or Council, that "the measure of Winchester should be placed in the custody of the Clerk of the House of Commons, and were destroyed by the burning of the Houses of Parliament on October 11, 1834. The members of this Standards Commission had previously given their services as a preliminary committee, having been appointed in 1838 to consider the steps to be taken for restoring the standards, the Act of 1824 (5 Geo. IV. c. 74), under the authority of which the lost standards had been legalised, having directed that, in the event of their loss or destruction, new standards should be constructed in accordance with provisions contained in the Act, by reference to an invariable natural standard.

These provisions were as follows:—In regard to the Standard of Weight, it was recited in § 5 of the Act, that a cubic inch of distilled water, weighed in air against brass weights, at the temperature of 62° Fahr. the barometer being at 30 inches, had been determined by scientific men to be equal to 252·458 grains, of which the Standard Troy pound contained 5,760; and if this Standard were lost or destroyed, a new Standard Troy pound was to be constructed, bearing the same proportion to the weight of a cubic inch of water, as the Standard pound bore to such cubic inch of water.

It will thus be seen that the new unit of weight was declared to be dependent upon the new unit of length, it being based upon the capacity of the cubic inch, or the cube of the thirty-sixth part of the Standard yard.

With respect to the Standard unit of length, § 3 of the Act recited that the Imperial Standard yard, when compared with a pendulum vibrating seconds of mean time in the latitude of London, in a vacuum at the level of the sea, had also been determined to be in the proportion of 36 inches to 39·1393 inches, and it was provided that if lost or destroyed, a new Standard yard should be constructed bearing the same proportion to such pendulum, as the Imperial Standard yard then bore to it.

After long deliberation, the Committee made a very full Report, dated December 21, 1841, and declared their opinion that the several elements of reduction of the pendulum experiments referred to in the Act of 1824, were doubtful or erroneous. It was evident, therefore, that the course prescribed by the Act would not necessarily reproduce the Standard yard. It appeared also that the determination of the weight of a cubic inch of water was still doubtful, differences being found between the best English, French, Austrian, Swedish and Russian determinations amounting to about $\frac{1}{1200}$ of the whole weight, whereas the results of the mere operation of weighing might be determined within $\frac{1}{10000}$ of the whole weight. The Committee were fully persuaded that with reasonable precautions, it would always be possible to provide for the accurate restoration of Standards by means of material copies which had been compared with them. And they had ascertained that several measures existed which had been most carefully compared with the former Standard yard; and several weights, which had been most accurately compared with the lost Standard pound; and by the use of these, the values of the original standards could be restored without sensible error.

They recommended that no change should be made in the values of the primary units of the weights and measures of the kingdom, or in the meaning of the names by which they were commonly denoted; that the construction of the Standards be entrusted to a Committee of scientific men, under certain instructions contained in the Report, and by comparison with the most carefully selected specimens; that the Parliamentary standard of length be one yard, there appearing no sufficient reason for departing from the length hitherto adopted for the standard; and that the Avoirdupois pound be adopted instead of the Troy pound as the Parliamentary standard of weight, the avoirdupois pound being invariably known and generally used, and the Troy pound being wholly unknown to the great mass of the British population, and comparatively useless. They also recommended that no new specific standard of capacity be established, the unit of capacity, the gallon, being continued to be defined by its containing 10 lbs. weight of distilled water, as specified in the Act of 1824.

Many other important recommendations were also made by the Committee in relation to the official Secondary Standards, and the verification and legalising of local Standards for the use of Inspectors of Weights and Measures throughout the country, and for the Colonies, in order to secure the requisite uniformity in commercial weights and measures, and their accordance with the scientifically constructed primary standards.

For more effectually carrying out these recommendations for the construction of the new Standards, the Standards Commission was appointed on June 20, 1843, and continued their labours until 1854, their definitive Report being dated on March 28 in that year.

The preliminary Committee was composed of the following scientific men:—G. B. Airy, Astronomer Royal, Chairman (now Sir G. B. Airy, K.C.B., and President of the Royal Society); F. Baily, V.P.R.S.; J. E. D. Bethune; Davies Gilbert, V.P.R.S.; J. G. S. Lefevre (now Sir J. G. S. Lefevre, K.C.B.); J. W. Lubbock (afterwards Sir J. W. Lubbock, Bart.); Rev. G. Peacock, F.R.S. Dean of Ely and Lowdian Professor of Astronomy; Rev. R. Sheepshanks, F.R.S.; Sir J. F. H. Herschel, Bart. With the exception of Mr. Davies Gilbert, who died in the meantime, all these scientific men continued their services as members of the Commission for constructing the new Standards. The Marquis of Northampton, P.R.S., Lord Wrottesley, F.R.S., and Prof. W. H. Miller were also appointed members of the Commission. On the death of the Marquis of Northampton, the name of the Earl of Rosse, his successor as President of the Royal Society, was added. H. W. CHISHOLM

OREODON REMAINS IN THE WOODWARDIAN MUSEUM, CAMBRIDGE

IN addition to the valuable collection of recent skeletons lately given by Lord Walsingham to the University of Cambridge, he also presented a series of mammalian remains from the Miocene deposits of the Mauvaises Terres in Nebraska. These were, fortunately, for the most part brought to England in masses of the original rock, and have therefore had the great advantage of Mr. H. Keeping's care and skill in developing them from the matrix. His long-continued labour has resulted in the most interesting collection of fossils referred to in this notice, and now deposited in the Woodwardian Museum. Professor Hughes has entrusted me with the examination and determination of the remains, and has afforded me every possible assistance. The species revealed, some of which may possibly require the establishment of a new genus, at any rate appear to be new to science, and much larger than any hitherto described in America. We have thought that, pending the preparation of a complete description, your readers would be interested in a general account of the fossils; and especially it has been thought desirable that an account of the skull and dentition should be given in as simple a form as possible; for I have not yet seen any description of the skull other than the complete one of Prof. Leidy. At any rate, fresh interest will be excited in the Oreodontidæ now that so splendid a series of remains can be seen in an English Museum.

A summary of our fossils may be thus given:—

1. A large nearly complete skull, with lower jaw attached; the zygomatic arches being, however, almost destroyed.

2. The greater portion of a large skull preserving very completely one zygomatic arch with posterior crest.

3. Another skull of the same species showing the part anterior to the bifurcation of the sagittal crest.

4. Another large skull of the same species, wanting the greater part of the face.

5. A nearly complete skull of another species.

6. The greater part of two skulls of *Oreodon Culbertsoni* (the original and typical species), smaller than any of the above.

7. Half of the frontal region of an individual larger than any of the others.

8. Casts of the brain of a large and of a small species, with determinable parts of bones attached.

9. Many pieces, more or less complete, chiefly parts of upper and lower jaws with teeth, including a number which show the canine and incisor teeth.

10. Portions of limb bones, and a number of vertebræ.

Besides these, the collection includes Carnivorous, Rodent, and other very interesting remains.

"The deposits of the Mauvaises Terres," says Prof. Leidy, "are remarkable for the great quantity of fossil remains of mammals and turtles they have yielded without further exploration than picking them up from the surface of the country. Detached from the neighbouring soft and readily disintegrating rocks, the fossils lie strewn about, and have often attracted the attention of the least curious of those who have traversed the district. Many of the loose fossils have gradually been collected by travellers and others, so that few of a conspicuous character, I am told, now remain. Of those collected, by far the greater part have been submitted to my investigation, and these have amounted to the enormous quantity of between three and four tons in weight." The first description of fossils from the Mauvaises Terres, was by Dr. Prout, who, in 1846 and 1847, described a jaw of a large animal supposed to be a Palæotherium, in the *American Journal of Science and Art*. Gradually specimens came to light, many of which were described by Prof. Leidy, who collected and completed his descriptions in 1852, when he published, in the Smithsonian Contributions, "The Ancient Fauna of Nebraska," of 126 pages, and 24 splendid plates. In succeeding years the Mauvaises Terres were further explored by Dr. David Dale Owen, Dr. John Evans, and Dr. F. V. Hayden, who brought to Philadelphia large collections of fossils. Altogether Prof. Leidy supposes that he has seen entire skulls or portions of skulls of about 500 individual Oreodonts, a very large proportion of which belong to one species, *Oreodon Culbertsoni*. In 1869 the results of his twenty years' labour were published as the seventh volume of the second series of the "Journal of the Academy of Natural Sciences of Philadelphia," under the title of the "Extinct Mammalian Fauna of Dakotah and Nebraska," 472 pages, and 29 plates, large quarto. This great work includes also a synopsis of the entire mammalian remains of North America, with the most complete references and the author's valuable critical opinions. The interest is not merely in the artiodactyle ungulates, but also in the perissodactyles, including the famous Hipparion and Anchitherium, as well as the Rhinoceros, Machairodus, Mastodon, and Edentate remains. Quite recently Prof. Marsh has described a new medium-sized species of Oreodon in the current number of the *American Journal of Science and Art*.

The family Oreodontidæ is characterised by the possession of an elongated massive skull, of which the portion in front of the articulation of the lower jaw constitutes more than three-fourths. The upper surface slopes gradually from behind forwards. Posteriorly is a high sagittal crest (1½ in. at the greatest height in large species), reaching far back, so as to project on a level considerably behind that of the occipital condyles. The crest is flanked by large and wide temporal fossæ, their floor being chiefly formed by the squamous bone, which is internally strongly convex, and bears a blunt ridge proceeding from behind forwards, downwards, and outwards. The sagittal crest bifurcates anteriorly to form the postero-lateral sides of a nearly flat lozenge-shaped frontal region, whose lateral angles overarch the completed bony orbits. The upper surface of the face is terminated by elongated convex nasals, which extend, I think, quite to the level of the front of the premaxilla, and project further in the middle line than at the sides. The nasal cavities are very large, high at the anterior opening, and do not open laterally on the face near the orbit. They have complicated turbinals. The frontal region is alternately gently convex and concave, being more convex near the lateral angles. The frontals have, near the middle line on each side, a considerable supra-orbital foramen, appearing at about the level of the posterior boundary of the orbit.

On the lateral aspect of the skull there is first to be noticed the lateral occipital crest which extends outwards and backwards, as the outer margin of the post-occipital fossa, which varies in size. It then bifurcates, giving an inferior branch continuing the margin of this fossa, and a lateral branch which passes far outwards, bounding the great temporal fossa. This ridge rises higher as it recedes from the occipital region, and external to the articulation of the lower jaw developes into a curved crest, which is remarkably large and thick in one specimen. Further forward this crest does not exist. The widest part of the skull is just in front of this; in one of our species the width at this point is twice as great as the distance from the occipital to the orbit. The zygomatic process of the squamosal comes forward to the under part of the orbit, and is received into a long concavity of the malar. The latter passes above this process, to join the post-orbital process of the frontal, and bound the large oval or circular orbit. The malar is often of great vertical depth, and joins a prominence of the maxillæ above the alveoli of the posterior molars. Inside and above this elevation, the lachrymal occupies a considerable space on the face, and has an antorbital fossa of varying size. Anteriorly the face continues comparatively high, generally convex, and nearly vertical.

The base of the skull presents the occipital condyles, which have their anterior and posterior portions obliquely bent upon each other at an acute angle; they approach very close to one another in the median line below. The basi-occipital has a strong raised median ridge, which gradually dies away on the basi-sphenoid. The basi-cranial axis is set at an angle of about 40° to the palatine axis. Externally there is a large nipple-shaped post-glenoid process of the squamosal (the transverse diameter being the greater). Immediately on its inner side is a large auditory bulla, somewhat compressed; and applied to its external surface, and at the same time nearly touching the post-glenoid process is a long and strong paroccipital. The external meatus opens obliquely upward in front of the paroccipital.

Between the teeth, the palate is of almost uniform width, is regularly concave, and smooth. It extends for some distance behind the molar teeth, being narrowed; and has a concave posterior margin of different form in the various species. The pterygoid continues the lateral part of the concavity to the alisphenoid region.

The horizontal ramus of the mandible is of moderate height, each half being separated slightly from the other in the specimens. The symphysis is considerable, and shows serrated sutures. The anterior end of the mandible is very little diminished in height, has less of the spatulate form than ordinary ruminants, and is somewhat expanded in consequence of the size of the canines. The rami are very nearly parallel throughout their whole extent. The ascending ramus is high, with a small coronoid process, and a transversely elongated condyle.

The dental formula is—

$$i.\frac{3-3}{3-3}\ c.\frac{1-1}{1-1}\ p.m.\frac{4-4}{4-4}\ m.\frac{3-3}{3-3}=44.$$

In the middle line above there are six small somewhat chisel-shaped incisors, increasing in size from within outwards. Next succeeds a large curved conical canine, flattened on its external aspect, and bearing a slight median longitudinal groove. There are seven teeth in the molar series, of which the first four appear to be premolars. These teeth present characters common to most ruminant genera, the premolars showing one double crescent, and the true molars two double crescents; the convexity of the crescents being turned inwards as in the upper jaw of all ruminants. They are very square in general shape, and the crescents are very convex. The junction of the anterior and posterior crescents externally is raised into a strong column, and a similar column projects as a third lobe on the posterior molar.

In the lower jaw eight teeth appear in front; the six middle ones of about the same size as the incisors of the upper jaw, but more cylindrical. The extreme tooth on each side, homologically a canine, is considerably larger and more chisel-shaped. The upper canine bites immediately behind this tooth; and behind this again is a long curved caniniform tooth similar to the canine of the upper jaw. Three premolars and three true molars succeed. They are generally similar to those of the upper jaw, but have the convexities of the crescents turned outwards. Throughout the series of teeth there is no diastema, except just as much as will allow the canine teeth to fit compactly above and below.

The following are, roughly, the dimensions of the large skull No. 1:—Length on upper surface, 13½ or 14 inches; height posteriorly 8½ inches; anteriorly, nearly 6 inches; length of lower jaw, 10½ inches; length of molar series of upper jaw, 6 inches.

A brief comparison with some other skulls will assist in giving an idea of the affinities of the Oreodonts. The Peccary presents perhaps the greatest number of resemblances. The sagittal ridge and frontal surface are somewhat alike, but the sagittal ridge is much longer and higher in Oreodon. The part of the squamosal (with the high crest) posterior to the glenoid cavity is similar, but not nearly so elevated or so widely diverging from the middle line. The supra-orbital foramen is on the level of the anterior, and not the posterior of the orbit. The post-occipital fossa and the condyles are very much alike; so is the narrowing of the palate behind the molars; but the palate is wider and not so long proportionally in Oreodon. The posterior edge of the mandible is similar.

But the differences between Oreodon and the Peccary are many and important; the characters of the teeth are very different: the Peccary has a large diastema; the mandibular rami are not parallel, the nasal cavities are smaller in proportion; there is no lachrymal fossa; the orbit is incomplete; there is scarcely any post-glenoid process of the squamosal.

The pig exhibits somewhat more likeness to Oreodon in the relations and size of the par-occipital and the auditory bullæ; but differs still more importantly in the wide separation of the two temporal fossæ by the intervening flat parietals.

The Camel agrees with Oreodon in the large size and close proximity of its temporal fossæ, which are separated by a sagittal crest, but the latter is low, and the floor of the temporal fossa is exceedingly convex. There are vast differences in the face, teeth, mandible, and auditory bullæ.

In the ordinary Ruminant, as the sheep, it is the face which presents most resemblances to our specimens. These consist in the shape of the nasals, the nearly vertical maxillæ, the complete orbits, the antorbital fossa of the lachrymal, the Ruminant molars, and the form of the palate between the molars. But the posterior part of the skull is very unlike. Even in the molar teeth, while the type is the same there are considerable differences which will be hereafter fully described.

The Llama is much less like Oreodon than the camel is.

The casts of brains and the limb and trunk-bones and vertebræ promise to afford very interesting matter, but I have not yet made a careful examination of them.

G. T. Bettany

ASTRONOMICAL ALMANACS,

A Comparative History of the "Connaissance des Temps," the "Nautical Almanac," and the "Jahrbuch" of Berlin.*

I.—*The "Connaissance des Temps" of Picard and Lefebvre.*

In 1666 a celebrated bookseller of Paris, Jean de la Caille, at the sign of the "Fontaine d'or," in the Rue Jacob, published, at his own expense, the "Astronomical Ephemerides" of Hecker, the Astronomer of Dantzig. These Ephemerides were calculated on the observations of Tycho Brahe and Kepler, according to the rules given in the Rudolphine tables—tables constructed at the expense of Rudolph II., Emperor of Germany, by Tycho Brahe, Kepler and himself. Their title was, "Johannis Heckeri Motuum Cælestium Ephemerides, ad anno 1676, ad annum 1680, ex observationibus correctis nobilissimorum Tychonis Brahei et Johannis Kepleri. Hypothesibus Physicis, tabulisque Rudolphinis ad meridianum Uraniburgicum in freto Cymbrico."

These tables gave for the meridian of Uranibourg (island of Heven, between Copenhagen and Elsinore)—which derived considerable importance from the immortal observations of Tycho Brahe—and for each day the longitudes and latitudes of the sun, of the moon, of Mercury, Venus, Mars, Jupiter, and Saturn; the longitudes in degrees and minutes for the planets and the sun, in degrees, minutes, and seconds for the moon; the latitudes in degrees. They contained, moreover, an announcement of the eclipses of the sun and of the moon for the whole period indicated, and a table of geographical co-ordinates (latitude and longitude reckoned from Uranibourg) of the principal towns.

These Ephemerides, the best that then existed, stopping at the year 1860, Picard, the creator of exact astronomy, resolved to continue them. But on account of a voyage which King Louis XIV. was about to undertake, and during which the work which Picard proposed might be useful, the French astronomer decided to advance by a year the date of his publication, and to commence with the year 1679.

The Ephemerides of Picard are thus titled:—"La Connaissance des Temps ou Calendrier et Ephémérides de lever et coucher du soleil, de la lune et des autres planètes, avec les éclipses, pour l'année 1679, calculées sur Paris, et la manère de s'en servir pour les autres élévations†; avec plusieurs autres tables et traités d'astronomie et de physique, et des Ephémérides de toutes les planétes en figures."

This work contains the following information:—1. The time, almost to the minute, of the rising and setting of the sun and moon at Paris, for every day of the year. 2. The time of the rising and setting of the sun (every fortnight) and of the moon (every ten days) for Calais, Paris, Lyon, and Marseille. From these tables the preceding time could be calculated for every point of France. 3. Announcement of eclipses of the sun and moon. 4. The time of the passage of the moon across the meridian and the right ascension of the sun for every day of the year. We have thus the time of the tide. Be-

* Translated from *La Revue Scientifique*, July 19.
† The word *élévation* is synonymous with *latitude*.