf, fox, bear, badger, wild boar, bovine, (*bos* ? *bison* ?), great Irish deer, red deer, roebuck, reindeer, horse, woolly rhinoceros, and mammoth. A flint lance-head and scraper were also found. The former was found beside a mammoth tooth, and under stalagmite.

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mammalian remains. Whatever the cause, there does not seem to have been such a great immigration of animals to Scotland as to England from the Continent, of which the British Isles then formed a part. The severer climatic conditions of North Britain may have exercised a repellant power. The sparser vegetation of Scotland would diminish the number of animals capable of living there, and consequently diminish the number of beasts of prey—for we must remember that, in the economy of nature, the food-supply of a country is invariably a test of the prevalence of animals within it. Still, without saying that the list is exhaustive, I would cite several localities in Scotland noted for the occurrence of mammalian remains, with the animals respectively found in each. Classifying these animals generically, I will shortly state our Scottish “finds” as follows:—

Of the different varieties of the Ox, there have been found in Scotland fossil remains of the *Urus* or wild bull (*Bos primigenius*) at Belhelvie Moss, Aberdeen; Glasgow; Lanark; Maybole, Ayrshire; Shaw, Dumfriesshire; New Galloway, Kirkcudbright; Jordanhill, near Glasgow; Keiss, Breckigo, and Bower, Caithness; Sandwick, Skara, Orkney; Blair Athole, Moulin, Muthill, and Drummond Castle, Perthshire; Crofthead, Renfrewshire; Newburgh, Fifeshire; Duns, Mertoun, and Whitrig Bog, Berwickshire; Whitmuirhall and Yarrow, near Selkirk; and Jedburgh, Lilliesleaf, Linton Loch, and Hapsburn, Roxburghshire.

The *Bos longifrons* of Owen, or small shorthorn, was found fossil at Nisibost, Island of Harris; Kinness Burn, St Andrews; Cupar-Angus; Williestruther Loch and Newstead, Roxburghshire; Cinn Trölla, Sutherlandshire; Glasgow; Nor' Loch, Edinburgh; Inchkeith; Borgue, Bo'ness, Kirkcudbright; Yarhouse, Thrumster Little, Keiss, and Kettleburn, Caithness; Kirkwall, Skara, and Burrian, North Ronaldshay, Orkney; Inveresk and Kinleith, Midlothian; Kinneil, Linlithgowshire; Seacliffe and Drem, Haddingtonshire; and Lower Warburton, Kincardineshire.

Mr Boyd Dawkins believes that this *Bos longifrons* is the ancestor of our present Welsh or Scotch cattle. Dr J. A. Smith considers that the *Bos longifrons* existed in the south of Scotland at the time of the Roman occupation of the country, its remains having been found with Roman pottery near Newstead, Roxburghshire (“Pro. Soc. Ant. Scot.,” ix., 588). Mr Jeffrey of Jedburgh tells of the occurrence of the *Urus* fossil in Selkirkshire, and says that a Roman spear was found sticking in the skull (Op. last cit., 656). The *Urus* or wild bull, again, according to Professor Alleyne Nicholson, “though much larger

than our ordinary oxen, is believed to be specifically undistinguishable from the domestic ox (*Bos taurus*), and it was probably the parent of the larger varieties of European oxen. It was a contemporary of the mammoth, woolly rhinoceros, cave lion, cave bear, Irish elk, and other postpliocene mammals, and it was in existence up to at least the twelfth century."¹ It is represented by the white cattle of Hamilton.

Then, of the different varieties of the DEER there have been found fossil in Scotland:—

The *Moose Deer* (*Alces malchis* or *palmatius*), at Auchtergaven, Airleywight, Perthshire; at Strath Halladale, Sutherlandshire; at Coldingham, Berwickshire; at Williestruther Loch, Roxburghshire; at Oakwood and Yarrow, near Selkirk; at Kirkurd, Peeblesshire; at Mertoun, Whitrig Bog, Berwickshire; at Duddingston Loch, Edinburgh; at Greycrook, near Cramond; at Trinity Muir, Brechin; at Kinloch Marlee, Perthshire; and at North Berwick.

The *Reindeer* (*Cervus tarandus*), was found fossil at Jordanhill, near Glasgow; at Croftamie, Dumbartonshire; at Dreghorn, near Edinburgh; near Tain, Ross-shire; at the Broch of Cinn Trölla, Sutherlandshire (with an iron spear head, knife, and dagger, and many human remains²); near Craigton, Linlithgowshire; at Raesgill, near the Clyde; at Kinloch Marlee, Perthshire; near Kilmaurs, Ayrshire; at Shaw, Dumfriesshire; and near Wick and Keiss Castle, Caithness.

The *Red Deer* (*Cervus elaphus*), the *Roe Deer* (*Cervus capreolus*), and the *Fallow Deer* (*Cervus dama*), are all found fossil, but are not extinct animals in Scotland, so I need not enter into details. The localities where the remains of these and the other animals have been found fossil are indicated on the map illustrative of this portion of my address.

The *Irish Elk* (*Cervus megaceros*, or *Megaceros Hibernicus*) "does not appear," says Nicholson, "to have survived into the prehistoric period." It was found fossil in Scotland at Croft-head, Renfrewshire, and at Maybole, Ayrshire.

We now come to an extinct animal, of which, as glacial geologists, we have heard a great deal. I refer to the MAMMOTH (*Elephas primigenius*). From specimens discovered embedded in the ice of Siberia, we know that the Mammoth Elephant was covered with long woolly hair. It had also huge curving tusks. "That it survived into the earlier portion of the human period," says Nicholson, "is unquestionable, its remains having been found in a great number of in-

¹ "Manual of Palæontology," 1872, p. 440.

² For list of articles presented by Rev. J. M. Joass to Antiquarian Museum, Edinburgh, see "Proc. Soc. Antiq. Scot.," ix. 53.

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stances associated with implements of human manufacture; whilst in one instance a recognisable portrait of it has been discovered carved on bone." The mammoth was found fossil in Scotland at Chapelhall, near Airdrie; at Woodhill and Kilmaurs, Ayrshire; between Edinburgh and Falkirk during the Union Canal excavations, in a field on Cliftonhall estate, near Edinburgh; and at Bishopbriggs, near Glasgow.

With regard to fossil remains of the HORSE (*Equus fossilis*), found in Scotland and elsewhere, Professor Nicholson says: "The *Equus fossilis* of the postpliocene and recent deposits is specifically undistinguishable from the common horse (*Equus caballus*). Such remains have been discovered at Newstead, Roxburghshire; at Crofthead, Renfrewshire; at Kinness Burn, St Andrews; in the Island of Harris; at Borgue, Bo'ness, Kirkcudbright; at Seacliffe, Haddingtonshire; and at Cinn Trölla, Sutherlandshire.

The next animal, the BEAVER, is no longer a native of Scotland, although it has been introduced and can live there. "The *Castor Spelæus*," says Nicholson, "of the European cave deposits does not appear to be specifically separable from the existing beaver (*Castor fiber*). Its remains have been found at Linton Loch, Roxburghshire; at Kimmerghame, in Berwickshire; and at Kinloch Marlee, Perthshire, in beds of marl under peat moss.

Of the SEAL family, the small Arctic seal (*Pagomys foetidus*) has been found fossil at various places throughout Scotland, such as, Westfield of Auchmacoy, near Aberdeen; Montrose; Springfield, near Stratheden, Fife; Portobello; Camelon, near Falkirk; Errol, Perthshire; near Grangemouth; and at Tyrie, Fifeshire.

Turning from these animals, all of which are of a comparatively harmless character, let us enquire what traces have been found in Scotland of extinct carnivora, such as the bear, the wolf, the hyæna, and the wild boar. There is no question that all of them inhabited Scotland, some to the historic period. Mr Harting, in his "British Animals Extinct within Historic Times,"¹ includes the bear, beaver, reindeer, wild boar, and wolf.

With regard to the BEAR, the skull of a large bear was found, with a rib of the same animal,² in a semi-fossil condition at Shaw in Dumfriesshire, in peat moss lying on marl, and associated with remains of red deer, roebuck, urus, and reindeer.

¹ London, 1880.

² On the authority of Sir William Jardine, Bart., Dr J. A. Smith says it was "the skull and rib of a black bear, *Ursus arctos*."—"Pro. Soc. Ant. Scot.," ix., 658.

"Strange to say," adds Mr Harting, "these are the only remains of the bear which have yet been discovered in Scotland."

As to the WOLF, it abounded, at one time, in every part of the British Isles, but, says Harting, "it survived in Scotland to a much later date than was the case in England." "In 1756 Buffon was assured by Lord Morton, then president of the Royal Society, that wolves still existed in Scotland at that date." Mr Harting says there is no doubt that wolves were killed in Sutherlandshire "within thirteen years of the date mentioned by Buffon." Both Professors Owen and Nicholson have pointed out the great difficulty of distinguishing with certainty between wolves, dogs, and foxes when found fossil. We were informed, however, last Session, that the bones of the wolf, as well as the reindeer, were found at Dreghorn, near Edinburgh.

Then, with regard to the WILD BOAR, it, too, was once well known in Scotland, although, like those of the wolf, its remains do not appear to have been often found in a fossil state. Dr Joseph Anderson, in his work on "Scotland in Pagan Times,"¹ states that at Parkhill in Aberdeenshire a cist was discovered containing human bones, and that among them were "fragments of the left fore-limb of a boar."

As to the HYÆNA, I do not think that its remains have been found in Scotland, but its presence has been inferred from the manner in which bones found fossil had been broken. It was from such evidence that its presence was inferred in connection with the remains at Dreghorn. Mr Pengelly arrived at a similar conclusion with regard to Kent's Cavern. He could not understand how so many bones there were broken obliquely until he went to the Zoological Gardens, London, and saw how the hyænas broke the bones given to them.

The last animal I shall mention, before I say a few words on the highest of all, is one very unlooked for in Scotland. I refer to the RHINOCEROS. Yet, on 25th January 1823, Professor Jameson exhibited to the Wernerian Society of this city the horn of a rhinoceros which was found in the marl pits of the Loch of Forfar. Professor John Fleming likewise refers to it as existing "in the Edinburgh Museum." Dr J. A. Smith thinks it was "possibly the second or smaller horn of a young woolly rhinoceros (*Rhinoceros tichorhinus*) if it did not belong to a smaller and more slender species altogether."² Professor Nicholson describes *Rhinoceros tichorhinus* as an extinct species which "formerly inhabited England and ranged over the greater part of Europe." "It is," he adds, "essentially a northern form, and has the same distribution *in space* as the Mammoth." In *time* it is younger than the mammoth, and is mainly found in

¹ Edinburgh, 1886, p. 79.

² "Pro. Soc. Antiq. Scot.," vol. ix, p. 637.

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quaternary cave deposits and valley gravels. Thus Dr Hicks, in the paper which he read in London last November, says that in one of the Welsh caves he found a flint implement "under the stalagmitic breccia in close proximity to a large portion of the jaw with teeth of a rhinoceros which unfortunately fell to pieces in being removed. Some large fragments of limb bones of mammoth were also found at this point." From this we have evidence of Man, the Rhinoceros, and the Mammoth being co-existent in Britain at one period. We need not be surprised, therefore, to hear of Rhinoceros remains having been found in Scotland. Like Dr Smith, Mr Davies of the British Museum designates Dr Hicks' specimen the "Woolly Rhinoceros (*R. tichorhinus*)."¹ Four hundred rhinoceros teeth, 15 mammoth teeth, and 180 hyæna teeth were found in the Welsh caves.

In his well-known paper on "British Postglacial Mammals,"¹ Mr Boyd Dawkins sums up the evidence of the existence of postglacial mammals in Scotland by stating that he knew of only five cases, viz., (1) the mammoth and reindeer at Kilmaurs, Ayrshire; (2) the mammoth at the Union Canal between Edinburgh and Falkirk; (3) the mammoth at Chapelhall near Airdrie; (4) the reindeer at Croftamie (not Kilmarnock), Dumbartonshire; and (5) the urus at Croftshead, Renfrewshire. Mr Boyd Dawkins refers the remains of other animals discovered fossil in Scotland to "Prehistoric and not Postglacial" times. I need not enter into this question at this stage, beyond stating that those eminent Glasgow geologists, Messrs Young and Craig, expressed surprise that Mr Boyd Dawkins, in full knowledge of the Kilmaurs section, should place the mammoth and reindeer remains in his postglacial series. They were of opinion that the mammoth and reindeer "existed in the *preglacial* valley of the Carmel at Kilmaurs." Professor James Geikie, on the other hand, considers that the mammoth and reindeer occupied Kilmaurs during an *interglacial* period. It is evident that where so many excellent authorities differ, there is no room for dogmatism on the preglacial, interglacial, or postglacial period of fossil mammalia. Again, as I showed in the paper which I read in 1882 before this Society upon the discovery of Arctic shells at high levels in Scotland, such a section as that of Chapelhall (cited by Mr Boyd Dawkins) was differently interpreted by different observers—Mr Smith of Jordanhill stating that he discovered the shells *beneath* the till; whilst Dr Crosskey found that the bed Mr Smith deemed till was a boulderclay of later deposit.²

This address opened with the description of Kent's Cavern on the coast of Devonshire. Let me close it with a reference to St

¹ "Q. J. G. S." 1869, vol. xxv. p. 208.

² See paper by Author, "Trans. Edin. Geol. Soc.," iv. 179.

Ninian's Cave, on the coast of the parish of Glasserton, Wigtownshire. No fewer than eighteen crosses, carved either on the walls of this cave or upon detached flagstones or boulders, have been discovered here within recent years. "The great interest," says Sir Herbert Maxwell, M.P., "attaching to these discoveries lies in the fact that, assuming the carved crosses, &c., to be coeval with, or made shortly after, the time of St Ninian's occupation of the cavern as a temporary hermitage, we are carried back to a time earlier than any Christian remains hitherto known to exist in Scotland—namely, to the fifth century."¹ Sir Herbert then describes excavations carried on in an immense mound of material which lay in front of the cavern. These excavations took place last April, and revealed four successive layers of debris, "bearing evidence," says Sir Herbert, "of as many successive falls of earth and rocks from the cliff above, and of as many successive *human* occupations."

Tabulating the layers found in this mound, as excavated last April, we obtain the following result :—Surface debris of modern date occupied a depth of about 2 feet. At a depth of 4 feet from the surface came the *fourth* human period, of which the evidences were a cross composed of Silurian rock, richly carved, and having a Runic inscription; also a stone spindle-whorl. At a depth of 5 feet from the surface, came the *third* human period, represented by portions of a human skeleton. At a depth of 6 feet came the *second* human period, being a deposit of compressed ash and wood cinder, with numerous limpet, whelk, and periwinkle shells, and bones, and a red-deer's antler. Lastly, at 8 feet from the surface, came the *first* human period, marked by a similar deposit of ashes, shells, and bones, a few of the bones having been sharpened into cutting instruments.

Now, here we have, in a comparatively obscure cave, evidence of no less than four successive periods of human occupation in a depth of only 8 feet from the surface. In this very cave we rise from the rude savage, sharpening bones into instruments, up to the pious and cultured Christian, fashioning richly-carved crosses, and covering them with religious thoughts and emblems. Again comes the question of Kent's Cavern, "How long does all this represent?" Can anyone set a chronological value on these successive deposits? and again there is no answer, and the antiquity of man remains a thing unsolved.

The Rhind Lectures of our Scottish Society of Antiquaries, as recently published, give us the latest and best description of the ancient remains of man in Scotland. It is to the implements and weapons and sepulchral monuments of the Stone Age that we must turn for evidences of primeval man in Scotland. And Dr Joseph Anderson takes a favourable

¹ *Scotsman*, 3rd May 1886.

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view of this earliest Scotsman. "In this man of the Stone Age," he says, "whose capacity, culture, and civilisation are thus made dimly visible to us by the relics of his life and the memorials of his dead—this maker of finely formed, and admirably finished tools and implements in stone—this builder of great sepulchral monuments that are completely structural, we have reached the typical representative of primeval man in Scotland. There is no evidence of the existence within our area of any representative type of man of higher antiquity or of lower culture than this."¹

By claiming for primeval man in Scotland "capacity, culture, and civilisation," Dr Anderson strikes a blow at those who consider that civilised man has sprung from a savage. Yet the "finely formed and admirably finished tools and implements in stone," typical of primeval man in Scotland, often closely resemble (as the engravings in Dr Anderson's volume show) the tools and implements used by very uncultured and uncivilised people to-day. We find a stone "adze of diorite in its handle" from New Guinea compared with a "stone axe with its handle found in the Solway Moss." Both adze and axe seem "finely finished and admirably formed"—but was primeval man in Scotland only on the same level as the savage Papuan of New Guinea? This is disappointing, and does not quite bear out Dr Anderson's claim that he possessed "capacity, culture, and civilisation." The truth is, we cannot say what primeval man in Scotland was by an examination merely of his implements and weapons and sepulchral remains. He may have been cultured or uncultured, savage or civilised—we cannot tell. The most civilised beings in the world might possess only stone implements and weapons, if, in the district in which they resided, they could obtain nothing but stone out of which to fashion them. The intellectual qualities of primeval man must remain, like the date of his existence, an insoluble problem.

I have now brought to a termination an address which I trust contains in it some features of interest. Where geology ends, there archæology begins. My address has related to the Borderland between the two sciences. We are accustomed in geology to go deep down into the history of the world, and to measure its antiquity not by centuries, but by ages. The mammalian remains of which I have spoken exist only on the surface of a world which had taken cycles to form. Of one thing we must be convinced, and it is this, that the period during which man has tenanted the world sinks into insignificance beside the æons which went to the building up of the globe, and which led to the gradual appearance of that organic life of which man is the latest form and the most splendid example.

¹ "Scotland in Pagan Times," 1886, p. 385.