

Hambleton, Kepwick, and Hawnby tribes, between whom, probably, feuds would frequently take place; so that sites which are now almost deserted may have been busy scenes of savage polity in pre-Roman times."

Finally, from these several interments, we ascertain that the Hambleton Hills have been occupied by different races of men during a long series of years. The earliest, or *long barrow*, dating very probably 3,000 years since, the *circular* British barrow not less than 1,800 years; though the Rev. William Greenwell considers that 1,000 years before Christ is not too remote a period to assign for the earliest of this class, and the latest, or Saxon, from the fifth to the ninth century of our era.

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ON THE PLEISTOCENE MAMMALS OF YORKSHIRE. BY WM. BOYD  
DAWKINS, M.A. (OXON.), F.G.S., ETC. (*An abstract only*).

In examining with some care the remains of animals embedded in caverns, peat mosses, river beds, and other early deposits, we find them indicate or point to distinct and widely-separate periods of time since their entombment. Some of the animals are still living in the district, and others of an earlier date no longer occur in Britain, but whose former existence is recorded in the early annals of this country. Another class embrace species, in addition, of which we have no record of their ever having been natives of Europe. To the first we apply the term *Prehistoric*; to the last, *Pleistocene*, which is synonymous with the terms *Post-Pliocene*, *Preglacial*, and *Glacial*. It applies to all deposits or formations, from the top of the Norwich Crag up to the prehistoric deposits comprising the preglacial, the forest-bed, the glacial drift, the post-glacial brickearths, loams, gravels, and the contents of the older ossiferous caverns. In some instances, species of animals appear to have lived through the earliest of these periods down to the present time; while others ceased to exist at a very remote epoch, and whose bones are either

embedded in river deposits or caverns in the limestone districts, which, in many cases, owe their formation to the action of underground currents of water from streams or the accumulation of springs, while the majority of caverns owe their contents to the falling of animals into open fissures and the transporting power of water: others, again, have been inhabited for ages by wild animals, and filled with the remains of their prey. The fissures, or old swallet holes, are in many instances still open, and more or less erect; and farmers will tell you that they have lost sheep, horses, oxen, and dogs, that had no means of regaining the surface. In caverns, however, which have afforded shelter from the weather, man and wild animals have resorted from the Pleistocene times to the present day; hence in such localities remains of different epochs are found. As in Kent's hole, for instance, where, overlying the mass of bones dragged in by hyænas in Pleistocene times, and sealed down by stalagmite, a layer of dark-coloured earth, containing various implements of bone, flint, and pottery, and exhibiting upon its surface the indications of the feasts and fires of some early race of people. The Kirkdale cave, in this county, contained several Pleistocene mammals intermixed with those of our own day. The Paviland cave, again, exhibited a mixture of Pleistocene and Prehistoric remains; while, in other instances, those of Prehistoric age only are met with. The old river gravels, loams, and brickearths, which are sometimes very high above the level of the nearest stream, are the result of the erosion of the rocks during the formation of the valleys by the ancient rivers flowing at a far higher level than at present, which has cut down their beds to the present level, so that the remains from the caverns and the river deposits are, geologically speaking, of the same date. Some of these deposits are of vast antiquity, and contain the remains of the extinct mammals that inhabited Yorkshire, and happened

to be swept down by the floods. From these two sources the following Pleistocene mammalia have been obtained in Yorkshire:—

KIRKDALE.	CAVERNS.		RIVER DEPOSITS.	
	KIRBY MOORSIDE.	KIRKDALE.	BIELECKS.	LEEDS.
<i>Felis spelæa</i> ... ..	×	×	×	—
<i>Hyæna spelæa</i> ... ..	×	×	—	—
<i>Canis lupus</i> ... ..	—	×	×	—
<i>Canis vulpes</i> ... ..	—	×	—	—
<i>Mustela erminea</i> ... ..	—	×	—	—
<i>Ursus spelæus</i> ... ..	—	×	—	—
<i>Ursus Arctos</i> ... ..	—	×	—	—
<i>Bos primigenius</i> ... ..	—	—	×	—
<i>Bison priscus</i> ... ..	—	×	×	×
<i>Megaceros Hibernicus</i> ... ..	—	×	—	—
<i>Cervus elaphus</i> ... ..	—	×	×	—
<i>Cervus tarandus</i> ... ..	—	×	—	—
<i>Elephas antiquus</i> ... ..	—	×	—	—
<i>Elephas primigenius</i> ... ..	—	—	×	×
<i>Hippopotamus major</i> ... ..	—	×	—	×
<i>Equus fossilis</i> ... ..	—	×	×	—
<i>Rhinoceros leptorhinus</i> (Owen) ... ..	—	×	×	—
<i>Arvicola amphibia</i> ... ..	—	×	—	—
<i>Arvicola agrestis</i> ... ..	—	×	—	—
<i>Lepus timidus</i> ... ..	—	×	—	—
<i>Lepus cuniculus</i> ... ..	—	×	—	—
<i>Mus musculus</i> ... ..	—	×	—	—

To this list Professor Owen would add the *Bos longifrons* and the Woolly rhinoceros (*Rhinoceros tichorhinus*); but a careful examination of the remains ascribed to these animals in the museums of York, Oxford, and London, has convinced me that they belong respectively to the bison and the Lep-torhine rhinoceros. Amounting in all to 22 species, which is nearly half of the entire number of Pleistocene mammalia whose remains have been found in Britain. These fall into five distinct groups. The first comprehending all the extinct species; the second, those confined at the present day to northern climates; the third, those confined to southern; the fourth, those common to northern and tropical climates; and, lastly, those still inhabiting the temperate zones of Europe.

1st. *The Extinct Species.* Out of the 53 species proved to have inhabited Pleistocene Britain, but 14 are no longer to be found on the face of the earth:—

Machairodus latidens.	Elephas meridionalis.
Ursus spelæus.	Hippopotamus major.
Megaceros Hibernicus.	Rhinoceros tichorhinus.
Cervus dicranios.	Rhinoceros megarhinus.
Elephas antiquus.	Rhinoceros leptorhinus.
Elephas primigenius.*	Rhinoceros etruscus.
Elephas priscus.	Castor trogontherium.

2nd. *Species confined to Northern Climates.* This group of Pleistocene mammals is now confined to the colder regions of the north, or the high altitudes in the northern hemisphere, where a low temperature obtains, and consists of eight:—

Gulo luscus.	Spermophilus citillus.
Cervus tarandus.	Spermophilus erythogenoides.
Alces malchis.	Lagomys spelæus.
Ovibos moschatus.	Lemmus.

3rd. *Species confined to Southern Climates.* This group consists of only two:—

Felis spelæa, variety of Felis leo.
Hyæna spelæa, variety of Hyæna crocuta.

4th. *Species common to Cold and Tropical Climates.* The Felis antiqua, or fossil representative of the leopard (Felis pardus), extend, at the present day, throughout Africa and Persia into Siberia. The fox and the wolf are other instances of some of the living carnivora being able to endure almost every degree of temperature without being specifically modified by it.

5th. *Species still Inhabiting the Temperate Zones of Europe.* This is the largest group of Pleistocene mammalia, and embraces 28 species which are still living in the temperate zones of Europe:—

Homo.	Canis lupus.
Rhinolophus ferrum-equinum.	Canis vulpes.
Vespertilio noctula.	Mustela erminea.
Talpa vulgaris.	Mustela putorius.
Felis catus ferus.	Mustela martes.

<i>Lutra vulgaris.</i>	<i>Sus scrofa ferus.</i>
<i>Meles taxus.</i>	<i>Equus caballus.</i>
<i>Ursus Arctos.</i>	<i>Castor Europæus.</i>
<i>Sorex vulgaris.</i>	<i>Arvicola amphibia.</i>
<i>Sorex moschatus.</i>	<i>Arvicola agrestis.</i>
<i>Bos primigenius.</i>	<i>Arvicola pratensis.</i>
<i>Bison prisceus.</i>	<i>Lepus timidus.</i>
<i>Cervus elaphus.</i>	<i>Lepus cuniculus.</i>
<i>Cervus capreolus.</i>	<i>Mus musculus.</i>

This analysis, therefore, of the 53 Pleistocene species gives—

- 14 as extinct.
- 8 confined to northern climates.
- 2 as confined to southern climates.
- 1 as common to temperate and hot climates.
- 28 as still inhabiting the temperate zones of Europe.

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The inference drawn from the first of the above lists of mammalia, as regarding the physical conditions and the climate of Yorkshire, at the time they lived in the county, is highly important and interesting. Again, the proportion of 14 extinct to 39 living species proves that, in the geological sense, the present order of things is separated by a small interval from the Pleistocene; while, from the fact that half are still living in the same European area, we may infer that the conditions of existence, the climate, and food, and the like, were then very similar to those now obtaining in the area in which we live.

That, however, some great physical change has taken place in Europe since the Pleistocene times, is proved by the presence of other groups of mammalia—those confined now to cold and to hot climates. They afford evidence that at first sight appears conflicting, but which, upon analysis, we find to be very conclusive, that the climate in Britain in those days was very much more severe than at present. From the conditions under which the surviving Pleistocene herbivores now live, we can infer those under which they lived in Britain in that early period. The Northern group of Pleistocene mammalia, living only now in a severe continental

climate, consists of species that have very different powers of resisting cold and heat. Thus the musk sheep is found now only under the lowest temperatures in the vast treeless, barren grounds of North America, while the reindeer lives *also in the forests, along with the elk of the Europæo-Asiatic and North American continents.* The red deer and the bison range up to the edge of the province inhabited by the other animals. The lemmings live under a very severe climate, while the marmots are found in the higher and colder districts in Southern Europe and Central Asia. Each of these Northern species is dependent upon the oscillation of the climate for its particular habitat in a given year, retreating northward or southward according to the temperature that regulates the supply of food necessary for its existence. By some such oscillation of temperature the remains of the animals of two contiguous zoological provinces may be found together in one spot, as in the case of the northward retreat of the musk sheep, from the neighbourhood of Fort Churchill, where it once lived, and which is now occupied by the elk and waipiti. In this manner the admixture of the remains of animals living at the present day, respectively in a severe and in a temperate continental climate, may be accounted for in the Pleistocene caverns and brickearths.

The hypothesis of a series of conditions obtaining in Pleistocene Western Europe, similar to those now found in some portions of Northern Asia, is necessary to complete the evidence afforded by the fauna, and the deposits in which they are found. Now, the contortion of the gravels, and the angular state of the pebbles of which they are often composed, are, as Mr. Prestwich infers, explicable only on the theory of ice having been found in our rivers in far larger quantities than at the present day—the one being the result of the grounding of miniature bergs, the other of the melting away and depositing their burden of pebbles. The large

plateaux of brickearths are probably the deposit of the floods caused by the sudden melting of the winter snow, similar to that which takes place in Northern Siberia and in the area north of the Canadian lakes. The winter cold would be sufficiently intense to allow of the Northern groups of mammalia living in the winter; and the musk sheep might have been obliged to leave the Pleistocene "tundras," and take shelter in the zone of the elk, and even the bison, in an unusually severe season. On the other hand, in the summer, the animals that are now found in the temperate zones of Europe might advance even into the country of the elk and the reindeer; and even carnivora, now confined to hot climates, find their way into the temperate zone of the day. Thus the *Hyæna vulgaris*, or common living hyæna, is found fossil in the South of France, without penetrating as far north as Britain, France, or Germany. In fact, the evidence afforded, both by the fauna and deposits of the Pleistocene, seems to us to prove that the climate in Pleistocene Britain was more severe than it is now; that at a time when Britain formed a portion of the Europæo-Asiatic continent it more closely resembled that now obtaining in the fur countries of Northern Asia than elsewhere; and, lastly, that it was subject to oscillation, by which the migrations of the herbivores were directed northward or southward, as the case may have been. Strong evidence is afforded by the thick woolly covering of the carcasses of certain larger pachyderms—as the Mammoth and Tichorhine rhinoceros of Siberia—that the temperature of the countries in which they resided was very severe. The Hippopotamus major, also, which was cotemporary, *may* have been, in like manner, supplied with warm covering; but of this fact we have no proof, and the aquatic habits of this last mammal militate somewhat against this supposition, and are apparently incompatible with a climate suited to the reindeer and other terrestrial mammals confined to cold climates.

Again; as its remains have never been found in high northern latitudes, it may more probably have been only a periodical visitor in England, France, and Germany, and not a dweller throughout the year, like other herbivores—as the elephant, rhinoceros, Irish elk, bison, reindeer, and its headquarters have been confined to the shores of the Mediterranean and the north of Africa, where its remains have occurred near Constantine, in Algeria. Again, the occurrence of the hippopotamus may be accounted for in a somewhat different manner; for instance, as it appears self-evident that the general climate of Britain, during the post-glacial epoch, has been more severe than at present, a period or periods of some length may have intervened, while England and Ireland formed a portion of the European continent, when the climate may have been less severe, and the rivers free from ice throughout the year. This inference is somewhat strengthened; but the fact that the remains of the hippopotamus are most frequently associated with those species of elephant and rhinoceros—*i.e.*, *Elephas antiquus* and *Rhinoceros leptorhinus*—which not only occur in this hemisphere, but have had a southern or tropical, rather than a northern range; and as certain plants belonging to the Lusitanian flora are found on the west coast of Ireland, it is only reasonable to suppose that their migration from a southern land has occurred along a coast line since the glacial epoch, which would have exterminated them by its severity. Is it not probable, therefore, that at the period which favoured the migration of the flora, certain southern forms of mammals have migrated also?

The evidence of a gradual increase of temperature in France and Germany during the Historical period appears perfectly certain. From Diodorus Siculus we learn that the Rhine and the Danube, during the first four centuries, were frequently frozen over in the winter; and Cæsar mentions



the reindeer as existing in the great Hercynian forest that overspread Northern Germany, along with the gigantic urus and the elk. This statement is singularly corroborated by the discovery in the peat bogs of Pomerania, according to Professor Nilsson, of the remains of these three animals; so that there can be no doubt of his accuracy in this particular instance. From some cause or other the temperature has increased on the banks of the Rhine; and from the fact that the reindeer cannot live, at the present day, south of the Baltic, we may recognize a proof of a diminution of cold in that region since it was inhabited by those of a severe climate. This change of temperature is very generally accounted for by the drainage of morasses and the cutting down of woods; but may it not, with more probability, be ascribed to a much deeper cause—to a secular change operating throughout Europe, which began in the Pleistocene, and was going on throughout the Prehistoric, and happened, incidentally, to be noticed, as we have seen, in Historical periods? The presence of the reindeer in the Prehistoric deposits of England, Ireland, and Scotland, affords precisely the same evidence as those mentioned by Cæsar, as at the time they lived in Britain and Ireland the climate must have been suited for them. There may have been oscillations of temperature, but the progress, on the whole, seems to have been gradual, from the intense cold of the glacial period to the temperate “insular climate” obtaining in Britain at the present day. In conclusion, I most earnestly recommend a careful and minute examination of the contents of the Prehistoric and Pleistocene caverns which occur in the mountain limestone districts of this county, as from such details much important information may, doubtless, be added to our knowledge of the former inhabitants of Pleistocene Yorkshire.