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The following communications were read:—

1. *On the FOSSIL BRITISH OXEN.* Part I. BOS URUS, *Cæsar.*
By W. BOYD DAWKINS, M.A., F.G.S.

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1. INTRODUCTION.

SINCE the publication of Professor Owen's great work on the British Fossil Mammalia in the year 1846, no addition has been made to our knowledge of the British Fossil Oxen, while on the continent Professor Nilsson, of Lund, has described with a master's hand those of Scandinavia, and Dr. Rüttimeyer, of Basle, those found in the Pile-works of Switzerland. In the meanwhile a large amount of information with reference to them has been obtained from the bone-caves and river-deposits of Britain, and from the peat-bogs and marls below of Britain and Ireland, for the most part unpublished or scattered about in disjointed fragments through the numerous scientific and archæological journals of the day.

The relics of the food of the Roman legions stationed in Britain, and of the Romano-British, and the contents of their tombs, and especially many incidental notices of wild oxen in the historians from the time of Charlemagne down to the end of the 12th century, afford remarkable evidence as to the date down to which the wild oxen lived in continental Europe and in Britain. To collect all these isolated facts together, and to give an outline of the characters of each species or variety, and to define their range, so far as may be,

in time, is the object of this essay. The three species which come under our notice are—1. The Great Urus, *Bos urus* of Julius Cæsar; 2. The Small Short-horn, *Bos longifrons* of Professor Owen; 3. The Bison, *Bos bison* of Pliny.

The problem as to the origin of our domestic races of cattle is only to be solved by a careful examination of each of these three European fossil animals. Of the three, we shall begin with the *Bos Urus* of Julius Cæsar.

2. CHARACTERS.

The *Bos urus*, or the *Bos primigenius* of Bojanus*, is characterized, according to the latter, by the concavity of the forehead, by the prominence of its orbits, which have not such a forward direction as in *Bos taurus*, and by the large size of the neural spines of the dorsal vertebræ. The large horns also have a double curvature, first outwards, and then forwards and upwards. Professor Nilsson †, describing the remains of this animal found in Scania, describes it as characterized by the flatness of forehead, the straightness of “the edge of the neck,” and by the horns being very large and long, near the roots directed outward and somewhat backward, in the middle bent forward, and towards the points turned a little upwards. Baron Cuvier, on the other hand, writes, with reference to the skulls of this animal that he had examined ‡, “The general contour of the frontal bone, its concavity, and the reentering curve which bounds it above, and which extends as a crest from one horn to the other, the acute angle that the surface of the frontal makes with that of the occipital, the circumference of the latter, the temporal fossa, are absolutely the same in these two skulls as in the common Ox (*Bos taurus*).” In the horn-core of the Urus he can detect no differences of specific value as compared with the former animal, in which almost every variation of curvature is to be found; while at the same time the fact that the horn-core of the Urus, after bending outwards, bends back upon itself a little downwards and forwards, instead of presenting the regular double curvature of that of the common Ox, outwards and more or less upwards or forwards, is well worthy of remark. The common Ox, however, presents every variation in the size of its horns, sometimes being entirely hornless, as in a Welsh, Scotch, and Islandic breed, at others having them most enormously developed, as in the Sanga or Galla Ox of Abyssinia, in which variety, according to Father Lobos (quoted by Zimmerman, Spec. Zool. Geograph. 4to, 1778, p. 110), the horn is sufficiently large to contain more than ten quarts. A walk into a cattle market will convince the most sceptical of observers that the common Ox presents also almost every variation possible in the shape and the direction of the horns. In fine, a very careful comparison of the skulls of *Bos urus* in Britain with those of the various varieties of *Bos taurus* or the common Ox, compels me to believe that there

* Nov. Act. Acad. Nat. Cur. xiii. 2. p. 424, l. 24.

† Ann. & Mag. Nat. Hist. 1849, vol. iv. ser. 2. p. 257-258.

‡ Oss. Foss. t. iv. p. 150, 3rd edit. 1825.

is no difference of specific value between them, those points of difference noticed by Professors Rüttimeyer and Nilsson proving to be peculiar to the individual and not to the species, and therefore useless for classificatory purposes. At the same time, its size, though inferior to that of the Italian or Abyssinian animal, was far greater than that of any variety of *Bos taurus*, which coexisted with it in the forests of France, Germany, or Britain, and affords a ready means of identification; while it is easily differentiated from the smaller contemporary Bison by the double curvature of the horns, their backward position close to the occipital crest, the concavity of the frontal bone, and the acute angle that the occiput makes with the frontal region. The quadrangular outline of the occipital region and the larger size of the bones, the anterior dorsal vertebræ being excepted, are also guides by which to recognize it.

3. SYNONYMS.

The synonymy of the *Bos urus* is in a state of very great confusion, arising from the fact that the two words denoting two distinct species, the Urox and the Aurochs, are derived from the same Sanscrit root, *ur*, *aur*, or *or*, that signifies a forest or stony waste. The root can be traced through many languages, and still survives in the Greek *ōpos* (a mountain), the Norwegian *ore*, the Islandic *urd* (the stony desert surrounding the base of the mountains), and is preserved without change in the old German *ur* (a forest) and in "Ur of the Chaldees." It appears also in the Ural Mountains, and also in the canton of *Uri*, the crest of which is an ox-head. At the annual election of magistrates in the latter place, my friend the historian of 'Federal Republics,' Mr. E. A. Freeman, tells me that two gigantic horns with double curvature are borne in solemn procession to this day. These probably are of considerable antiquity, and were obtained from a gigantic Urus-bull* that fell a victim to the chase, in which the German youth in Cæsar's time prepared themselves for the toils of war, obtaining almost as much honour from the possession of horns of Urus slain by their own hands as from that of trophies won in battle†. The root also occurs in the name applied to the gigantic ox of the tableland of Central India—the *Gaur* (*Bos gaurus*). With reference to this, Mr. W. A. Chatto observes, "The word *Gau* or *Ghoo*, as it is sometimes spelt by European writers, appears to be used both as a generic and specific term in Persia and Hindostan; and as it has the same meaning as the German word *Kuh*, and the English *Cow*, it is highly probable that its origin is the same. As the word *ur* in Hindostan appears to have the meaning of *wild* or *savage*, the name *Gaur* or *Gau-ur* literally signifies *wild cow* ‡.

* That the Urus's horns were used in the Bronze age, and possibly before, is proved by Professor Nilsson's discovery of a bronze trumpet made in the shape of a horn of Urus, dug from a depth of 6-8 feet out of a turf-bog in Southern Scania. "It is more than probable that the inhabitants of the south of Sweden first used the horns of the Urox for their *war*-horns, and at a later period made themselves horns of bronze in the same form as the former." *Op. cit.* p. 267.

† Cæs. Bell. Gall.

‡ Nat. Hist. of the Ox Tribe. By George Vasey. 8vo. London, 1857: p. 103.

The German Urox, Aurochs, and the Gaur of Hindoostan are therefore etymologically one and the same, and mean primarily *wild* or *forest ox*, but are used to denote three distinct species. To pass over the latter species of Hindostan, with which we have nothing to do in this place, the term *Aurochs* has been restricted to the European Bison by the authority of Buffon, Cuvier, and Professor Owen; the term *Urox*, or *Bos urus*, to the species under consideration by Julius Cæsar, Pliny, the chronicler of 'The Wars of Charlemagne'*, and other writers of the 6th to the 12th centuries; also by Cuvier, Nilsson, and our great naturalist Professor Owen. The Polish "Thur" is simply another form of the root *ur*, and signifies wild ox.

A reference to Dr. Fischer's great work (Synopsis Mammalium, 8vo, Stutgardtiæ, 1829, pp. 497-498) will show the confusion that exists between the *Urox* and *Aurochs* in the works of the older European naturalists, and will obviate the necessity of my giving details in this place.

The large fossil ox of the Pleistocene period, termed *Bos primigenius* by Bojanus and Professor Owen, differs in no respect from the *Bos urus* of the Prehistoric and Historical period.

4. MEASUREMENTS.

The following measurements show that there was a considerable difference in size between the individuals of the *Bos urus*. They are all reduced to inches and tenths, for the sake of ease of comparison. The first skull that Cuvier mentions (*op. cit.* pp. 150-151, pl. iii. figs. 3-8) presents a

Width between the horn-cores of	in. 12·8
" " orbits	12·9
Circumference of horn-core.....	12·9
Length of horn-cores following curvature.....	27·9
Distance between their tips	32·5

Cuvier observes of this skull that, according to the proportion of the *Bos taurus*, it would belong to an animal 12 feet long and 6·5 feet high at the withers.

The dimensions of a second and more perfect skull, dug from the peat-bog of Saint-Vrain in the canton of Arpajon (*op. cit.* pl. xi. figs. 1, 2, 3), indicate an animal of considerably smaller size than the preceding—

Extreme length from occipital crest to end of premaxillary.....	in. 25·75
Distance between orbits.....	11·3
Horn-core to horn-core	11·0
Diameter of horn-core at base	5·5
Distance between tips of horn-cores.....	24·8
Height of occipital crest from the bottom of the foramen magnum	8·8
Maximum width of occipital surface between the two mastoid processes	12·0
Antero-posterior extent of palate	12·08
Length of skull from the foramen magnum to anterior edge of premaxillaries.....	22·05

* Monachi Sangallensis Lib. ii. de Rebus Bellicis Caroli Magni, c. xi.

This skull is 4 inches longer than that of the largest *Bos taurus* in the Jardin des Plantes.

The most perfect remains, however, are those derived from the turbaries of Scania, described by Professor Nilsson, of Lund*. They afford the following measurements in inches and tenths:—

Occipital crest to premaxillary.....	28·33
Horn-cores to anterior edge of premaxillary	25·41
Lower edge of orbit	15·33
Outer curve of horn-core	26·0
Breadth of forehead between base of upper part of horn-cores	9·08
" " " lower part of "	12·01
" " between orbits, upper part	12·01
" " " lower part	11·33
Distance between tips of horn-cores.....	28·0
Circumference of base of horn-core.....	14·33
Distance between auditory foramina	12·33
First cervical to last dorsal vertebra	91·33
Cervical vertebræ	23·33
Length of shoulder-blade	20·0
Breadth of its distal end	12·0
Length of humerus between articulations	14·0
" of radius	14·33
" of ulna and olecranon	19·5
" of femur.....	19·0
" of tibia	17·5
" of metatarsal.....	11·0

Professor Nilsson estimates the length of the animal as being from 11·5 to 12 feet, and its height over the withers as about 6 to 6·5— an estimate that coincides remarkably with that given by Baron Cuvier from the examination of the head of a French specimen, which we have already noticed.

To pass, however, to the remains of the *Bos urus* found in our own country, the first and most noteworthy discovery in Britain was that of the frontal portion and horn-cores in the bed of the river Avon at Mellisham, near Bath. The span from tip to tip of the unbroken horn-cores was 39 inches†, their basal circumference 17·5, and their length, following their curvature, 36·5. This last measurement is one-fourth greater than that mentioned by Cuvier as indicating an animal 12 feet long and 6·5 feet high. Mr. Woods also cites an instance of the occurrence of a head of this species of a size little inferior to the head of the preceding, under a tumulus near Calne in Wilts, and associated with remains of the Deer, Boar, and British pottery ornamented with right lines. The measurement from tip to tip of horn-core of 33 inches, and their basal circumference of 15·5, prove that at the time the makers of the tumulus lived in Wiltshire a Urox inhabited the same area of larger size than any of those mentioned by Baron Cuvier in Germany, or by Professor Nilsson in Scania.

Professor Owen figures, in the 'British Fossil Mammals,' a skull from near Athol, in Perthshire, derived probably from a turbarly. It is

* *Op. cit.* p. 258 *et seq.*

† Descript. of Fossil Skull of Ox. By Henry Woods, A.L.S. 4to. London, 1839: p. 29.

36 inches long, the span of the horn-cores is 42 inches, and the breadth of the forehead between the horn-cores 10·5 inches*. Dr. Fleming notices the large size of the skulls of oxen from the marlpits underlying the peat of Scotland, and speaks of one in his possession as being 27·5 inches long, with a span of 9 inches between the bases of the horn-cores, and of 11·5 across the orbits. He considers them to have belonged to a species of *Bos taurus* †.

All the cases cited above, with the exception of that found on the banks of the Avon, near Bath, which may perhaps be of the same date as elephantine and leonine remains found in the neighbouring gravels, are of a date posterior to the extinction of the Mammoth, tichorhine Rhinoceros, Cave-bear, and other animals characteristic of the Pleistocene period in Central, Western, and Northern Europe, and are derived from deposits either of peat or of marl beneath it, or from tumuli. They are therefore of Prehistoric age. The few remaining measurements that I shall give are those of the skulls and horn-cores of the same species that boast of a vastly greater antiquity, and which were associated with the remains of the Pleistocene Mammals, both in the caverns and in river-deposits of that early period.

Mr. Brown, of Stanway, to whom we are indebted for the discovery and preservation of the remains of a large number of Pleistocene mammals, describes a skull of this species, along with the molar of a *Elephas primigenius*, in the drift of Clacton in Essex ‡. Each of its cores measures 36 inches in length following the outer curvature, and has a basal diameter of 6 × 5 inches. Professor Owen describes a second skull, obtained by Mr. J. Wickham Flower, F.G.S., from the drift of Herne Bay, as possessed of horn-cores measuring along the outer curve 39 inches, with a basal circumference of 18·85. A remarkably fine pair of horn-cores have also been obtained from the brick-earth at Crayford, in Kent, belonging to the low-level series of gravels and brick-earths of Mr. Prestwich. Their basal circumference is 16·6 inches, and their length, following the outer curvature, 35 inches. They are preserved in the collection of Mr. Grantham, to whom I am indebted for their examination. A large number of other cases of the remains of this species having been found in Britain may be cited, as in the river-deposits near Erith, Maidstone, Ilford, Wickham, Brentford, Bielbecks in Yorkshire, and Fisherton in Wilts, and in the caverns of Kent's Hole, Oreston, and many others. As sufficient evidence has been given for the variation in size of the head and of the horn-cores of the species, their measurements would serve no special purpose in this place. The measurements of the long bones and lower jaws will be given in a tabular form in the essay upon the Aurochs, or *Bison priscus* of Professor Owen.

One point is very remarkable with reference to the development of the horn-cores and the size of the animal—that just as the

* *Op. cit.* p. 512.

† *British Animals.* 8vo. Lond. & Edin. 1828: p. 24.

‡ *Mag. Nat. Hist.* n. s. 1838, p. 163.

Urus mentioned by Cæsar as “magnitudine paulo infra elephantos,” and that found in the peat and in the marl beneath in France, Northern Germany, and Scandinavia, surpassed the average *uncastated Bos taurus* of Western and Central Europe in size, so were they exceeded in size by those that inhabited the same area in the Pleistocene period. The more abundant food afforded by the vast prairie grounds of the Pleistocene continent would naturally cause the Pleistocene Urus to attain to a higher pitch of development than the more restricted range and food, after the submergence of the Pleistocene lowlands, of the species in Prehistoric and in Historic times, where, moreover, it would have a hard battle to fight for its very existence with the most formidable of the beasts of prey—with man. This is the only hypothesis that I can suggest to account for the larger size of nearly all the Pleistocene Mammalia as compared with those descendants of them now living in the same area.

5. RANGE IN SPACE AND TIME.

That the *Bos urus* or *Bos primigenius* was a contemporary of the Mammoth, leptorhine, megarhine, and tichorhine Rhinoceros is proved by its occurrence in the brick-fields of Crayford, in Kent, already mentioned. Besides the above, it was associated with

Felis spelæa.
Ursus spelæus.
Ursus arctos.
Bison prisæus.
Megaceros Hibernicus.

Cervus elaphus.
Elephas antiquus.
Equus fossilis.
Arvicola amphibia.

In the brick-earths on the opposite side of the Thames it is associated with the *Hippopotamus major* at Grays, in Essex. The associated remains, indeed, from many other localities such as that given above leave no room to doubt that it wandered through the Pleistocene woodlands in France, Germany, and Britain with the other mammalia of the period. A table of the distribution of Pleistocene Mammalia in my possession proves that it was far less numerous in Britain than its smaller contemporary the Bison, or *Bison prisæus* of Professor Owen. In Prehistoric times, after the Elephants and Rhinoceroses of the Pleistocene period had passed away, and the Cave-hyenas and Cave-lions had retreated from Western and Central Europe southwards, it still held its ground in France, Germany, and Scandinavia; and from the instances cited of the occurrence of its remains, it seems to have become relatively more numerous than the Bison, which also survived in Europe, but which, so far as I know, has not yet been detected in any Prehistoric deposit in Britain or Ireland. The case of the skull of this species being found under the tumulus at Calne, associated with the remains of the feasts and the fragments of pottery of some ancient British tribe, proves that the Urus was hunted in those early days in Wiltshire. The date of its extinction in Britain is, to say the least, a very vexed question. Professor Owen infers, from the condition of the remains from the Scotch peat-bogs, that it retained its ground longest in Scotland; Nilsson infers, from Cæsar’s silence, that it was

extinct in his time; but when we take into consideration the small area that he saw of the country, and its physical condition, covered with vast forests and pathless morasses, his silence does not seem to be of any weight either for or against the extinction of the animal at that time. The absence, however, of its remains from the very numerous accumulations of bones of *Bos longifrons*, Red Deer, Wild Boar, and the like animals, which were the food of the people after Britain was interpenetrated by Roman influence, makes it highly probable that it was, to say the least, very scarce. It may perhaps have still lingered on in the wilder parts of the country. To add to the perplexity as to the date of its extinction, William Fitz-Stephens, in his 'Life of Becket,' incidentally mentions the condition of the country immediately to the north of London*. After describing the pleasant gardens that the citizens had out of town, the pastures and hills, he says, "Close by there extends a great wilderness, woodland glades, the lurking-places of wild beasts, Red Deer, Fallow Deer, Wild Boars, and Wild Bulls" (*tauri sylvestres*). Whether or not "*taurus sylvestris*" be synonymous with *Bos urus* in this passage may be disputed, as it may be objected that perhaps it may mean only the domestic cattle that were sent out into the woods to get their own living. On the other hand, the fact of their being classed under the head of *feræ*, along with the Red Deer, Fallow Deer, and Wild Boar, read by the light of records of the existence of the *Urus* on the continent at that time, inclines me to the belief that they were as undoubtedly wild in Britain in the middle of the 12th century as the wild bull hunted by Charlemagne in the forest of Aix-la-Chapelle, to be mentioned subsequently. That the *Bison* is not meant is rendered almost certain by the absence of its remains from any British formation posterior to the Pleistocene period. The smaller *Bos longifrons* may perhaps be the animal meant in this passage. Probably, however, the *Urus* lived in Britain to Becket's time in a wild state, modified in size according to its food and the extent of its range, that of the Pleistocene being vastly larger than that of the Prehistoric times, and the latter than those few survivors in the struggle for life when the cultivated lands encroached more and more on their feeding-grounds and the dread of the hunter was upon them. The half-wild oxen of Chillingham Park in Northumberland, and other places in Northern and Central Britain, are probably the last surviving representatives of the gigantic *Urus* of the Pleistocene period, reduced in size and modified in every respect by their small range and their contact with man.

On the mainland of Europe *Bos urus* was very numerous and had a very extended range, both in Pleistocene and Prehistoric and Historic times; while in our own country, insulated from the con-

* *Undique extra domos suburbanorum horti civium arboribus consiti spatiosi et speciosi contigui habentur. Item a borea sunt agri pascuæ, et pratorum grata planities aquis fluvialibus interfluis; ad quas molinarum versatiles rotæ citantur cum murmure jocoso. Proxime patet ingens foresta (not forest, but uncultivated ground), saltus nemorosi, ferarum latebræ, cervorum, damarum, aprorum, et taurorum sylvestrium. (Vita sancti Thomæ, auctore Willelmo filio Stephani, vol. i. p. 173). 8vo. Edidit E. A. Giles, Oxoniæ.*

continent, at the close of the Pleistocene it was exposed to exterminating causes that did not obtain in the far larger and wilder area of the European mainland; it was rare in the two latter periods, and probably became extinct as a wild variety several centuries before the species (or variety) on the continent was driven away from the Hercynian Forest and the banks of the Danube. In Pleistocene times it wandered in vast herds over Northern, Central, and Western Europe, and, according to Bojanus, over Southern Russia, and, in company with the Woolly Rhinoceros (*R. tichorinus*) and the Mammoth, frequently fell a prey to the Cave-hyena and the Cave-lion. In the Prehistoric deposits of France, Germany, and Scandinavia its remains are very abundant, and in the latter district prove that it was far more numerous than the contemporary Bison.

That the animal was hunted at this early date in Scania is proved by the discovery by Professor Nilsson of a skeleton which had been pierced with a javelin. It was found at a depth of 10 feet, at the bottom of a peat-bog, and "lay with its head downwards; and one of its horns (horn-cores) had penetrated deep into the blue clay which formed the bottom under the peat"* . The evidence that the animal fell by the hand of man is indeed perfectly incontrovertible.

The dwellers on the Pile-works of the Swiss lakes have also left numerous remains of *Bos urus* among the bones that have been found surrounding the rotten piles, in association with other varieties of oxen, for the discussion of which I must refer to the works of Dr. Rüttimeyer, of Basle.

In Historic times the animal has been frequently mentioned, first by Cæsar, as a dweller in the Hercynian Forest along with the Elk and Bison. Its name occurs also in the writings of Pliny, Martial, and Seneca, in passages which must be familiar to those who have studied the works of Professors Nilsson and Owen, and of Mr. Henry Woods, who has described so ably the ox-head found at Melksham, near Bath †. There are, however, other and later notices of the animal scattered through the records of France and Germany from the 6th to the 12th centuries, that have not as yet attracted the attention they merit in this country. The chronicler of the life of St. Karilef, the founder of the Abbey of St. Calais, happens incidentally to mention an interview that the hermit saint had with Childebert, the son of Clovis ‡. It came to pass in this way: the king happened to be out hunting in the Province of Maine about the year A.D. 540, and having started a fine ox—rare game in that district—he chased it with his dogs right into the hermit's cell, where he found it standing behind his back. This passage proves two things—that the Bubalus or Wild Ox occurred sometimes in the Province of Maine, and

* *Op. cit.* p. 264.

† *Op. cit.*

‡ *Erat spectabile videre bubulum qui in eâ provinciâ difficile est inventu. . . . Invenimus in quodam tugurio hominem nobis cognitum post tergum illius adstantem bubulum. Unde vobis, O incognitæ personæ! tanta presumptionis audacia, ut ausi sitis nostræ venationis dignitatem mutilare?* (Vit. S. Karilefi, c. 4, 14, 20.) This quotation is taken from 'Les Moines d'occident,' par le Comte de Montalembert: Paris, 8vo (1860): vol. ii. p. 362. I have had no opportunity of verifying it.

that this one happened to be *tamed* by the hermit. There may indeed be a doubt as to whether the Bubalus mentioned here be actually the *Bos urus*; but interpreted by the light of what we know in other districts respecting the hunting of *Bos urus*, I think that probably it was the animal mentioned in this passage: at all events, the passage is worthy of note.

In the 'Wars of Charlemagne,' written by a monk of St. Gall, a remarkable anecdote is told of a hunt in the forest near Aix-la-Chapelle, in which the king was attacked by a *Bos urus*, and in which, for the first time in history, "hose" are mentioned*. "On the next day Charles, very tired of the quiet and leisure, prepares to go into the forest to hunt (Bisontium vel Urorum) Bisons or Uri, and to take the Persian ambassadors along with him, who, when they saw these gigantic animals, struck with very great terror, took to their heels; but the hero Charles, unmoved, mounted on a very swift horse, coming up close, drew his sword and attempted to cut off the head of one of them. But when he missed his stroke, the most fierce beast, rending his sandals and gaiters, and grazing his thigh with just the tip of its horn, made him a little more cautious, and then, enraged by the slight wound, took refuge in a most safe retreat, bristling with thickets and stones; and when all his suite, to curry favour with the king, wished to take off their hose (hossas suas vellent extrahere), he forbade them, saying, 'In this plight I must go to Hildegarda (one of his wives).' And Isambardus, the son of Warinus, the persecutor of your patron Otmarus, having followed up the beast when he dared not approach nearer, thrust his lance between its shoulder and throat, pierced its heart, and presented it, still quivering, to the king. This deed he pretended not to notice; and leaving the dead animal to his companions, he returned home, and called the queen (Hildegarda), and showed her his torn hose, and said to her, 'What reward is he worthy of who has delivered me from an enemy inflicting these things upon me?' And when she answered, 'Of every good,' the king told her every particular; and having had the vast (immanissimis cornibus) horns brought forward as a proof that he was telling the truth, moved the queen to tears and groans and beating of her breasts." . . .

It is clear, then, that at this time (the beginning of the 9th century) Bisons and Uri were still to be found in the forests near Aix-la-Chapelle. The description of the horns proves that the animal was one of the latter species, as the size of the horns of the former is not such as to warrant the use of the term "immanissima." In the remarkable collection of MSS. preserved in the Abbey of St. Gall is one by Ekkehard the younger, who lived from A.D. 980 to 1036, and composed a set of graces for the use of the monks, in which we are indebted to the custom of returning thanks after every dish for the preservation of the names of the animals they ate†. Among

* Monachi Sangallensis Lib. ii. de Rebus Bellicis Caroli Magni. Folio. (Du Chesne.) Chap. xi.

† "Benedictiones ad mensas Ekkehardi Monachi Sangallensis," Archæol. Journ. vol. xxi. pp. 117-136. "Dextra Dei veri comes assit carnibus uri" (p. 125).

the wild animals, the list comprises Bear, Wild Boar, Red Deer, Roe Deer, Fallow Deer, Chamois, Wild Horse (*Equus feralis*), the Beaver (which is termed *a fish*, and therefore eatable on fast-days), the Bison, and the Urus. The Bison and the Urus, then, were sufficiently abundant in the wilds of Southern Germany and Switzerland at the close of the 10th century to be used as an article of food, and to be deemed worthy of a special grace by the monks of that day. At the close of the next century (the eleventh) the Urus is mentioned along with the Elk as being met with on the route through Germany taken by the First Crusade, and the large size of their horns is noted*. Posterior to this, in the 12th century, in the "Niebelungen-Lied," Tregfried is said to have killed one Bison and four Uri in the neighbourhood of Worms (p. 3775-6). For four centuries after this no mention is made of the animal; and if not extinct in Germany, it must have become very rare. Gesner, in his 'History of Animals,' published at Frankfort in the year 1622, gives a figure of the Polish "Thur," which corresponds exactly in the curvature of its horns with the wild Urus of Germany, though it is very much inferior to the latter in point of size. The wild Urus, therefore, probably lingered in the wilder parts of continental Europe till at least the 16th century; and having first of all sprung into being in Pleistocene times, survived the larger of its contemporaries, and is indeed superior in point of bulk to any of the Pleistocene mammalia that have come down to the times of history. In Pleistocene, as I have mentioned, it was larger than in Prehistoric times, and in the latter than when it was last met with in Poland. The diminution in size is probably to be accounted for by the gradually diminishing area over which it ranged. The area in Prehistoric and Historic days was gradually lessened by the hand of man and the encroachment of cultivation on its old haunts.

6. RELATION TO DOMESTIC RACES.

The question that still remains to be discussed is, whether or not it still lives in any of the domestic races. Professor Nilsson thinks that the larger cattle of the Netherlands and Holstein have sprung from this animal. Baron Cuvier and Professor Bell believe that the Urus was, in part at least, the ancestor of our domestic breeds; while Professor Owen† thinks that the tame ox of Western Europe was probably derived from the already domesticated cattle of the Roman colonists. The evidence, on the whole, inclines me to the belief, as there is no osteological or other difference saving that of size between the Urus and the domestic race of cattle, (to pass over the notice already quoted of the tame "bubalus" being hunted into the hermit's cell in Maine) that the larger cattle of Western Europe at least are the descendants of the former animal, modified in many respects by restricted range, but still more by the domination of man.

* "Uris cornua sunt immensæ concavitatis, ex quibus ampla satis et levia pocula fiunt." (Hist. Gest. Viæ Hierosolymitanæ a Fulcone quodam, Lib. i. [Du Chesne, Hist. Franc.])

† *Op. cit.* p. 500.