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DESCRIPTIVE CATALOGUE

OF

THE OSTEOLOGICAL SERIES

CONTAINED IN

THE MUSEUM

OF

THE ROYAL COLLEGE OF SURGEONS OF ENGLAND.

VOLUME I.

PISCES, REPTILIA, AVES, MARSUPIALIA.

LONDON:
PRINTED BY TAYLOR AND FRANCIS, RED LION COURT, FLEET STREET.
1853.

PREFACE.

THE Catalogue of the Osteological Series published in the year 1831 contained descriptions of 1936 specimens; of these 963 formed part of the Hunterian Collection, and 973 were added by the College. In the present Catalogue are descriptions of 5906 specimens; of which 1431 were collected by Hunter, and 4475 by the College. The additional Hunterian specimens have been derived from the stores of the original collection, which contained skeletons, more or less complete, of animals dissected by Hunter and preserved in an unarticulated state. These have been carefully examined and compared; and every specimen in a condition to illustrate the Series, for the completion of which it had been preserved, has been articulated or otherwise made suitable for display in the Museum. These specimens are marked "*Hunterian.*"

The remaining 4475 specimens added by the College have been acquired, with few exceptions, either by donation or purchase, and the liberality of donors is acknowledged in each instance by the affix of the donor's name to the description of the specimen presented. A list of Donors is placed at the end of this Catalogue, amongst whom the following should be specially mentioned. Henry Cline, Esq., a Member of the Council of the College, early contributed a choice series of the skeletons and skulls of many of our native Mammals. The numerous and valuable donations by Sir T. Stamford Raffles, P.Z.S., include skeletons and parts of skeletons of rare Mammals and Birds from the islands of the Indian Archipelago. The liberal contributions by the Admiralty of specimens collected by the Officers of the Northern Expeditions, especially by Captains Sir Edward Parry, C.B., Sir John Franklin, C.B., Sir James Clarke Ross, C.B., and Sir John Richardson, M.D., have furnished many rare and instructive additions of the osteology of Arctic Mammals. To Robert McCormick, Esq., F.R.C.S., Surgeon to the Antarctic Expedition, the Museum is indebted for skeletons of some rare Antarctic animals. Messrs. George and Frederic D. Bennett, Members of the College, have increased the Mammalian, and more especially the Ornithological series by their liberal donations of skeletons of Tropical, Australian, and Marine species, collected during voyages in the years 1834, 1835, and 1836. The Zoological Society of London have liberally added to the Osteological as well as to the other departments of Comparative Anatomy in the Museum. Sir Joseph Banks, Bart., P.R.S., the late Sir Everard Home, Bart., V.P.R.S., Governor Sir George Grey, C.B., Dr. N. Wallich, F.R.S., Dr. Henderson, Dr. Leach, F.L.S., Capt. Harris, Ronald Gunn, Esq., and William Bullock, Esq., have also contributed, by donation, valuable additions to the Osteological collection.

Purchases have been effected whenever suitable opportunities presented themselves; and have principally accrued from the Museums of Messrs. Brookes, Heaviside, Langstaff, De la Fons, South, and

Gould; such purchases are indicated in the Catalogue by the words "*Museum Brookes,*" "*Mus. Heaviside,*" &c., respectively. Some specimens have been obtained from the British Museum by exchange, and are marked "*Mus. Brit.*"

The skeletons of several rare African animals have been procured by purchase; and other remarkable specimens, as the skeletons of the adult Chimpanzee, of the Giraffe, of the Hippopotamus, and of the largest Elephant exhibited alive in this country, have been secured at a cost commensurate with their rarity. All such specimens are marked "*Purchased.*"

When an instructive and well-defined series of preparations had been left incomplete by Hunter, it has been completed so far as the duplicate materials at command would allow, and the date of the preparation added to its description.

In the Catalogue of 1831, the specimens of Human Osteology were first described, and those of the lower animals followed in the descending order. The ascending order having been followed in the original arrangement of the Hunterian Physiological specimens, and adhered to in the Catalogues of that and the Zoological departments of the Collection, has been adopted in the arrangement of the Osteological specimens described in the present Catalogue.

In the description of each specimen, the species from which it was derived and the name of the part or bone are mentioned. When the specimen consists of a skeleton, a skull, or other part including several bones, the names thereof are indicated by numerals attached to them, answering to the numerals in the first column of the appended TABLE OF SYNONYMS. By reference to that Table will be found not only the name of the bone, but the views of its homology as indicated by the names or phrases designating it in some of the most esteemed Works on Osteology. Names of bones and parts, applicable to the *Vertebrata* generally, are, in this Catalogue, applied to the same bones or parts in the Human Skeleton. The 'os innominatum' is a single bone in adult Man; but special names are given, in Human Anatomy, to the three distinct bones of which it originally consisted: these remain distinct in many of the lower animals. As the constituents or 'elements' of other Human compound bones, such as the 'occipital,' 'temporal,' 'sphenoid,' remain ununited in many lower *Vertebrata*, and have received distinct names, these names are also applied to the corresponding bones which, when united, form those compound bones in Man.

The power of identifying any bone, under the variations of configuration which it presents in the different classes of Vertebrate animals, depends upon the principle that the skeletons of the *Vertebrata* consist of segments, each of which is constructed according to the pattern of a vertebra. And in order to facilitate the recognition of these divisions in the different classes of *Vertebrata*, the labels on the component portions of the same segment are of the same colour. Thus, in the skull, the labels on the hindmost or occipital segment are 'yellow,' on the next or parietal segment 'green,' on the frontal segment 'blue,' on the nasal segment 'red.' The component portions or 'elements' of each segment or 'vertebra' are distinguished by numerals, or, in some instances, indicated by the initial letters of their names. For example, *c* is the centrum; *n*, the neurapophysis; *pl*, the pleurapophysis; *h*, the hæmapophysis: and besides such proper elements which are developed from distinct centres of ossification, the more constant processes which grow out from them are indicated in some instances by the initials of their names; such, as *p*, the parapophysis; *d*, the diapophysis; *z*, the zygapophysis; *m*, the metapophysis; *a*, the anapophysis; *hy*, the hypapophysis: the synonyms of these processes, whether single- or many-worded, by which they have been indicated in Human and Comparative Anatomy, being also given in the TABLE OF SYNONYMS, and in the subjoined note *.

The sole responsibility for the contents of the present Catalogue belongs to Professor Owen, to whom the formation of it was entrusted by the Council with entire confidence in his eminent qualifications for the important duty.

* Centrum (κέντρον, centre)	Body of the vertebra.
Neurapophysis (νεῦρον, nerve, and ἀπόφυσις, a process of bone).	Superior or posterior laminæ of the vertebra.
Pleurapophysis (πλευρὰ, a rib, and ἀπόφυσις)	Transverse process of the vertebra (in the neck and sacrum); osseous or vertebral part of the rib (in the thorax).
Hæmapophysis; by syncope for hæmato-apophysis (αἷμα, blood, and ἀπόφυσις).	Sternal or cartilaginous part of the rib (in the thorax); inferior or anterior laminæ of the vertebra, and chevron-bones, in the tail.
Parapophysis (παρὰ, across, and ἀπόφυσις)	Anterior root of transverse process (in the neck); transverse process in the thorax and loins. Lower transverse process in reptiles and fishes.
Diapophysis (διὰ, across, and ἀπόφυσις)	Posterior root of transverse process (in the neck); transverse process in the thorax and loins. Upper transverse process in reptiles and fishes.
Zygapophysis (ζυγὸς, junction, and ἀπόφυσις)	Oblique or articular process.
Anapophysis (ἀνὰ, backwards, and ἀπόφυσις)	Accessory tubercle or process.
Metapophysis (μετὰ, between, and ἀπόφυσις)	Accessory tubercle or process.
Hypapophysis (ὑπὸ, beneath, and ἀπόφυσις)	Inferior spine or process.

ROYAL COLLEGE OF SURGEONS,
February 14, 1853.

CONTENTS.

Class MAMMALIA.

Subclass *IMPLACENTALIA*.

Subclass *PLACENTALIA*.

Division LEIENCEPHALA.

No. of Preparations.

Division MUTICA.

Order CETACEA.

Order SIRENIA.

Division UNGULATA.

Order PROBOSCIDIA.

Order PERISSODACTYLA.

	No. of Preparations.
Section *PLATYRHINA.*	
Genus *Hapale*	4663—4665
Callithrix	4666—4669
Cebus	4670—4686
Ateles	4687—4717
Mycetes	4718
Section *CATARHINA.*	
Genus *Papio*	4719—4746
Cynocephalus	4747—4825
Macacus	4826—5003
Semnopithecus	5004—5008
Cercopithecus	5009—5025
Hylobates	5026—5049
Pithecus	5050—5081
Troglodytes	5082—5183

Order BIMANA.

Genus *Homo.*

MELANIAN (dark-brown or black) VARIETIES.	
Australian race	5184—5345
Papuan race	5346—5356
African Negro races	5357—5385
XANTHIAN (yellow, olive and red) VARIETIES.	
Polynesian race	5386—5402
American races	5403—5441
Esquimaux and Greenlanders	5442—5483
Asiatic races	5484—5563
Egyptian race	5564—5567
Guanche race	5568
LEUCANIAN (white and light olive) VARIETIES.	
European races	5569—5754

ALPHABETICAL INDEX OF DONORS*.

* The numbers of the specimens follow the names of the Donors by whom they were presented.

416, 422, 423, 428, 429, 447, 508, 511, 512, 561, 580, 581, 582, 586, 610, 611, 612, 616, 617, 626, 627, 637, 641, 645, 647, 648, 662, 663, 668, 669, 674, 675, 683 to 701 inclusive, 712, 727 to 730 inclusive, 746 to 749 inclusive, 774 to 777 inclusive, 1012 to 1017 inclusive, 1101, 1102, 1104, 1109, 1192, 1363, 1385, 1386, 1387, 1475, 1706, 1727, 1735, 1779, 1791, 1796, 1797, 1900, 1946, 1947, 1948, 1976, 2040, 2051, 2074, 2162, 2166, 2200, 2201, 2230, 2231, 2292, 2293, 2294, 2295, 2391, 2421, 2441, 2488, 2510, 2548, 2626, 2627, 2628, 2758, 2771, 2772, 2773, 2775, 2974, 3358, 3413, 3501, 3542, 3940, 3941, 4068, 4080 to 4084 inclusive, 4200, 4217, 4237, 4439, 4474, 4539, 4568, 4569, 4676, 4717, 5056, 5080, 5316, 5877, 5878, 5879, 5882, 5884.

Parry, Captain Sir Edward, C.B., R.N. Nos. 464 to 472 inclusive, 3816, 3817, 4367, 4370, 5474, 5475, 5476.

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White, Anthony, Esq. Nos. 5488, 5489.
Wilbraham, Roger, Esq. No. 1967.
Williams, The Very Reverend Archdeacon. Nos. 1388, 3922.
Willis, Dr., F.R.S. Nos. 1577, 2225.
Wilson, Sir Thomas Marion, Bart. Nos. 3512, 3513.

YARRELL, William, Esq., F.L.S. No. 4233.

ZOOLOGICAL SOCIETY OF LONDON. Nos. 762, 1881, 1977 to 2000 inclusive, 2291, 2387, 2549, 3114, 3115, 3483 to 3487 inclusive, 3587, 3640 to 3647 inclusive, 3819, 4016 to 4036 inclusive, 4286 to 4303 inclusive, 4358, 4581 to 4584 inclusive, 4855 to 4917 inclusive, 5148.

TABLE OF SYNONYMS.

BONES OF THE VERTEBRATA, ACCORDING

Nos.	CATALOGUE. Names.	Nos.	CUVIER. Names.	GEOFFROY. Names.
1.	Basioccipital ...	5.	Basilaire (in perch[3] and crocodile[8]); occipital inférieur (in cod and python[4]).	Basisphénal and otosphénal (in fishes)[18]; sous-occipital[19] and basisphénal[20] (in crocodile); occipital inférieur (in birds)[21].
2.	Exoccipital	10.	Occipital latéral	Ex-occipital[18] (in fishes); plur-occipital[19] and ex-occipital[20] (in crocodile); occipital latéral (in birds)[21].
3.	Superoccipital...	8.	Interpariétal, ou occipital supérieur (in perch[3]); interpariétal unique (in cod[4]); occipital supérieur (in reptiles[5] and birds); partie grande et mince de l'occipital (in mammals).	Interpariétal (in fishes); rupéal unique[19] and interpariétal[20] (in crocodile); occipital supérieur (in birds)[21].
4.	Paroccipital......	9.	Occipital externe (in perch[3] and reptiles); occipital supérieur (in cod[4]); apophyse mastoid (in many mammals[5]).	Sur-occipital (in fishes)[18]; plur-occipital[19] and ex-occipital[20] (in crocodile); occipital latéral (in birds)[21].
5.	Basisphenoid ...	6.	Sphénoïde principal (in fishes); sphénoïde unique (in reptiles and birds); sphénoïde postérieur (in mammals).	Hyposphénal (in fishes and crocodile); basilaire (in birds)[21].
6.	Alisphenoid......	11.	Grande aile ou aile temporale du sphénoïde (in fishes, birds and mammals); rocher (in reptiles).	Ptéreal (in fishes)[18]; prérupéal[20] (in crocodile) ...
6′.	Columella	y.	Columelle (in lacertians[8])	....
7.	Parietal	7.	Pariétal	Pariétal (in fishes and crocodile); interpariétal (in birds)[21].
8.	Mastoid	12.	Mastoïdien (in fishes and reptiles); temporal (in birds and monotremes[6]).	Ex-rupéal (in fishes); temporal[19 & 20] (in crocodile); pariétal (in birds)[21].
9.	Presphenoid ...	6.	Sphénoïde principal (in fishes); sphénoïde unique (in reptiles and birds[6]); sphénoïde antérieur (in mammals).	Hyposphénal (in fishes)[18]; entosphénal[19] (in crocodile); os basilaire antérieur (in birds)[21].
9′.	Entosphenoid ...	...	Sphénoïde antérieur (in fishes)	Entosphénal (in fishes)[18] ....
10.	Orbitosphenoid..	14.	Aile orbitaire (in fishes, birds and mammals); aile temporale et une grande partie de l'aile orbitaire (in crocodile[7]).	Ingrassial (in fishes); ptéreal[20] (in crocodile); rocher (in birds)[21]; pl. 27. fig. 2. P.
11.	Frontal	1.	Frontal principal (in fishes and reptiles); frontal ou frontal unique (in birds and mammals).	Frontal (in fishes and birds); frontal unique (in crocodile).
12.	Postfrontal	4.	Frontal postérieur (in fishes and reptiles); borde externe ou postérieur de l'arcade sourcilière du frontal (in mammals).	Temporal (in fishes)[18]; jugal[19 & 20] (in crocodile)...
13.	Vomer	16.	Vomer	Rhinosphénal (in fishes)[18]; hérisséal (partly, in crocodile); vomer (in birds)[21].
14.	Prefrontal	2.	Frontal antérieur (in fishes, tailed batrachians and crocodiles); os en ceinture (in tail-less batrachians[8]); cornets inférieurs (in ophidians); ethmoïde (in birds and mammals).	Lacrymal (in fishes)[18]; ethmophysal (in crocodile); nasal ethmoidal (in birds)[21].
15.	Nasal	3.	Ethmoïde (in fishes); frontal antérieur (in tail-less batrachians); nasal (in ophidians, saurians, birds and mammals).	Nasal (in fishes[18] and crocodile); nasal maxillaire (in birds).
16.	Petrosal	13.	Rocher (in fishes, birds and mammals)	In-rupéal (in fishes)[18]; post-rupéal (in part, in crocodile)[20].
16′.	Otosteal	......	Osselets de l'oreille	....
17.	Sclerotal	......	Pièces cartilagineuses ou osseuses de la sclérotique	....
18.	Ethmoturbinal ..	15.	Partie cranienne de l'éthmoïde (in birds); cornets supérieures et cellules ethmoïdales (in mammals).	Ethmosphénal (in crocodile)[20]; rhinosphénal[19] ...
19.	Turbinal	20.	Nasal (in fishes); cornet inférieur (in mammals)........	Ethmophysal (in fishes)[18]; rhinosphénal (in crocodile)[20].
20.	Palatine	22.	Palatin........................	Palatal (in fishes and crocodile); palatin antérieur (in birds)[21].
21.	Maxillary.........	18.	Maxillaire supérieur	Addental (in fishes[18] and crocodile)[20]; maxillaire supérieur (in birds)[21].
22.	Premaxillary ...	17.	Intermaxillaire[10]	Adnasal (in fishes and crocodile)[20]; inter-maxillaire (in birds)[21 & 22].
23.	Entopterygoid...	25.	Ptérygoïdien interne (in fishes[3])	Hérisséal (in fishes)[18]........................
24.	Pterygoid	24.	Transverse (in fishes[3]); ptérygoïdien (in batrachians and saurians[8]); ptérygoïdien interne (in ophidians[4]).	Adgustal (in fishes)[18]; hérisséal (in crocodile); palatin postérieur (in birds)[21].
25.	Ectopterygoid...	*l.*	Transverse (in ophidians[4], *x* in lizards[8], *d* in crocodiles[8])	Adgustal (in crocodile)[20] ....
26.	Malar	*g.*	Jugal (in lizards[8], *c* in crocodiles[8], *f.* &c. in mammals[5]). Cuvier includes the squamosal with the jugal in birds[6].	Adorbital (in crocodile)[20]; pièce antérieure de l'os jugal (in birds)[21].
27.	Squamosal	*l.*	Temporal, ou partie écailleuse (in lizards[8], *p* in crocodiles, *e*, &c. in mammals); jugal (in birds and monotremes[6]).	Cotyléal (in crocodile)[20]; pièce postérieure de l'os jugal (in birds)[21].

[3], [8], These and following small numerals refer to the notes at pp. xlii. and xliii.

TO THEIR SPECIAL HOMOLOGIES.

HALLMANN [16].	MECKEL [26].—WAGNER [27].	AGASSIZ [38].	SOEMMERRING [39].	
Names.	*Names.*	*Names.*	*Names.*	*Nos.*
Corpus ossis occipitis	Hinterhauptbeinkörper	Basilaire	Pars prior sive basilaris partis occipitalis ossis spheno-occipitalis.	1.
Occipitale laterale	Gelenktheil, oder Seitlichen untern Hinterhauptbein.	Occipital latéral	Pars lateralis sive condyloidea, &c.	2.
Squama occipitalis	Hinterhauptschuppe	Interpariétal	Pars occipitalis stricte sic dicta, &c.	3.
Os mastoideum(*e*), processus mastoideus (*e'*).	Seitlichen obern Hinterhauptbein	Occipital externe	Eminentia aspera musculum rectum lateralem excipiens, &c.	4.
Sphenoideum basilare and processus ascendens piscium.	Keilbeinkörper	Sphénoïde principal	Basis sive corpus partis sphenoidalis ossis spheno-occipitalis.	5.
Petrosum (in fishes and reptiles); ala magna sphenoidei (in birds and mammals).	Felsenbein[28] (in fishes and reptiles); grosse Keilbeinflügel (in birds and mammals)[29].	Grande aile du sphénoïde	Ala media sive major partis sphenoidalis, &c.	6.
Columella	Grosser Keilbeinflügel (in lizards).	....	....	6'.
Parietale	Scheitelbein	Pariétal	Os bregmatis sive parietale	7.
Squama temporis	Zitsenbein[30]	Ecaille du temporal	Processus mastoideus ossis temporis	8.
Sphenoideum basilare	Keilbeinkörper	Sphénoïde principal	Pars prior sive rostrum basis partis sphenoidalis ossis spheno-occipitalis	9.
Os innominatum (in perch); ala parva sphenoidei (in carp).	Vordere oder kleiner Keilbeinflügel (in fishes).	Ethmoïde crânien	....	9'.
Ala magna sphenoidei (in fishes and reptiles); ala parva (in birds and mammals).	Grosse Keilbeinflügel[31]	Aile orbitaire	Ala superior sive minor partis sphenoidalis, &c.	10.
Frontale	Stirnbein	Frontal principal	Os frontis	11.
Frontale posterius	Schläfbeinschuppe, oder vordere do.	Frontal postérieur	Apophysis orbitaria externa	12.
Vomer	Pflugschar	Vomer	Vomer	13.
Frontale anterius[17] (in fishes and saurians); æthmoideum (in batrachians and birds).	Seitlichen Riechbeine	Frontal antérieur	Pars media ossis ethmoidei	14.
Æthmoideum[25] (in fishes); frontale anterius (in batrachians); nasale (in saurians, birds and mammals).	Riechbeinkörper[32]	Nasal	Os nasi	15.
Os innominatum (in fishes); petrosum (in birds and mammals).	Felsenbein (in fishes, Oken; not Wagner[33]).	Rocher rudimentaire	Pars petrosa partis pyramidalis ossis temporis.	16.
Ossicula auditûs	Paukenknochen	....	Ossicula auditûs	16'.
....	Knochenschuppen der Sclerotica	[37]	Tunica sclerotica opaca oculi	17.
Ossa turbinata superiora	Obere Muscheln und Labyrinth des Siebbeins.	....	Partes laterales, seu cellulæ et conchæ ethmoidei.	18.
Nasale (in fishes)	Nasenbein (in fishes); untere Muscheln (in mammals).	Cartilage mobile du nez	Os spongiosum sive turbinatum inferius.	19.
Palatinum	Gaumenbein	Palatin	Os palati	20.
Maxilla superior	Oberkieferbein	Maxillaire supérieur	Maxilla superior	21.
Intermaxillare	Zwischenkieferbein	Intermaxillaire[10]	Pars incisiva maxillæ superioris	22.
Pterygoideum internum	Ausserer Flügelfortsatz, W. (in fishes)	Pterygoïdien interne	....	23.
Pterygoideum externum (in fishes); pterygoideum (in other vertebrates).	Innerer Flügelfortsatz, W. (in fishes); Untere Keilbeinflügel[34] (in other vertebrates).	Transverse	Lamina externa alæ inferioris sive processûs pterygoïdei partis sphenoïdalis ossis spheno-occipitalis.	24.
Transversum	Ausserer Flügelfortsatz (in reptiles).	....	....	25.
Zygomaticum	Jochbein (in reptiles, birds and mammals).	....	Os jugale seu malæ	26.
Quadrato-jugale and quadrato-maxillare (in reptiles and birds); squama temporalis (in mammals[25']).	Hintere Schläfbeinschuppe (in reptiles); Scheibenförmigestück des Schläfbeins (in mammals).	....	Pars squamosa ossis temporis	27.

	CATALOGUE.		CUVIER.	GEOFFROY.
Nos.	*Names.*	*Nos.*	*Names.*	*Names.*
28.	Tympanic	*k.*	Le caisse (in ophidians and *o* in crocodiles); *r* os tympanique (in lizards); os carré (in birds[11]); caisse, ou partie tympanique du temporal (in mammals).	Enostéal (in crocodile)[20]; tympano-styloïde (in birds).
28*a*.	Epitympanic	23.	Temporal (in fishes[3]); tympanique (in batrachians)	Serrial (in fishes)
28*b*.	Mesotympanic	31.	Symplectique (in fishes[3])	Uro-serrial (in fishes)
28*c*.	Pretympanic	27.	Tympanal (in fishes[3])	Epicotyléal (in fishes)
28*d*.	Hypotympanic	26.	Jugal (in fishes[3] and batrachians)	Hypocotyléal (in fishes)
29.	Mandible	...	Mâchoire inférieure (in birds and mammals)	
29′.	Articular	35.	Articulaire	Submalléal (in fishes); subrupéal (in crocodile)[20]
30.	Surangular	*f.*	Surangulaire (in lizards, *x* in crocodiles[8])	Subjugal (in crocodile)[19]
31.	Angular	36.	Angulaire	Subcotyléal (in fishes); subtemporal (in crocodile)[19]
31′.	Splenial	37.	Operculaire (in reptiles)	Subvoméral (in fishes); sublacrymal (in crocodile)[19]
32.	Coronoid	*c.*	Complémentaire (in lizards, *z* in crocodiles[8])	Subpalpébral (in crocodile)[19]
33.	Dentary	34.	Dentaire	Subdental (in fishes and crocodile)[18 & 19]
34.	Preopercular	30.	Pré-opercule	Tympanal[18]
35.	Opercular	28.	Operculaire	Stapéal[18]
36.	Subopercular	32.	Sous-opercule	Incéal[18]
37.	Interopercular	33.	Inter-opercule	Malléal[18]
38.	Stylohyal	29.	Osselet styloïde (in fishes[3]); — Os styloïdien (in lizards[8] and mammals).	Styl-hyal (in fishes and mammals)[22]
39.	Epihyal	37.	Grande pièce latérale (in fishes); } branche suspensoire, ou corne antérieure de l'os hyoïde (in batrachians); grande corne and corne moyenne (in some chelonians[12]); { Seconde pièce de la corne antérieure (in lizards[8] and mammals); petit appendice cartilagineux (in crocodiles[8]).	Hyposternal (in fishes); cerato-hyal (in mammals)[22]
40.	Ceratohyal	38.	Grande pièce latérale (in fishes); — Première pièce de la corne antérieure (in lizards[8] and mammals); corne antérieure (in crocodiles).	Hyo-sternal (in fishes); glosso-hyal (in birds); apo-hyal (in mammals)[22].
41.	Basihyal	39, 40.	Petites pièces latérales (in fishes[3]); première pièce impaire de l'os hyoïde (in siren[8]); pièce impaire de l'os hyoïde (in other batrachians[8]); corps de l'os hyoïde (in saurians and some chelonians[13], in birds and mammals).	Apo-hyal and cerato-hyal (in fishes); basi-hyal (in birds and mammals)[22].
42.	Glossohyal	41.	Os lingual (in fishes and birds[3]); cartilage qui soutient la langue (in batrachians[8]); os particulier de la langue (in chelonians[8]).	Glosso-hyal (in fishes and some birds); ento-hyal and uro-hyal (in mammals)[22].
43.	Urohyal	42.	Queue de l'os hyoïde (in fishes[3] and birds); seconde pièce impaire de l'os hyoïde (in siren[8]).	Episternal (in fishes); uro-hyal (in birds)[22]
44.	Branchiostegal	43.	Rayon branchiostégal	Côtes sternales (in fishes)[22]
45.	Basibranchial	53, 54, 55.	Chaîne intermédiaire d'osselets	Basi-hyal and uro-hyal (in fishes)[22]
46.	Hypobranchial (in fishes); Thyrohyal (in other vertebrates[7]).	57.	Pièce interne de partie inférieure de l'arceau branchiale (in fishes); branche latérale and corne postérieure[14] de l'os hyoïde (in batrachians); la deuxième paire de cornes (in lizards); grande corne and corne moyenne (in some chelonians); corne antérieure (in birds[6]); corne postérieure (in mammals).	Thyréal and arytheneal (in fishes)[23]; apo-hyal and cerato-hyal (in birds)[23]; glosso-hyal (in mammals)[23].
47.	Ceratobranchial	58.	Pièce externe de la partie inférieure de l'arceau branchiale, and os pharyngien inférieur (in fishes).	Pluréal inférieure and cricéal (in fishes)[23]
48.	Epibranchial	61.	Partie supérieure de l'arceau branchiale	Pluréal supérieure[23]
49.	Pharyngo-branchial.	62.	Os pharyngien supérieur	Pharyngéal[23]
50.	Suprascapula	46.	Surscapulaire (in fishes[3]); lame cartilagineuse du bord spinal de l'omoplate (in urodeles and saurians); partie spinale de l'omoplate (in anourans); un et même deux petits os particuliers dans le ligament de l'omoplate (in chelonians[8]).	Omolite[24]
51.	Scapula	47.	Scapulaire (in fishes); col de l'omoplate (in proteus); l'autre partie, *b*, de l'omoplate (in anourans).	Omoplate[24]
52.	Coracoid	48.	Huméral (in fishes); os coracoïdien (in reptiles and birds); apophyse ou tubercule coracoïde (in mammals).	Furculaire (in fishes); coracoïde (in reptiles, birds and mammals)[24].

THEIR SPECIAL HOMOLOGIES. (*Continued.*)

HALLMANN[16].	MECKEL[26].—WAGNER[27].	AGASSIZ[38].	SOEMMERRING[39].	
Names.	*Names.*	*Names.*	*Names.*	*Nos.*
Os quadratum seu tympanicum	Gelkentheil des Schläfbeins oder Pauke.		Lamina ossea ossis temporis e quâ meatus auditorius externus oritur.	28.
Os quadratum seu tympanicum (in fishes).	Obere Gelenkbein[35]	Mastoïdien		28*a*.
Os symplecticum (in fishes)	Griffelförmiges Stück des Schläfbeins	Tympano-malléal		28*b*.
Pterygoideum posterius (in fishes)	Scheibenförmiges Stück des do.[36]	Caisse, or os tympani		28*c*.
Os quadrato-jugale (in fishes)	Unteres Gelenkbein[37]	Os carré, or os quadratum		28*d*.
Maxilla inferior	Unterkiefer		Mandibula, sive maxilla inferior	29.
Os articulare	Gelenkstück des Unterkiefers	Articulaire		29′.
	Aeusseres Ausfüllungstück des do.	Surangulaire		30.
	Hinteres do. do.	Angulaire		31.
	Inneres do. do.	Operculaire		31′.
	Kronenstück des do.			32.
Os dentale	Zahnstück des Unterkiefers	Dentaire		33.
Præoperculum	Vorkiemendeckelstück	Apophyse styloïde du temporal.		34.
Operculum	Eigentlich Kiemendeckelstück	Operculaire		35.
Suboperculum	Unterkiemendeckelstück	Sous-opercule		36.
Interoperculum	Zwischenkiemendeckelstück	Inter-opercule		37.
Processus styloideus	Kleine stiletförmige Knochen des Zungenbein (in fishes); Griffelfortsätz des Schläfenbeins (in mammals).	Styloïde de l'os hyoïde	Stilus sive processus stiliformis partis pyramidalis ossis temporis.	38.
	Zungen-horn, oder		Ligamentum os linguale superius inter et processum stiliformem.	39.
	Zungen-bogen. Drittes, vorderstes weit kleiner Hörnerpaar (in chelonians).	Branche latérale	Os linguale superius vel pisiforme	40.
Das vierte doppelte Seitenstück des Zungen-beinbogens (in fishes).	Mittlere Stück der Zungenbein	Tête glénoidale	Os linguale medium	41.
	Zungenkerne (W.)	Os lingual		42.
	Hintere mittlere Stück der Zungenbein.	Corps de l'hyoïde		43.
	Kiemenhautstrahlen	Rayon branchiostège		44.
	{ Unpaare Knochen in der Mitelline, &c. }	Queue de l'os hyoïde		45.
	Hinteres Hörnerpaar (in batrachians); hintern aüsseren Zungenbeinhörner (in lizards); vorderes Hörnerpaar (in chelonians); Seitenhörner (in birds); hintern Hörner (in mammals).	Pièce articulaire	Ossa lateralia lingualia	46.
	Stück der Kiemenbogen	Pièce branchiale, et Pharyngien inférieur.		47.
		Pièce branchiale		48.
	Obere Schlundknochen	Pharyngien supérieur		49.
	Oberste Knochen der Schultertheil (in fishes).	Surscapulaire		50.
	Obere Knochen desselb. oder Schulterblatt (in fishes); Schulterblatt (in other vertebrates).	Scapulaire	Scapula	51.
	Unterste Knochen der Schultertheil. Vordere Schlüsselbein (in fishes); Hintere Schlüsselbein (in other vertebrates).	Clavicule	Processus coracoïdeus	52.

BONES OF THE VERTEBRATA, ACCORDING TO

	CATALOGUE.		CUVIER.	GEOFFROY.
Nos.	*Names.*	*Nos.*	*Names.*	*Names.*
52′.	Episternum	......	Pièce antérieure du sternum (in batrachians[40]); os allongé et os en flèche du sternum (in lizards[41]); os impaire du plastron (in chelonians[42]); pièce osseux du sternum plate, allongée, &c. (in crocodiles[43]); os impaire auquel appartient la crête (in birds[44]); os à la forme d'un T (in monotremes[45]).	Furculaire (in reptiles and monotremes); entosternal (in chelonians and birds)[24].
53.	Humerus	......	Troisième os de l'avant bras qui porte la nageoire pectorale[9] (in fishes); humérus (in reptiles, birds and mammals).	Humérus (in reptiles, birds and mammals)[24] ......
54.	Ulna...............	52.	Radial (in fishes); cubitus (in reptiles, birds and mammals)...	Radial?[24] (in fishes); cubitus (in reptiles, birds and mammals).
55.	Radius	51.	Cubital (in fishes); radius (in reptiles, birds and mammals) ...	Humérus[24] (in fishes); radius (in reptiles, birds and mammals).
56.	Carpal	64.	Os du carpe	Radius and cubitus[24] (in some fishes); os du carpe (in reptiles, birds and mammals).
57.	Metacarpal[1], phalanx[2].	65.	Rayons de la pectorale (in fishes); métacarpiens and phalanges (in other vertebrates).	Carpe and phalanges[24] (in some fishes); os du métacarpe and phalanges (in reptiles, birds and mammals).
58.	Clavicle	49, 50.	Os coracoïdien[3] (in fishes); acromion de l'omoplate (in chelonians[8]); clavicule (in other reptiles, birds and mammals).	Coracoïde[24] (in fishes); furculaire (in batrachians and birds); acromion (in lizards and monotremes)[24].
59.	Manubrium	*b.*	Cartilage rhomboïdal (in saurians[46]); deuxième os du sternum (in monotremes[47]); premier os du sternum (in other mammals[48]).	Entosternal (in lizards and monotremes); sternal claviculaire (in mammals)[24].
60.	Sternum	......	Cartilage en languette (in crocodiles[49]); pièces impairs du sternum (in monotremes[50]); pièces intermédiaires du sternum (in other mammals[51]).	......
61.	Xiphoid	......	Cartilage xyphoïde (in batrachians[52]); os xyphoïde (in most mammals[53]).	......
62.	Ilium	......	Os des îles (in reptiles[54]); l'os iléon (in birds and mammals[55]).	......
63.	Ischium	......	Ischion	......
64.	Pubis	......	Pubis	......
65.	Femur	......	Fémur, os de la cuisse	......
66.	Tibia	......	Tibia	......
66′.	Patella............	......	Rotule	......
67.	Fibula	......	Péroné; l'os malléolien (in ruminants)[56]......	......
67′.	Fabella............	......	......	......
68.	Tarsal	......	Os du tarse	......
69.	Metatarsal, phalanx.	......	Rayons de la ventrale (in fishes); metatarsiens and phalanges (in other vertebrates).	......
71.	Superorbital ...	......	Sur-orbitaire	......
72.	Supratemporal...	21.	Sur-temporal[3] (in fishes)	......
73′.	Suborbitals	19.	Sous-orbitaire[3] (in fishes)	Jugal (in fishes)......
73.	Lacrymal.........	19.	Lacrymal; frontal antérieur (in ophidians)	Adorbital......
74.	Labial	......	Labial[3] (in fishes)	......

[1] These bones are indicated by Roman numerals, counting from the one on the radial side, or innermost, and by the usual names, *e. g.* i *pollex*, ii *index*, iii *medius*, iv *annularis*, v *minimus*.

[2] These bones are specified by Arabic numerals, as, 1 the proximal, 2 the middle, 3 the distal or ungual phalanx, added to the symbol of the digit they belong to.

[3] Histoire Naturelle des Poissons, t. i. (1828).

[4] Règne Animal, t. iii. (1830) pp. 431, 432. In this work the bones are indicated by letters: the numbers cited are those used in the 'Histoire des Poissons.'

[5] Ossemens Fossiles, 4to, t. i. p. 287, "l'apophyse mastoïde et pointue et courte, et appartient à l'occipital." The same confusion of the paroccipital with the true mastoid process pervades the work.

[6] Leçons d'Anatomie Comparée, t. ii. (1837).

[7] Ossemens Fossiles, v. part ii. p. 76. Aile temporale et l'aile orbitaire (in lizards). *Ibid.* p. 252.

[8] Ossemens Fossiles, 4to, t. v. part ii. (1824).

[9] Hist. Nat. des Poissons, t. i. p. 151.

[10] The term "intermaxillare" had previously been applied by Schneider to the so-called "os quadratum" in birds, or "os tympanicum."

[11] Cuvier, in his description of the "interpariétal" of the horse, alludes to it as a bone "que certains hippotomistes ont appelé 'os carré'."—Oss. Foss. 4to, ii. p. 101. Cuvier gives distinct names to the subdivisions of the tympanic bone in fishes and batrachians, which, with those applied to them by Geoffroy and Agassiz, will be found after Nos. 28 *a.* to 28 *d.*

[12] Cuvier adds, that this pair of horns is "celle qui représente les os styloïdiens."—Oss. Foss. v. part ii. p. 193. But they answer to the epi- and cerato-hyals. The epi-hyal of the *Chelys* he describes as "une pièce osseuse et pointue de la corne moyenne."—*Ibid.* p. 194. The totality of Nos. 38, 39 and 40 is sometimes called "corne styloïde" in mammals by Cuvier.

[13] Cuvier specifies the Chelonian genera in which the "corps de l'os hyoïde" is "subdivisé en plusieurs pièces."—Oss. Foss. v. part ii. p. 192. This modification repeats that in many fishes; but in *Trionyx* and *Chelys* Cuvier calls the anterior of these subdivisions "les petites cornes antérieures."—*l. c.* p. 194.

[14] Meckel recognised the homology of the posterior bony appendages of the hyoid of the adult frog with a part of the branchial apparatus of fishes, and thought them the probable "analoga" of the pharyngeal bones (schlundkopfknochen).—Archiv fur Physiologie, iv. (1818) p. 240. Cuvier described these parts of the hyoid as "cornes osseuses postérieures," in the 'Leçons d'Anatomie Comparée,' iii. (1805) p. 252, but afterwards adopted Meckel's view of their homology, and observes that "ils pourroient bien correspondre aux pharyngiens inférieures."—Oss. Foss. v. part ii. p. 397. In fact, the thyrohyals of higher reptiles and birds do frequently include the homologous elements of that modified branchial arch, viz. the cerato-branchials with the hypo-branchials.

[16] Die Vergleichende Osteologie des Schläfenbeins, 4to, 1837.

THEIR SPECIAL HOMOLOGIES. (*Continued.*)

HALLMANN[16].	MECKEL[26].—WAGNER[27].	AGASSIZ[38].	SOEMMERRING[39].	
Names.	*Names.*	*Names.*	*Names.*	*Nos.*
	Vordere Stück des Brustbeins (in batrachians and saurians); Unpaare Stück (in chelonians and birds).			52′.
	Oberarmknochen	Humérus	Os humeri	53.
	Vorderarmknochen (in fishes); ...... Ellenbogen	Radial	Ulna	54.
	Vorderarmknochen (in fishes); ...... Speiche	Cubital	Radius	55.
	Handwurzelknochen	Carpe and métacarpe	Ossa carpi	56.
	Brustflossenstrahle (in fishes); Mittelhandknochen und Phalangen (in other vertebrates).	Rayons de la pectorale	Ossa metacarpi et phalanges digitorum.	57.
	Vordere Schlüsselbein (in reptiles, birds and mammals).	Coracoïde	Clavicula	58.
	Schlüsselbeine aufnehmenden theile (in saurians); handhabe (in mammals).		Superius os sterni	59.
	Körper des Brustbeins		Medium sterni os	60.
	Schwertfortsatz		Processus ensiformis	61.
	Hüftbein		Os ilium	62.
	Sitzbein		Os ischii	63.
	Schambein		Os pubis	64.
	Oberschenkelbein		Os femoris	65.
	Schienbein		Tibia	66.
	Kniescheibe		Patella	66′.
	Wadenbein		Fibula	67.
				67′.
	Fusswurzelknochen		Ossa tarsi	68.
	Mittelfussknochen und Phalangen		Ossa metatarsi et phalanges digitorum pedis.	69.
	Oberaugenhöhlenbein	Sur-orbitaire		71.
	Augenbogenschuppe (Boj.)	Sur-temporal		72.
	Jochbein (in fishes); Unteraugenhöhlenbein (Boj.).	Jugal et apophyse zygomatique.		73′.
	Thränenbein	Jugal	Os lacrimale	73.
	Lippenbein	Labial		74.

17 "Æthmoideum cribrosum," Bojanus, Isis, 1818.

18 Annales des Sciences Naturelles, vi. (1825) p. 353.

19 *Ibid.* iii. (1824) p. 298.

20 Mémoires de l'Acad. Royale des Sciences, t. xii. (1833) pp. 1–138.

21 Annales du Muséum, t. x. (1807) pp. 342–360.

22 Philosophie Anatomique, 1818, p. 158. pl. 3 & 4.

23 *Ibid.* p. 205. pl. 8.

24 *Ibid.* p. 408. pl. 9.

25 "Crista æthmoidei," Bojanus, Isis, 1818.

25′ "Jugale posterius," Boj. *Ib.*

26 System der Vergleichenden Anatomie, 8vo, Th. i. & ii. 1821.

27 Lehrbuch der Zootomie, 8vo, 1843, 1844.

28 "Hinterer Schläfenflügel," Köstlin: Der Bau des Knochernen Kopfes, 8vo, 1844.

29 This is from Wagner. Meckel more truly, yet vaguely, describes the alisphenoid as "das Seitenstück des Keilbeins" (in batrachia; Vergl. Anat. Th. ii. p. 496), and hintere Flügelstück (in ophidia; *Ibid.* p. 516): but he also ascribes a distinct petrosal (Felsentheil der Schläfbein) to chelonians, ophidians and saurians (*Ibid.* p. 507), which must be either part of the exoccipital or alisphenoid.

30 "Schuppentheil des Schläfenbeins" (in fishes, reptiles and birds); hintere Abtheilung des Schläfenflügels (in monotremes), Köstlin; "Felsentheil desselben (os petrosum)," Bojanus.

31 "Kleine Flügel des Keilbeins," Bojanus; "Vordere Schlafenflügel," Köstlin.

32 Siebbein, Köstlin.

33 Mastoideum, Bojanus and Köstlin.

34 "Os transversum," Köstlin.

35 "Gelenktheil des Schläfensbein," Köstlin; "Paukenringknochen," Bojanus.

36 Gaumenflügel des Keilbein, Bojanus.

37 Jochfortsatz, Köstlin; Flügelbein, Bojanus.

38 Recherches sur les Poissons Fossiles, 4to, t. i. 1843.

39 De Corporis humani Fabricâ, 8vo, 1794.

40 Ossemens Fossiles, 4to, t. v. part 2. p. 401.

41 *Ibid.* p. 289.

42 *Ibid.* pp. 204, 291.

43 *Ibid.* p. 100.

44 Leçons d'Anatomie Comparée, i. (1835) p. 241.

45 *Ibid.* p. 239.

46 Ossemens Fossiles, t. v. part 2. pp. 100, 289.

47 Leçons d'Anat. Comp. i. (1835) p. 239.

48 *Ibid.* p. 336.

49 Ossemens Fossiles, t. v. part 2. p. 100.

50 Leçons d'Anat. Comp. i. (1835) p. 239.

51 *Ibid.* p. 239.

52 Ossemens Fossiles, t. v. part 2. p. 401.

53 Leçons d'Anat. Comp. i. (1835) p. 238.

54 Ossemens Fossiles, v. part 2. pp. 102, 294, 403.

55 Leçons d'Anat. Comp. i. (1835) pp. 474, 481.

56 *Ibid.* p. 515.

ELEMENTS AND PARTS OF THE TYPICAL VERTEBRA.

CATALOGUE.	GEOFFROY[1].	CARUS[3].	MÜLLER[4].	CUVIER[5].	SOEMMERRING[6].
Autogenous Elements.					
Centrum (κέντρον, centre)....	Cycléal	Tertiar-wirbel	Wirbel-körper..	Corps de vertèbre ..	Corpus vertebræ.
Neurapophysis (νεῦρον, nerve, and ἀπόφυσις, a process of bone).	Périal	Deckplatten and Grund-platten.	Oberer schluss-stücken der Wirbelbogen.	Partie annulaire, ou lames vertébrales.	Arcus posterior vertebræ, seu radices arcus posterioris.
Pleurapophysis (πλευρὰ, a rib, and ἀπόφυσις).	Paraal	Rückentheil and Ober-sternal-theil des Ur-wirbelbogens.	Rippe	Côtes vertébrales ..	Processus transversus vertebræ cervicalis. Costa, seu pars vertebralis, seu ossea, costæ.
Hæmapophysis; by syncope for hæmato-apophysis (αἷμα, blood, and ἀπόφυσις).	Cataal	Unter-sternal-theil des Urwirbelbogens.	Unterer Wirbel-bogen.	Côtes sternales (in thorax); côtes abdominales, ou cartilages ventraux (in abdomen); os ployé en chevron (in tail).	Cartilago costæ seu pars sternalis costæ; inscriptiones tendineæ musculi recti (in the abdomen).
Neural spine	Périal (in fishes); épial (in other vertebrates).	(Its base is the) Oberer Tertiar-wirbel, (its apex is the) Oberer Dornfortsatz.	Oberer Dorn-fortsatz.	Apophyse épineuse .	Processus spinosus vertebræ.
Hæmal spine	Paraal (in fishes); cataal (in other vertebrates)[2].	Sternal-wirbel Körper .	Unterer Dorn-fortsatz.	Apophyse épineuse inférieure.	Ossa sterni et processus ensiformis; linea alba (in the abdomen).
Exogenous Parts.					
Parapophysis (παρὰ, across, and ἀπόφυσις).	Paraal (in the tail of fishes).	Querfortsatz	Unterer Quer-fortsatz.	Apophyse transverse	Radix prior seu antica processus transversi vertebræ.
Diapophysis (διὰ, across, and ἀπόφυσις).	Paraal (in reptiles and mammals).	Querfortsatz	Oberer Quer-fortsatz.	Apophyse transverse	Radix posticus processus transversi vertebræ, (and) processus transversus.
Zygapophysis (ζυγὸς, junction, and ἀπόφυσις).	....	Seitlicher Tertiar-wirbel	Gelenk-fortsatz	Apophyse articulaire	Processus obliquus vertebræ.
Anapophysis (ἀνὰ, backwards, and ἀπόφυσις).	....	....	....	Seconde apophyse articulaire, apophyse styloïde.	Processus accessorius.
Metapophysis (μετὰ, between, and ἀπόφυσις).	....	....	....	Apophyse articulaire ordinaire prolongée (in the lumbars of armadillo).	Processus accessorius processui transverso et articulari superiori interpositus.
Hypapophysis (ὑπὸ, beneath, and ἀπόφυσις).	....	....	Unterer Dorn-fortsatz.	Apophyse épineuse inférieure.	

[1] Mémoires du Muséum, 4to, t. ix. 1822, p. 89.

[2] The dermal spines which sustain the dorsal and anal fins of fishes are called respectively "épiaux" and "cataaux" by Geoffroy.

[3] Urtheile des Knochen- und Schalen-gerüstes, fol. 1828.

[4] Vergleichende Anatomie der Myxinoiden: Abhand. Akad. der Wissenschaften zu Berlin, 1834. The terms adopted in most of the recent works of the German zootomists correspond with those of John Müller.

[5] Leçons d'Anatomie Comparée, t. i. edit. 1835.

[6] De Corporis Humani Fabricâ, tom. i. 1794.

TYPICAL DENTITION IN THE DIPHYODONT MAMMALIA.

CATALOGUE.	CUVIER[1].	DE BLAINVILLE[2].	SOEMMERRING[3].
i 1. First or mid-incisor..	....	....	Dens incisor medius.
i 2. Second incisor	Les incisives.		
i 3. Third or ex-incisor ..	....	....	Dens incisor externus.
c. Canine............	La canine	....	Dens caninus.
p 1. First premolar......	La fausse molaire rudimentaire[4].		
p 2. Second premolar....	Les fausses molaires	Les avant-molaires.	
p 3. Third premolar	....	La principale[8]................	Duo priores dentes molares (bicuspides).
p 4. Fourth premolar	La vraie molaire carnassière[5]....	La principale[9]; la première arrière molaire.	
m 1. First molar	La vraie molaire carnassière[6]: la vraie molaire tuberculeuse[7].	La principale[10]..................	Tertius dens molaris.
m 2. Second molar	Les vraies molaires............	Les arrière-molaires	Quartus dens molaris.
m 3. Third molar........	....	....	Quintus dens molaris.

[1] Leçons d'Anatomie Comparée (1836), tom. iv.
[2] Ostéographie et Odontographie des Cinq Classes des Animaux Vertébrés.
[3] De Corporis Humani Fabricâ, 8vo, 1794, tom. i.
[4] Cuvier, *op. cit.* t. iv. p. 254.
[5] *Ibid.* p. 261. This tooth is so called, in the upper jaw of the Carnivora.
[6] *Ibid.* p. 261. This tooth is so called, in the lower jaw of the Carnivora.
[7] *Ibid.* p. 263. This tooth is so called, in the upper jaw of the genus *Felis*, and the same term is applied to the molar teeth which succeed it in other Carnivora.
[8] De Blainville, *op. cit.* This tooth is so called, in the upper jaw of the genus *Felis*, in the 'Ostéographie des Carnassiers,' p. 69; but the name is applied to *p* 3 in both jaws, in the 'Ost. des *Felis*,' p. 55.
[9] *Ibid.* This tooth is so called, in the lower jaw, in the 'Ost. des Carnassiers,' p. 69; but it is described as "la première arrière molaire," in the 'Ost. des *Felis*,' p. 55.
[10] *Ibid.* This tooth is so called, in both jaws of the Human subject, in the First Fasciculus, 'Mammifères en général,' p. 43.

For the principles on which the homologies of the teeth, as signified by the symbols and names in the first column, have been determined, reference may be made to the Author's 'Odontography,' pp. 514–522, and to the Article TEETH, Cyclopædia of Anatomy, vol. iv. p. 905.

CATALOGUE.

OSTEOLOGY.

SYSTEMS OF THE SKELETON.

1. A Human os sacrum, as an example of the vertebral system of bones, called the internal skeleton, or 'endo-skeleton.' *Hunterian.*

2. A bony ganoid plate of a Sturgeon (*Acipenser Sturio*), as an example of the dermal system of bones, called the external skeleton, or 'exo-skeleton.' *Hunterian.*

3. The osseous tessellated carapace of an Armadillo (*Dasypus minutus*), as an example of an exo-skeleton. *Presented by Charles Darwin, Esq., F.R.S.*

4. The bone of the heart of a Bullock (*Bos Taurus*), as an example of the visceral system of bones, or 'splanchno-skeleton.' *Purchased.*

5. The bony sclerotic of the Sun-fish (*Orthagoriscus Mola*), as an example of the same system of bones. *Hunterian.*

CONSTITUENTS OF OSSEOUS TISSUE.

6. The shaft of the femur of an Ostrich (*Struthio Camelus*), which has been steeped in dilute acid in order to remove the earthy salts; the animal or gelatinous

basis having been afterwards dried: this basis consists of the proximate organic principles called 'glutin' and 'chondrin.' *Hunterian.*

7. The shaft of the Human humerus, from which the animal or gelatinous matter has been driven off by heat, and the incombustible earthy hardening salts left behind. *Presented by Edward Stanley, Esq., F.R.S.*

The following gives the average result of the chemical analyses of Human bone:—

Phosphate of lime, with a trace of fluate of lime	59·63
Carbonate of lime	7·33
Phosphate of magnesia	1·32
Sulphate, carbonate and chlorate of soda	0·69
Glutin and chondrin	29·70
Oil	1·33
	100·00

THE VERTEBRA, OR PRIMARY SEGMENT OF THE ENDO-SKELETON.

A. *Permanent or arrested conditions illustrative of stages of development of the vertebræ.*

8. A Lancelet (*Branchiostoma lubricum,* Costa; *Amphioxus lanceolatus,* Yarrell), with the integuments and muscles of the right side removed, together with the viscera, exposing the continuous cylindrical gelatinous chord ('chorda dorsalis,' or notochord): this, with its fibro-membranous sheath, represents the bodies or central elements of the vertebræ, and the aponeurotic processes, sheathing the neural axis and forming intermuscular septa, represent the peripheral elements of the vertebræ. *Prepared by Mr. George Hansbrow, Anatomical Student.*

9. A transverse section of the caudal portion of the vertebral column of a Lamprey (*Petromyzon marinus*), showing the persistent notochord and its double aponeurotic sheath, with two of the pairs of cartilaginous laminæ developed upon the aponeurotic wall of the upper (neural) canal, representing the 'neurapophyses' of ossified vertebræ; and with two of the pairs of cartilaginous laminæ developed from the aponeurotic wall of the lower (hæmal) canal, representing the 'hæmapophyses' of ossified vertebræ.
Prepared by Mr. George Hansbrow, Anatomical Student.

10. An abdominal vertebra of a Sturgeon (*Acipenser Sturio*), showing the centrum or body still represented by a segment of the persistent continuous notochord: the inner layer of the fibrous capsule of the notochord has increased in thickness, and assumed the texture of tough hyaline cartilage. In the outer layer are developed distinct, firm, and opake cartilages—the neurapophyses, which consist of two superimposed pieces on each side, the basal portion bounding the neural canal, the apical portion the parallel canal filled by fibrous elastic ligament and adipose tissue: above this is the single cartilaginous neural spine. The parapophyses are now distinctly developed, and joined together by a continuous expanded base, forming an inverted arch beneath the notochord, for the vascular trunks. Short and simple pleurapophyses are articulated by ligament to the ends of the laterally projecting parapophyses. There is a small accessory (interneural) cartilage at the fore and back part of the base of the neurapophysis; and a similar (interhæmal) one at the fore and back part of the parapophyses.

Prepared by Mr. George Hansbrow, Anatomical Student.

11. A section of the abdominal part of the vertebral column of the *Lepidosiren annectens*. The continuous notochord still represents the vertebral bodies, but its capsule is thickened. The neurapophyses, the neural spine, and the parapophyses are ossified; the latter are of great length, and resemble ribs, but there are no true or distinct pleurapophyses, as in the Sturgeon or Siren.

Prepared by Prof. Owen.

12. A series of the semi-ossified portions of the vertebral bodies of the Spotted Dogfish (*Scyllium Canicula*): they consist each of two conical pieces confluent at their apices, which are perforated: each cone forms a concave articular extremity of the vertebral body, which contained a remnant of the primitive gelatinous notochord. This was continued through the central perforation, and had been reduced by the ossification of the biconical plates to a moniliform figure, or chain of semifluid gelatinous beads. The exterior of the ossified part of each centrum was occupied by a clear cartilage developed from the primitive fibrous capsule of the notochord. *Hunterian.*

13. A vertebral centrum of the Porbeagle Shark (*Lamna cornubica*). Ossification

has extended along the terminal concave plates so as to reduce the central communication to a very small foramen: osseous plates have, also, been developed in the exterior hyaline cartilage: these plates are triangular, and parallel with the axis of the vertebra, their apices converging towards its centre: the interspaces were filled by the cartilage: and the two widest (marked *n*, *n*), at the upper part of the centrum, were closed by the bases of the neurapophyses. *Hunterian.*

14. A vertebral centrum of a Blue Shark (*Carcharias glaucus*). Ossification has extended along the terminal articular cones so as to obliterate the central communication and reduce the primitive notochord to a series of detached semi-fluid gelatinous balls filling the capsules that united together the opposite concave surfaces of the centrums. Ossification has, also, extended through the exterior cartilage, except at the parts (marked *n*, *n*) which supported the neurapophyses, and at those (marked *p*, *p*) which supported the parapophyses: these parts are hollow in the present dried vertebra. *Hunterian.*

15. Two caudal vertebræ of the Gray Shark or Tope (*Galeus communis*), showing a similar progress of ossification of the bodies: the neural canal is protected not only by the proper neurapophyses, but by interneural plates resting upon the interspace of the vertebræ: the hæmal arches are slender, and there is a single pair for each centrum. *Hunterian.*

B. *Characteristic ossified vertebræ of the different classes of Vertebrata.*

16. Five vertebræ of a bony Fish, vertically bisected, showing the articular cavities formed by the opposite terminal conical surfaces. Each vertebral centrum has a very deep and large depression opening behind the parapophyses; there are smaller depressions at the base of the neurapophyses. *Hunterian.*

17. A caudal vertebra of an Angler (*Lophius piscatorius*). The concave articular ends of the centrum, characteristic of the vertebræ of Fishes, are formed by smooth compact bone; the exterior of the centrum consists of light reticular osseous texture, continued from the neural arch above to the hæmal arch below: both arches have coalesced with the centrum. *Hunterian.*

18. A caudal vertebra of a Tunny (*Thynnus vulgaris*), in which all the ossified parts present a smooth surface and compact tissue; each side of the centrum shows two wide and deep depressions: smaller but deep unossified portions—vacuities in the dried vertebra—extend from the neural and hæmal surfaces into the substance of the centrum. Both neural and hæmal arches have coalesced with the ossified centrum. *Hunterian.*

19. The last abdominal and the anterior caudal vertebræ of a bony Fish, showing a remarkable compression of the bodies of the vertebræ, which have a strong longitudinal ridge on each side. The bent-down but diverging parapophyses are united in each of the abdominal vertebræ by a transverse osseous ridge: in the caudal vertebræ they converge and coalesce as usual to form the hæmal canal. *Hunterian.*

20. The caudal vertebræ of a bony Fish with cylindrical centrums, having a finely-reticulated exterior: the neural and hæmal arches and spines are symmetrically developed. *Hunterian.*

21. The terminal caudal vertebræ of a bony Fish, in which the neural and hæmal spines of the last two vertebræ are supported by a single centrum upon a compressed and expanded triangular bony plate. *Hunterian.*

22. The terminal vertebræ of the same species of bony Fish, showing the same degree of coalescence and metamorphosis of the neural and hæmal arches for the support of the rays of the caudal fin. *Hunterian.*

23. A vertebra of a Reptile—the fourth cervical of a Crocodile,—in which the completely ossified centrum (*c*) presents an anterior concavity and a posterior convexity, the vertebræ being united by ball-and-socket joints. The centrum sends out a short inferior transverse process or 'parapophysis' (*pp*) on each side; and a 'hypapophysis' (*hp*) or spinous process from its under part: the neurapophyses (*nn*) have coalesced with their spine (*ns*), but still continue articulated by suture with the centrum; each developes a superior transverse process or 'diapophysis' (*dd*), and anterior and posterior oblique or articular processes, 'zygapophyses' (*zy*), from their summit. There is on each side a 'pleurapophysis' (*pl*), or rudimental cervical rib, articulated by its head to the

parapophysis, and by its elongated tubercle to the diapophysis, completing the lateral canal or 'foramen for the vertebral artery.' *Hunterian.*

24. A typical vertebra of a Reptile—the third dorsal of a Crocodile,—in which the pleurapophyses are elongated, forming 'vertebral ribs,' and the hæmal arch is completed by the hæmapophyses (ossified costal cartilages, or sternal ribs) and hæmal spine (sternum). The neurapophyses have coalesced with each other and with the neural spine, but articulate with the centrum by suture. The head of the rib here joins a notch upon the largely-developed diapophysis; the tubercle of the rib still articulates with the end of that process. The parapophysis is suppressed: the hypapophysis (*hp*) is retained.

Prepared by Prof. Owen.

25. An anterior caudal vertebra of a Crocodile. The pleurapophyses are reduced to the proportions they presented in the cervical vertebra, and are simplified in form, being mere flattened laminæ articulated by suture to the extremities of short diapophyses. The hæmapophyses articulate to the under surface of the centrum, and coalesce with each other and with the hæmal spine at their opposite ends. Both parapophyses and hypapophyses are suppressed.

Hunterian.

26. A vertebra from the tail of a Serpent (*Python*). All the parts have coalesced into one bone: the pleurapophyses appear as short deflected extremities of long diapophyses: no hæmapophyses are developed in any part of the body of the serpent, but their place is here taken by a pair of exogenous hypapophyses, and consequently the hæmal canal is open below. The anterior articular surface of the centrum is concave, the posterior one convex. *Purchased.*

27. The vertebra of a Bird—the lower cervical one of a Pelican (*Pelecanus Onocrotalus*). The anterior articular surface of the centrum is convex vertically, concave transversely; the posterior surface is concave and convex in the reverse directions: this interlocking articulation of the vertebral bodies is characteristic of the class of Birds. All the parts of this vertebra have coalesced into one piece, the neurapophyses and spine circumscribing the upper or neural canal, the pleurapophyses completing with the diapophyses and parapophyses the

canals for the vertebral arteries laterally; and a hæmal canal for the carotids being formed below by a perforation of the hypapophysis, which is here analogous to, but not homologous with, the hæmal arch in the tail of the crocodile: the body of the vertebra forms the common centre of these four canals. *Hunterian.*

28. A typical vertebra of a Bird—from the thorax of a Wild Swan (*Cygnus ferus*). The neurapophyses and spine have coalesced with each other and with the centrum: a short parapophysis is developed from the base of the neurapophysis, and a broad diapophysis from near the summit. The pleurapophysis remains distinct, and articulates by its head to the parapophysis, and by its tubercle to the diapophysis. The hæmapophyses (*h*) are articulated to the extremities of the pleurapophyses, and the capacious hæmal canal or arch is completed by the expanded hæmal spine (*hs*) or 'sternum,' from which a median crest is developed. Thus the body of the vertebra is still the common centre of an upper and lower and two lateral canals; but the lower or hæmal one has undergone an extraordinary expansion in relation to the lodgement and protection of the great centres of the vascular system.

Presented by Prof. Owen.

29. A typical vertebra from the thorax of an Ostrich, wanting the sternum or hæmal spine. The parapophyses (*p*), to which the heads of the pleurapophyses (*pl*) are articulated, are developed from the sides of the centrum; the diapophyses (*d*) from those of the neural arch; the hæmapophyses (*h*) are expanded at their lower extremities, where the arch is completed in the natural state, by their junction with the sternum. *Hunterian.*

30. A typical vertebra of a Mammal—the second dorsal or thoracic of a Phalanger. The articular ends of the centrum are flat, which is a common, but not a constant character of the vertebræ of Mammals. The neurapophyses (*nn*) have coalesced together and with the centrum. The pleurapophyses (vertebral rib, or *pars ossea costæ*) remain distinct, and articulate by their head to the side of the centrum, and by their tubercle to the diapophysis (*d*): the hæmapophyses (sternal rib, or *cartilago costæ*) are joined to the pleurapophyses by one

end, and by their other end to the hæmal spine or sternal bone, which completes the hæmal arch below;—the condition of the great expansion of this arch being the same as that noticed in the thoracic vertebra of the bird.

Prepared by Prof. Owen.

31. A cervical vertebra of the Dugong, in which the pleurapophyses as well as the neurapophyses have coalesced with the centrum, about which, therefore, there are three canals, the upper or neural one for the spinal chord, and two lateral ones for the vertebral arteries. The hæmal canal is not circumscribed by bone. This vertebra is singularly flattened in the direction of its axis; the neural canal is capacious, which is characteristic of the mammalian trunk vertebræ: there is no neural spine. *Presented by Sir T. Stamford Raffles, F.R.S.*

32. The fifth cervical vertebra of a young Rhinoceros, showing the anterior convex articular end and the posterior concave end of the centrum, as distinct epiphyses of that element; which is a characteristic mode of its development in Mammalia. On removing these epiphyses, traces of the suture between the neurapophyses (*n*) and the centrum may be recognised, showing that the parapophyses (*p*) are developed from the centrum, and the diapophyses (*d*) from the neural arch. The pleurapophyses or cervical ribs have, however, completely coalesced with the parapophyses and the diapophyses, circumscribing therewith the canals for the vertebral arteries. *Purchased.*

33. The third cervical vertebra of a nearly full-grown *Echidna*, in which Monotrematous Mammal the pleurapophyses (*pl*) retain longer than in the higher orders of that class their primitive distinctness. The proportion of each 'vertebral foramen' contributed respectively by the parapophysis, diapophysis and pleurapophysis is clearly shown in this example. The pleurapophysis is short and broad, and has both 'head' and 'tubercle.' The neural canal has the characteristic mammalian capacity; there is a short neural spine.

Prepared by Prof. Owen.

OSTEOLOGICAL SPECIMENS ARRANGED ACCORDING TO THE CLASSES OF VERTEBRATA, IN THE ASCENDING ORDER.

Class PISCES, Fishes.

The specimens of this class are arranged according to the following Orders:—

Order I. DERMOPTERI.

Endo-skeleton unossified; exo-skeleton and vertical fins mucodermoid; vermiform, or abrachial and apodal; no pancreas; no air-bladder; no oviducts or sperm-ducts; peritoneal outlets.

Suborder I. *CIRROSTOMI.*

Gills free, pharyngeal, inoperculate; no heart.

Fam. *Amphioxidæ.* Example, Lancelet.

Suborder II. *CYCLOSTOMI.*

Gills fixed, bursiform, inoperculate, receiving the respiratory streams by apertures usually numerous and lateral, distinct from the mouth; a heart.

Fam. *Myxinidæ.* Example, Myxine.
Petromyzontidæ. ,, Lamprey.

Order II. MALACOPTERI.

Endo-skeleton ossified; exo-skeleton, in most as cycloid, in a few as ganoid scales; fins supported by rays, all of which, save sometimes the first ray in the dorsal and pectoral, are soft or jointed; abdominal or apodal; gills free, operculate; a swim-bladder and air-duct; peritoneal outlets in many.

Suborder I. *APODES.*

Fam. *Murænidæ.* Example, Eel.

Suborder II. *ABDOMINALES.*

Salmonidæ. Example, Salmon.
Cyprinidæ ,, Carp.

Order III. PHARYNGOGNATHI.

Endo-skeleton ossified; exo-skeleton, in some as cycloid, in others as ctenoid scales; inferior pharyngeal bones coalesced; swim-bladder without duct.

Suborder I. *MALACOPTERYGII.*

Fam. *Scomberesocidæ.* Example, Saury-pike.

Suborder II. *ACANTHOPTERYGII.*

Fam. *Labridæ.* Example, Wrasse.

Order IV. ANACANTHINI.

Endo-skeleton ossified; exo-skeleton, in some as cycloid, in others as ctenoid scales; fins supported by flexible or jointed rays; ventrals beneath the pectorals, or none; swim-bladder without air-duct.

Suborder I. *APODES.*

Fam. *Ophididæ.* Example, Ophidium.

Suborder II. *THORACICI.*

Fam. *Gadidæ.* Example, Cod.
Pleuronectidæ. ,, Plaice.

Order V. ACANTHOPTERI.

Endo-skeleton ossified; exo-skeleton as ctenoid scales; fins with one or more of the first rays unjointed or inflexible spines; ventrals in most beneath or in advance of the pectorals; swim-bladder without air-duct.

Fam. *Percidæ*. Example, Perch.
Sclerogenidæ. ,, Gurnard.

Order VI. PLECTOGNATHI.

Endo-skeleton partially ossified; exo-skeleton as ganoid scales or spines; maxillaries and premaxillaries fixed together; swim-bladder without air-duct.

Fam. *Balistidæ*. Example, File-fish.
Ostracionidæ. ,, Trunk-fish.
Gymnodontidæ. ,, Globe-fish.

Order VII. LOPHOBRANCHII.

Endo-skeleton partially ossified; exo-skeleton ganoid; gills tufted; opercular aperture small; swim-bladder without air-duct.

Fam. *Hippocampidæ*. Example, Sea-horse.
Syngnathidæ. ,, Pipe-fish.

Order VIII. GANOIDEI.

Endo-skeleton, in some osseous, in some cartilaginous, in some partly osseous partly cartilaginous; exo-skeleton ganoid; fins usually with the first ray a strong spine; heterocercal; a swim-bladder and air-duct; intestine with a spiral valve in most.

Fam. *Salamandroïdæ*. Examples, { Lepidosteus. Polypterus.
Sturionidæ. ,, { Sturgeon. Paddle-fish.

Order IX. PROTOPTERI.

Endo-skeleton partly osseous partly cartilaginous; exo-skeleton as cycloid scales; pectorals and ventrals as flexible filaments; gills filamentary, free; no pancreas; swim-bladder as a double lung, with an air-duct; intestine with a spiral valve.

Fam. *Sirenoïdæ*. Example, Lepidosiren.

Order X. HOLOCEPHALI.

Endo-skeleton cartilaginous; exo-skeleton as placoid granules; most of the fins with a strong spine for the first ray, ventrals abdominal; gills laminated, attached by their margins; a single external gill-aperture; no swim-bladder; intestine with spiral valve. *Copula gaudent.*

Fam. *Chimeridæ.* Example, Chimæra.
Edaphodontidæ. „ {Edaphodon. Passalodon.}

Order XI. PLAGIOSTOMI.

Endo-skeleton cartilaginous or partially ossified; exo-skeleton placoid; gills fixed, with five or more gill-apertures; no swim-bladder; scapular arch detached from the head; ventrals abdominal; intestine with spiral valve. *Copula gaudent.*

Fam. *Hybodontidæ.* Example, Hybodus.
Squalidæ. „ Shark.
Raiidæ. „ Ray or Skate.

Order I. DERMOPTERI.

Suborder I. *CIRROSTOMI.*

(See Prep. No. 8, *Branchiostoma,* as an example of a skeleton of this Order of Fishes.)

Suborder II. *CYCLOSTOMI.*

34. The skull and part of the vertebral column, with the branchial and pericardial cartilages of the Lamprey (*Petromyzon marinus*). No part of the skeleton in this low organized fish is advanced, histologically, beyond the cartilaginous stage.

In the skull the basi-occipital cartilage is continued backwards, in the form of two slender processes, upon the under part of the notochord into the cervical region. The hypophysial or pituitary space in front of the basi-occipital cartilage remains permanently open, but has been converted into the posterior aperture of the naso-palatine canal. The sphenoidal arches are very short, approximated towards the middle line; and the presphenoid and vomerine cartilage is brought back, closer to the sphenoidal arches. Two cartilaginous arches circumscribe elliptical spaces, outside the presphenoid plate: these appear to represent the pterygoid arches; but, as in the embryo of higher fishes, are not separated from the base of the skull by distinct joints. The basal cartilages, after forming the ear-capsules, extend upwards upon the sides of the cranium, arch over its back part, and leave only its upper and middle part membranous, as in the human embryo when ossification of the cranium commences. Two broad cartilages represent, upon the roof of the infundibular suctorial mouth, the palatine and maxillary bones, and anterior to these there is a labial cartilage; there are likewise cartilaginous processes for the support of the large dentigerous tongue, and the attachment of its muscles.

The structure and grade of development of the spinal column accord with those described in Preparation No. 9. The processes, answering to the 'epibranchials' in osseous fishes, come off from a cartilaginous tract on each side of the notochord, and after a short course outwards and downwards, divide, each, into three branches, one passing forwards, one backwards, and the intermediate branch, answering to the 'ceratobranchial,' downwards: this, after sending off processes which surround the branchial apertures, descends, bends inwards, dilates, and is perforated; then contracts and joins a long and broad 'hypobranchial' cartilage. The posterior pair of ceratobranchials constitute, with the hypobranchial, a perforated cartilaginous case, which is lined by the pericardium, and contains and protects the heart.

Prepared by Mr. George Hansbrow, Anatomical Student.

35. The dried conical lip, with the labial cartilages and teeth of a Lamprey (*Petromyzon marinus*). *Purchased.*

In all the skeletons and skulls in which the individual bones are numbered, the numbers answer to those in the first column of TABLE I. of SYNONYMS, and the names under which such bones are noticed or described are those given in the second column of the same TABLE, under the head CATALOGUE. The synonyms are chosen from the Works of the two great French Anatomists, CUVIER and GEOFFROY-ST. HILAIRE, who have most advanced Osteological science; from Dr. HALLMANN'S elaborate 'Treatise on the Temporal Bone;' and from two comprehensive German Works on Comparative Anatomy, viz. those of MECKEL and WAGNER. The synonyms of the bones of the head of Fishes are taken from the celebrated Work on Fossil Fishes by the distinguished Ichthyologist of Neuchatel; and the Anthropotomical terms have been chosen from SOEMMERRING'S classical Work, 'De Corporis Humani Fabrica.'

Order II. MALACOPTERI.

Suborder I. *APODES.*

36. The skeleton of a Mediterranean Sea-eel (*Muræna*). There are no ribs in this genus. The number of abdominal vertebræ, characterized by prominent parapophyses, in the present specimen is 72; that of the caudal vertebræ, characterized by the coalescence of the parapophyses below the hæmal canal, is 64; but some are wanting. *Hunterian.*

37. The skeleton of the *Muræna Helena*, wanting the lower jaw and opercular bones. The number of the abdominal vertebræ is 72; that of the caudal, 72: these latter are characterized by transverse processes, in addition to the bent-down and coalesced parapophyses.

The caudal transverse processes are due to a progressive bifurcation of the parapophyses, which, in the present skeleton, commences at the end of those of the twenty-fifth vertebra: the divisions diverge as the fissure deepens, until, at about the seventy-third vertebra, the lower portion descends at a right angle to the upper one, which remains as the transverse process, and meets its fellow, with which it coalesces to form the hæmal arch: from the point of coalescence is developed the antero-posteriorly expanded hæmal spine.

Hunterian.

38. The skull of a large species of Muræna (*Muræna tigrina*), wanting all the opercular bones except the preoperculum on the right side; the outer surface of this bone is excavated by large cells.

The pterygoids are closely attached behind to the hypotympanics, but appear to have been loosely connected by ligament with the vomer and palatines anteriorly. The jaws are upwards of four inches in length; they are armed with a row of close-set strong conical teeth, with the base extended transversely, and firmly anchylosed to the alveolar margin of the jaw, and the apex narrowed off to a pointed and somewhat trenchant edge set lengthwise; on the outside of this row there is an irregular series of small conical teeth, and on the inside a broader stripe of small granular teeth. At the extremity of the lower jaw two of the conical teeth are developed to a size much exceeding the rest; they are surrounded by smaller conical teeth which spread out like the prongs of a grappling-iron. These large terminal teeth of the lower jaw are opposed to four similar large, conical, sharp-pointed, divergent fangs on the expanded anterior extremity of the vomer. A longitudinal oval plate on the vomer supports twelve large and strong conical teeth, anchylosed by transversely extended bases; these teeth are arranged in alternate pairs in the middle of the group, but the rest form a single longitudinal row, decreasing in size as they are placed anteriorly. The whole dentition presents a most formidable armature for seizing and lacerating a resisting prey.

The specimen was caught off Malemba, during the Expedition to explore the river Congo, under the command of Captain Tuckey, in 1816.

Presented by Dr. Leach, F.L.S.

39. The coalesced centrums and neural arches of the skull, with the left ramus of the lower jaw, of a large species of Muraenoid Fish.

It differs from the preceding in the minor development of the prefrontal processes for the attachment of the palatines, in the greater length of the dentigerous groove of the vomer, and in the greater length and slenderness of the entire nasal segment of the skull. The crowns of the teeth are subcompressed laterally, and have an anterior and posterior dentated edge.

Mus. Brit.

40. The skeleton of a small Eel (*Anguilla*). The number of abdominal vertebræ is 47; that of the caudal vertebræ is 70: total, 117. *Hunterian.*

41. The skull, wanting the scapular arch, of the Conger Eel (*Anguilla Conger*).

The prefrontals have coalesced with each other and with the nasal, which, in like manner, has coalesced with the vomer. The parietals here meet and form a sagittal suture, separating the occipital from the frontal. The mastoids extend forwards and divide the postfrontals from the frontals. The tympanic pedicle has coalesced into two pieces; the upper piece, answering to the epitympanic, pretympanic and mesotympanic, articulates above by two widely separated condyles with the postfrontal and mastoid. The paroccipitals are unusually small, the scapular arch being very feeble and not directly articulated with them in the Eel-tribe. The opercular bone articulates with a convex condyle at the back of the epitympanic. It is narrower than usual and curved upwards, showing its primitive character as a modified ray of the tympano-mandibular arch. The subopercular retains still more the character of a ray, and closely resembles one of the branchiostegal appendages of the hyoid arch. The preopercular and interopercular bones have the ordinary form. Both glossohyal and urohyal bones are much elongated.

Hunterian.

42. Eight abdominal vertebræ of the Conger Eel.

The neurapophyses rise vertically, parallel with each other, and are connected together by transverse osseous bridges: each neurapophysis terminates in a free bifurcate extremity, so that each centrum supports four spinous processes. The parapophyses are large, triangular, with plicated exterior surfaces resembling leaves.

Hunterian.

43. Three vertebræ of the Conger Eel. *Hunterian.*

44. Several abdominal and some caudal vertebræ of an Eel; showing the progressive bifurcation of the parapophyses at the beginning of the tail, the lower forks descending and forming the sides of an open hæmal canal, like that in the tail of Serpents (see No. 26). *Hunterian.*

45. The left ramus of the lower jaw of the Electric Eel (*Gymnotus electricus*): it supports a single series of small, equal, triangular, compressed, recurved and sharp-pointed teeth. *Hunterian.*

Suborder II. *ABDOMINALES.*

46. The skeleton of a Bull-trout (*Salmo eriox*, Linn.). It is of a male, with the upturned cartilaginous prolongation or appendage of the lower jaw, characteristic of the sex: its weight when caught was 22 lbs., and the skeleton measures 3 feet 4 inches in length. Number of abdominal vertebræ, 28; of caudal vertebræ, 32: total, 50.

The neurapophyses have not coalesced with the centrum in the anterior abdominal vertebræ, nor do they blend with each other until the last abdominal vertebra. In the preceding vertebræ each neurapophysis is produced into a long and slender spine, and the neural spines in these vertebræ thus appear to be double, or in transverse pairs. The epineural rays begin to be developed from the second, and are continued to the antepenultimate, abdominal vertebra. They diverge outwards and backwards from the base of the neurapophysis*. The neural arch again becomes distinct from the centrum in the last six caudal vertebræ, and the penultimate one has its base unusually extended, both forwards and backwards, so as to clamp together the four terminal vertebræ. The neurapophyses have not united together above the neural canal in any of these vertebræ. The three terminal vertebræ with neurapophyses, and the last rudimental one, which consists of the modified centrum, bend upwards, and manifest, with the different proportions of their neural and hæmal arches and spines, a certain retention of the primitive heterocercal structure.

The last caudal vertebra departs, like that which commences the vertebral column, from the typical cylindrical form of the centrum, and beyond its articulation with the penultimate centrum becomes compressed and vertically expanded, and transformed into a triangular bony plate, embraced by the split proximal ends of five or six of the caudal rays. The first and

* These diverging rays are the superior costæ or ribs, '*obere rippe*,' of Meckel and other German anatomists.

second abdominal vertebræ have no parapophyses, nor have they any pleurapophyses connected with them. The parapophyses begin to be developed from the lower part of the side of the centrum of the third vertebra, and gradually increase in size to the tenth. They continue short and thick to the antepenultimate abdominal vertebra, suddenly increase in the penultimate one, where they present a triangular form with an excavated base, project downwards and backwards in this and the last abdominal vertebra, and are united together by a transverse bony bar across their lower extremities in the first caudal vertebra. In this and the second they descend parallel with each other from the under surface of the centrum, begin to converge in the third caudal, and unite together at an acute angle in the fifth; the spine beyond the union progressively increasing in length to the tenth caudal, and thence slightly diminishing to the twenty-fifth. This begins to increase both in length and antero-posterior breadth. The hæmal arches in the succeeding caudal vertebræ are joined by suture to their respective centrums, increase in thickness and in antero-posterior extent, and are suturally articulated together with a slight degree of imbrication. A ridge is developed from each side of the base of the fourth of these three inverted arches. The six last contribute to support the rays of the caudal fin, the rest being supported by the modified centrum of the last caudal and by the neurapophyses of the five preceding caudals.

The pleurapophyses * are long and slender: they rapidly increase in length to the sixth, and gradually diminish after the twentieth. Their proximal end is slightly expanded and articulated to the parapophysis, to which they continue to be articulated after the parapophyses have bent down and united together to form the hæmal arch. There are thirty-two pairs, the last pair being articulated to the sixth caudal vertebra.

The interneural spines which form the basis of the dorsal fin are twenty-three in number, and extend from the fifth to the twenty-fifth neural spine inclusive: the ten anterior interneural spines terminate freely; the first is of moderate length, compressed, but expanded from before backwards. This dimension decreases and the spine elongates, until it assumes the form of a simple ray in the fourth. The thirteen posterior interneural spines are expanded and united together at their distal ends, where they articulate with fourteen dermoneural spines or rays of the dorsal fin. These rays are essentially double, or consist of a pair, disunited though in contact in the first and second, but joined together at their distal portions in the rest, where they are divided into several soft-jointed filaments in the last eleven rays. From the first to the fourth of the dermoneural rays, these very rapidly increase in length; from the fourth they diminish, but less rapidly, to the last. From the end of the premaxillaries to the first dermoneural ray is 19 inches. From the origin of the last dermoneural ray to the first ray of the caudal fin is 12½ inches. The small adipose fin is here preserved: its base lies over the 18th caudal vertebra. The number of caudal rays is 34, of which 17 are attached to the neural spines and the last caudal vertebra, and 17 to the hæmal spines. These latter, however, form two-thirds of the straight vertical border of the caudal fin, in consequence of their larger size.

The ischial bones, which are joined by a thick cartilaginous symphysis at the median line, lie underneath and parallel with the last six abdominal vertebræ. Each ischium supports

* These elements are the inferior costæ or ribs, '*untere rippe*' of Meckel.

nine rays of the ventral fin. There are ten interhæmal spines, articulated to the tenth and fourteenth hæmal spines inclusive. The first of these interhæmal spines is very short and much expanded transversely at its distal end: the rest are less expanded there, and are modified to articulate with dermohæmal spines, which form the eleven rays of the anal fin. The first four of these rapidly increase in length, and in the first and second the lateral moieties have not coalesced.

The bones of the head are numbered on coloured labels showing their special and general homologies, according to the Tables I. and II.

The basisphenoid underlaps the basioccipital as far as its articulation with the atlas, with the centrum of which the bases of the exoccipitals likewise articulate. The supraoccipital is a short thick spine, and the paroccipitals develope similar rough processes for the attachment of the suprascapulars; each of these bones likewise sends a short straight process to join the mastoids. The petrosal appears externally at the back part of the skull, wedged between the exoccipital, paroccipital and mastoid. The parietals are small and divided from each other by the interparietal portion of the superoccipital, which joins the back part of the large frontals. There is a wide vacuity between the parietal, paroccipital, mastoid and frontal, analogous to that which is closed by the squamosal in mammals: it is filled up by cartilage in the recent fish.

There are two small dermal ossicles on each side between the superoccipital spine and the suprascapula. The scapula, as in other osseous fishes, is a simple rib-like bone: the coracoids are long, expanded, and unite together below to complete the scapular arch, without the intervention of a median piece. The humerus is articulated to the middle of the back part of the coracoids by a transversely elongated extremity. It is also expanded at the distal end where it articulates by cartilage with the ulna and radius.

The ulna is a semicircular plate of bone perforated in the centre, and, besides its articulation with the humerus, the radius and the ulnar carpals and metacarpal ray, it also directly joins the broad coracoid. The radius, after expanding to unite with the humerus, the ulna and the radial carpals, sends a long and broad process downwards and inwards which is united by ligament with its fellow and with the lower termination of the coracoid. A basis of adequate extent and firmness is thus ensured for the support of the pectoral fins. The carpal bones of these fins are four in number, progressively increasing in length from the ulnar to the radial side of the wrist.

The metacarpo-phalangial rays are thirteen in number; the uppermost or ulnar one being the strongest and articulating directly with the ulna. The base of each ray is expanded and bifurcate. They slightly increase in length from the first to the third, and then gradually diminish to the lower or radial border of the fin.

The broad epitympanic articulates by a continuous joint with both the mastoid and postfrontal. It presents an articular surface at its posterior margin for the opercular bone which is subquadrate; the two posterior borders meeting at a right angle to form the obtuse posterior angle. The convex margin of the subopercular is directed as much backwards as downwards; the vertical diameter of the interopercular is the longest; the posterior border of the preopercular is gently and almost equally convex.

The short stylohyal is attached to the cartilaginous interspace between the epi- and mesotympanics. The glossohyal supports a pair of strong recurved pointed teeth near its extremity, and one of a similar pair remains attached at its middle part. The pharyngeal bones support several smaller teeth of the laniary kind.

The cartilage representing the orbitosphenoid shows a very slight extent of reticulate ossification.

The ossification of the prefrontals is of the same incomplete character, and in two detached portions on each side; one surrounding the olfactory nerve or 'crus rhinencephali,' the other supporting the back part of the nasal. The nasal bone is a single subcircular flat reticular disc. The vomer supports at its expanded anterior extremity a group of three strong laniary teeth.

The premaxillaries are short and thick; each supports six or seven short thick laniary teeth. The long maxillary has a row of from sixteen to eighteen smaller teeth; each palatine has a row of fifteen or sixteen smaller teeth of the same shape. Each ramus of the lower jaw consists of an articular and dentary portion, the latter having from fourteen to sixteen teeth.

The branchiostegal rays are ten in number, and progressively increase in length and breadth as they approach the opercular bones, which they closely resemble in their scale-like character.

The formula of the fin-rays is:—D. 14, P. 13, V. 9, A. 11: that assigned to the *Salmo eriox* in 'Yarrell's British Fishes' is:—D. 11, P. 14, V. 9, A. 11, C. 19.

The fine specimen from which the skeleton above described was prepared, was taken in the river Thame, at Drayton Manor, near Tamworth, November 1848.

Presented by the Right Hon. Sir Robert Peel, Bart., M.P., F.R.S.

47. The dried head of a Trout (*Salmo fario*); apparently of the variety called 'Gillaroo': showing the position of the teeth upon the premandibular, palatine, hyoid, vomerine, premaxillary and maxillary bones; which latter is a very rare position for the teeth in the class of Fishes. *Hunterian.*

Family *Esocidæ.*

48. The skeleton of a Pike (*Esox Lucius*). Number of abdominal vertebræ, 41; of caudal vertebræ, 21: total, 62.

Small exogenous transverse processes are developed from the six last abdominal and eight first caudal vertebræ, like those in the *Anguillidæ*: the terminal centrums of these vertebræ decrease almost to a point, and incline towards the upper lobe of the tail, indicating the heterocercal structure: the neural spines of several of the anterior vertebræ coalesce, and form a continuous ridge: superorbital as well as suborbital scale-bones are present in the skull.

Hunterian.

49. The skeleton of a larger Pike (*Esox Lucius*). The number of the vertebræ is the same in this as in the preceding skeleton.

Notwithstanding the superior age of this specimen, most of the neural arches remain unanchylosed to the centrums: the sutures of many of the parapophyses may also be seen: both epipleural and epineural accessory spines are here present.

Mus. South.

50. The skull of a Pike (*Esox Lucius*), with the integuments, and the branchiæ injected. *Hunterian.*

51. A similar specimen. *Hunterian.*

52. A longitudinal vertical section of a skull of a Pike (*Esox Lucius*), showing the cranial and subcranial canals.

The long posterior process of the epitympanic for the articulation of the large subopercular bone may here be noticed: the four branchial arches of the left side are preserved. Laniariform and villiform teeth are supported by the vomer, as well as by the palatine, premaxillary, and premandibular bones. The edentulous maxillary forms a larger proportion of the upper border of the mouth than in most osseous fishes, and the affinity to the *Salmonidæ* is hereby indicated.

Presented by Prof. Owen.

53. The palatal and premandibular bones of a large Pike (*Esox Lucius*). The palatines show a coarse variety of the rasp-like teeth. In the lower jaw some new-formed teeth may be observed, the ligamentous bases of which have not been affixed by ossification to the substance of the jaw. *Hunterian.*

54. The palatine and one of the pterygoid bones of a large Pike (*Esox Lucius*).

Purchased.

55. The lower jaw of a large Pike (*Esox Lucius*), which weighed 16½ lbs.

Presented by William Thompson, Esq., 1820.

56. The premandibular bones of a Pike. *Hunterian.*

57. The skeleton of the Gar-pike (*Belone vulgaris*). Number of abdominal vertebræ, 52; of caudal vertebræ, 29: total, 81. The ribs and epipleural spines are numerous, long and slender: the green colour of the osseous texture is a peculiarity of this fish, which is still exhibited in the skeleton; but it fades by long exposure. *Mus. South.*

58. The skull and a considerable portion of the vertebral column of a Gar-pike (*Belone vulgaris*).

The bodies of the vertebræ are elongated and excavated at their middle; they present three longitudinal ridges, one inferior and two lateral; the parapophyses are continued from the fore-part of the sides of the centrums; and, before they bend down to form the hæmal canal in the tail, they develope a small transverse process. Some of the original green colour peculiar to the bones of the species still remains in this specimen.

Hunterian.

59. The skeleton of a Flying-fish (*Exocœtus volitans*). This is chiefly remarkable for the enormous development of the rays of the pectoral fins; those of the ventral fins being also of unusual length. The pectoral rays increase in strength from the lower or radial to the ulnar or upper border of the fin. The lower lobe of the tail is longer than the upper one, and there is a small ridge on each side of the anchylosed bodies of the last caudal vertebræ. The spines of the anterior abdominal vertebræ form a continuous bony crest. The number of the abdominal vertebræ in this skeleton is 31; that of the caudal vertebræ is 18: total, 49. *Purchased.*

Family *Cyprinidæ*.

60. The skeleton of a Carp (*Cyprinus Carpio*), showing the peculiar form and development of the parapophyses of the first three abdominal vertebræ and the expansion of the spine of the atlas. The ribs are long. The first dermal spine of the dorsal and that of the anal fin form dense osseous serrated weapons. The number of abdominal vertebræ is 18; that of the caudal vertebræ is also 18: total, 36. *Mus. South.*

61. The right moiety of the skull of a Carp (*Cyprinus Carpio*). The numbers upon the bones indicate their names according to Table I.

In this specimen may be noticed the position and size of the parietal bone; it meets its fellow at a sagittal suture on the upper surface of the head, which is a rare structure in the class of Fishes, although the normal one in the Vertebrate Series. Here also may be seen the superorbital scale-bone, and the perforated hypapophysis of the basioccipital, which supports the peculiar large brown-coloured dental plate. The opercular bones present a remarkably dense osseous texture. The ordinary bones of the mouth are all edentulous.

Presented by Prof. Owen.

62. The two inferior pharyngeal bones and the upper pharyngeal tooth, with the portion of the basioccipital bone to which it is attached, of a Carp (*Cyprinus Carpio*), said to have been fifty years old. The teeth are of the molar type, and present a complicated triturating surface: they are attached to the inner side of the pharyngeal bones by a confluence of their base with the osseous substance. The bones supporting them are modified hypobranchial elements of the fifth pair of arches: they are smaller, stronger, and more curved than the true branchial arches which are anterior to them. *Purchased.*

63. The separated and artificially articulated bones of the head of a Carp (*Cyprinus Carpio*), in which the bones are indicated by numbers according to Table I., and the natural segments of the skull by the colours of the labels according to Table II. *Yellow* denotes the occipital segment or vertebra; *green* the parietal one; *blue* the frontal, and *red* the nasal segments.

The following peculiarities may be noticed in this specimen. The under part of the basioccipital (1) either developes a large hypapophysis, or by the confluence therewith of a pharyngobranchial bone, is converted into a longitudinally perforated process, the under part of which expands into a broad triangular plate, and supports the upper pharyngeal grinding tooth. The exoccipitals (2, 2) are perforated by unusually large foramina. The superoccipital (3) is triangular; but its base is formed by the superior border which articulates with the parietal bones. The alisphenoid (6) is perforated at its centre by the facial nerve, or opercular branch of the trigeminal: a more posterior foramen gives exit to the glossopharyngeal: the third division of the fifth escapes from a foramen common to the alisphenoid and orbitosphenoid (10). The orbitosphenoids are large, as in most *Malacopteri*. The entosphenoid (9′) is unusually large in the Carp. The premaxillary (22) and premandibular (32) are small and edentulous. There is a small prenasal bone (15′); and a superorbital (71) as well as suborbital bones (73).

Purchased.

64. An inferior pharyngeal bone of a large Cyprinoid fish, with four molariform teeth having smooth crushing surfaces.

Presented by Sir Anthony Carlisle, F.R.S.

65. An inferior pharyngeal bone and teeth of a Tench (*Tinca vulgaris*).

Hunterian.

66. The two inferior pharyngeal bones and teeth of a Roach (*Leuciscus rutilus*).

Hunterian.

67. The two inferior pharyngeal bones and teeth of a Barbel (*Barbus vulgaris*). Here the teeth are elongated, compressed, with pointed incurved summits: in the preceding specimens may be seen the gradual change from the molary to the laniary type. *Hunterian.*

68. The superior pharyngeal plate and the inferior pharyngeal bones and teeth of a Chub (*Leuciscus cephalus*). In this fish the inferior pharyngeals support both obtuse and pointed teeth: they are small, and in greater numbers than the pharyngeal teeth of the preceding subgenera of Cyprinoid fishes. The ordinary bones of the mouth in all this family are devoid of teeth. *Hunterian.*

69. The skull and anterior abdominal vertebræ of a small Cyprinodont fish.

Hunterian.

Family *Siluridæ.*

70. The skeleton of a small Siluroid fish; showing the strong symphysial union of the lower ends of the coracoid arch, and the anchylosis and lateral development of the anterior abdominal vertebræ, both of which relate to the support of the strong anterior pectoral and dorsal spines, which are pointed and serrated, and constitute formidable weapons of offence. *Purchased.*

71. The dried head of a Siluroid fish, apparently of the genus *Plotosis*. The premaxillaries support a few long, slender, straight, but not very sharp teeth: the vomer supports a large triangular patch of small molar teeth with hemispherical crowns: both kinds of teeth are present upon the premandibular bones: the pharyngeal teeth are setiform. *Hunterian.*

72. The upper and lower jaws of a Siluroid fish of the genus *Platystoma*: it is attributed to the *Silurus fasciatus* of Bloch in the Osteological Catalogue of 1831. The teeth are arranged on the premaxillary and premandibular bones in broad bands like a rasp of strong short bristles. There are two small groups of similar teeth on the vomer.

Presented by Claude Russell, Esq., the executor of Dr. Patrick Russell, to Sir Joseph Banks, Bart., and by him to the Museum of the College, 1805.

73. The upper and lower jaws of the same species of Platystome (*Pl. fasciatum*).

Presented by Sir Joseph Banks, Bart.

74. The cranium, with the anchylosed anterior trunk-vertebræ, the tympanic pedicles, preoperculars, left opercular bone, and suprascapular bones, of a species of Siluroid fish (*Silurus* (*Schilbe*) *congensis*, Leach)*; from the Congo River.

This specimen is chiefly interesting as showing the close resemblance between the modifications by which the anterior abdominal or cervical vertebræ have deviated from the common vertebral type, and those by which the cranial vertebræ more constantly deviate from the same type. The bodies, for example, of three cervical vertebræ have coalesced into a continuous bony mass, grooved below: the parapophyses of two of the vertebræ are horizontally expanded, and form a continuous plate like the paroccipitals (4), mastoids (8), and postfrontals (12) in the skull. Two of the spinous processes have also coalesced to form a continuous longitudinal crista of bone, the summit of which expands laterally to an equal breadth with the spines of the occipital, parietal and frontal vertebræ, and present a similarly granulated outer or upper surface. The frontal is longitudinally fissured. The prefrontals send down short obtuse articular processes for the suspension of the palato-maxillary arch. The

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* The following are the specific characters of this fish, given by Dr. Leach in the Appendix No. 4 to the "Narrative of an Expedition to explore the river Zaire, usually called the Congo, in South Africa, in 1816; by Captain J. N. Tuckey, R.N."

"*Sp.* 1. *Silurus congensis.* With the upper nostrils, the angles of the mouth, and each side of the chin furnished with a filament; the first ray of the dorsal and pectoral fins serrated towards the point, which is unconnected with the second ray; the second ray very much elongated and attenuated; the laciniæ of the tail acute.

"*Obs.*—The first ray of the dorsal fin is only serrated towards its point, the unconnected apex itself being destitute of teeth. The first ray of the pectoral fins is serrated above the unattached part, an the teeth are continued downwards to near its middle. It is akin to *Silurus mystus* (Geoff. *Poiss. de Nil*), but may be easily distinguished from it by the characters of the pectoral fins, and by the presence of the filaments on the chin. The filaments of the chin and nostrils are nearly of equal length; those of the angles of the mouth are very long."

tympanic pedicle articulates by an upper partially divided ball to a socket formed by the postfrontal, by the orbito-sphenoid, and by the mastoid. The upper and posterior articular tubercle of the tympanic pedicle supports the operculum. The upper fork of the suprascapula has coalesced with the paroccipital: the lower fork articulates with a transverse process of the basioccipital.

Presented by Dr. Leach, F.L.S.

75. The left half of a vertically bisected skull of a large Siluroid fish (*Bagrus tachypomus*).

In this specimen the articular surface for the tympanic pedicle is formed by the mastoid and postfrontal exclusively, and chiefly by the latter: the upper prong of the suprascapula again bifurcates to unite with both paroccipital and mastoid; the long and slender lower prong is joined by suture to a lateral process of the basioccipital.

The five anterior vertebræ of the trunk are anchylosed together and to the basioccipital by a continuous hypapophysial plate developed from their under part, which is perforated lengthwise for the beginning of the aorta, and expands upwards and outwards where it is closely applied to the under surfaces of the co-expanded parapophyses of the same vertebræ. It is remarkable that the concave articular surfaces of the bodies of these coalesced vertebræ have been preserved by a retention of the interposed gelatinous remains of the primitive 'notochord.' The body of the atlas is short; it is quite detached from its broad parapophyses, which are wedged between those of the occiput and axis: they are much expanded, and terminate backwards each in a pointed process. The body of the axis is six times as long as that of the atlas; but the apices of the two deep hollow terminal articular cones meet in the centre: its parapophysis is expanded, like that of the atlas, to which it articulates anteriorly by a suture, as it does posteriorly to the co-expanded parapophysis of the third vertebra. The gradual resumption by the parapophyses, in the succeeding vertebræ, of their normal form and position establishes the serial homology of those of the three posterior cranial vertebræ, which parapophyses have received, on account of their special modifications, the special names of 'paroccipital,' 'mastoid,' and 'postfrontal' bones. The axis, also, sends upwards a strong spinous process: the bodies of the third and fourth vertebræ are elongated like that of the axis, but in a less degree. That of the fifth vertebra is singularly modified; its anterior half presenting the long and slender character of the antecedent vertebræ, whilst the posterior half is suddenly shortened and developed in depth and breadth, like the short and broad centrums of the succeeding free vertebræ of the trunk. The nerves quit the spinal canal by directly perforating the neurapophyses, and the anterior roots separately from the posterior ones, as in the similarly coalesced vertebræ forming the sacrum of birds.

Presented by H. N. Turner, jun., Esq.

76. The cranium, or neural arches, of the skull, with the three anterior trunk-vertebræ of a large Siluroid fish.

The bodies of the vertebræ of the trunk and occiput have been horizontally bisected, exposing the biconical cavities between them. They are, however, firmly interlocked together by the same kind of deeply indented suture as that which unites the bodies of the occipital and parietal vertebræ in this and other fishes.

The posterior articular surface of the third trunk-vertebra is as remarkable for its shallowness and breadth as the anterior one for its narrowness and depth. The parapophyses of this vertebra are of great length, are depressed, flattened and extended outwards, and suturally united by the whole of their anterior margin with those of the second vertebra. The neurapophyses are distinct from one another; each sends off a zygapophysis, looking upwards from the back part of its base, and terminates above in a short thick triangular spine, which articulates anteriorly with the neurapophyses of the second vertebra. The centrum of the second vertebra is twice the length of the third, and is irregularly excavated laterally, as well as before and behind. The parapophysis is enormously developed in length and breadth, and its anterior margin is bent upon itself, so as to circumscribe a deep canal leading outwards. It extends outwards and upwards, and articulates not only with the parapophysis of the atlas, but with the extremity of that of the occipital vertebra.

The neurapophyses each send upwards a separate spinous process, which rise parallel with each other, but are united together above the neural canal; and their interspace receives the hind margin of an enormous compressed neural spine, the base of which extends along the neural arch of the atlas, and the anterior border of which articulates with the posterior border of the spine of the occiput.

Purchased.

77. The dried skin of a Siluroid fish (*Arius cruciger*), showing the large dermo-placoid plates of the exo-skeleton, and the proportions and position of the strong pectoral and dorsal spines.

The broad patches of tessellated small hemispheric teeth upon the palatines are worthy of notice; and the transverse group of short setiform teeth upon the premaxillaries. In the lower jaw the setiform denticles are gradually transformed into the hemispheric tubercles, as they are situated further back in the mouth. The cranial ganoid plate is cruciform, with a granular surface, the granules running together into striæ at the middle of the plate; the short arms of the cross touch, but are not confluent with, the scapular plates. The humeral plates extend almost as far back as the strong pectoral spine which they assist in supporting, and are rounded at their extremities as in the *Arius rita*. The dorsal plate is formed by four bones; its pointed anterior end penetrates a notch in the contiguous end of the cranial one. The first short and strong dorsal spine overlaps the base of the second enormous one which constitutes the chief weapon of defence of this Siluroid fish. The anterior border of this spine has a fine ridge lodged in a slight longitudinal groove: some small teeth are developed from the posterior margin, which is attached to the dorsal fin. This species of *Arius* is from the Ganges; the native name is 'Bilgugra.'

Purchased.

78. The interneural and dermoneural spines, forming the first ray of the dorsal fin of a large *Siluroid*. The summit of the interneural spine expands into a broad

heart-shaped scute with a granular and reticulate external surface. A bony ring is formed at its posterior part, which passes through a perforation in the base of the spine; which base reciprocally traverses the interneural ring, so that the spine and plate are locked together like the links of a chain. The spine is grooved and dentated posteriorly.

Presented by William Chambers, Esq.

79. The corresponding parts of a smaller *Siluroid.* *Hunterian.*

80. The dermoneural spine and articular part of the interneural plate of a *Siluroid*; showing the linked articulation of the two parts: the base of the spine is convex at the middle, and plays in a corresponding concavity of the interneural plate; its sides expand into two flattened surfaces which rest in corresponding surfaces of the interneural plate. *Hunterian.*

81. A dermoneural osseous serrated spine of a *Siluroid.* *Hunterian.*

82. The right coracoid bone with the anchylosed radius and ulna, and the first ray of the pectoral fin of the *Silurus congensis.* This ray is completely ossified, thick, and strong: serrated on its anterior and posterior borders. Its expanded base is articulated by a double, interlocking, oblique trochlea. The movements of flexion and extension can only be performed when the spine is maintained by muscular action in a certain oblique position; any direct attempt to bend back the spine, when it is at any stage of the erection, is opposed by the nature of the joint. *Presented by Dr. Leach, F.L.S.*

83. The corresponding bones of the left side of the same fish. The expanded inferior border of the coracoid is deeply notched or indented, and is articulated with the opposite coracoid by suture. *Presented by Dr. Leach, F.L.S.*

84. The right coracoid bone of another species of *Siluroid*; showing larger and deeper notches at the lower sutural margin of the bone. *Hunterian.*

85. Serrated spines of the pectoral fins of a *Siluroid.* *Mus. Brit.*

Order III. PHARYNGOGNATHI.

Suborder I. *MALACOPTERYGII.*

86. The anterior part of the skull of a species of *Scomberesox*; it is remarkable for the long and slender muzzle, formed principally by the premaxillary and dentary bones. *Hunterian.*

Suborder II. *ACANTHOPTERYGII.*

Family *Labridæ*. Wrasses.

87. The dried head of a large species of Wrasse (*Labrus*), showing, even in their present shrunken state, the unusual development of the external lips, to which the name of the genus refers. The relative position, and the form of the single lower pharyngeal bone, and of the two upper pharyngeals, are well shown in this specimen: the latter play backwards and forwards upon articular surfaces of the basisphenoid, which are concave mesially, convex laterally: the upper pharyngeals show co-adapted convexities and concavities. *Mus. Brit.*

88. The dried head of a small *Labroid* fish, showing the four laniary teeth at the fore-part of the premandibular and premaxillary bones, the two smaller laniary teeth at the posterior part of each premaxillary, and the intermediate row of minute subequal teeth. The corresponding teeth of the lower jaw are rather larger: on the inner side of these in both jaws there is a narrow band of villiform teeth. The two triangular superior pharyngeal bones with their pavement of rounded molars are preserved in this specimen. *Hunterian.*

89. The dried head of a small Wrasse (*Julis*). *Hunterian.*

90. The dried head of the same species of Wrasse. *Hunterian.*

91. One premaxillary and both premandibular bones of a Wrasse (*Julis*), showing a similar type of dentition, but with a larger proportional size of the posterior teeth in the lower jaw. *Hunterian.*

92. The premandibular and premaxillary bones of a large fish of the genus *Cossyphus*. *Hunterian.*

93. The premaxillary and premandibular bones of a large fish of the genus *Cossyphus*. There are two large laniariform teeth at the fore-part of each premaxillary; and one such tooth at the fore-part of the premandibular bone: a few small conical teeth represent the rest of each series, which is not terminated by any larger laniary. The inner side of the alveolar border of the jaw is paved by a broad band of small tubercular teeth.

Presented by William Lynn, Esq.

94. The superior and inferior pharyngeal bones of a *Labroid* fish. *Hunterian.*

95. The two superior pharyngeal bones of a *Labroid* fish, with their pavement of molar teeth.

The whole of the unattached surface of the pharyngeals is covered with these teeth, which vary in size and shape in different parts of the pharyngeal bones; many are round, some are angular, and some of the smaller ones at the external angles present a conical form. Each tooth is attached by the circumference of a slightly contracted base to the margin of a shallow alveolus; this margin is indented by fine vertical grooves, the plates between which are morticed into corresponding grooves in the osseous margin of the base of the tooth. The floor of the alveolus is a thin plate, perforated by numerous foramina, and does not become anchylosed to the base of the tooth; nor indeed does it sustain any of the superincumbent pressure. The pharyngeal tooth, when first in place, has its base excavated by a wide but shallow pulp-cavity. This is gradually diminished by a formation of dentine from the margins of the base, which encroaches towards the centre, until it finally forms a partition between the pulp-cavity and the alveolus. In most of the specimens of the pharyngeal bones of the Wrasse-tribe some of the alveoli are empty, and the crown of a new tooth is seen protruding for a greater or less extent through the cribriform base.

Mus. Brit.

96. The two superior pharyngeal bones of a large *Labroid* fish. *Hunterian.*

97. The two superior pharyngeal bones of a large *Labroid* fish. *Hunterian.*

98. The two superior pharyngeal bones of a large *Labroid* fish. *Mus. Brit.*

99. One of the pharyngeal bones with its pavement of large obtuse teeth of a *Labrus*. Two of the cavities of reserve are exposed which contain the germs of successional teeth. *Hunterian.*

100. The left superior pharyngeal bone of a large fish of the genus *Cossyphus*. It is paved with rounded or flattened molars of different sizes. Some of these have been shed, and the germs of their successors are exposed in the closed alveoli, which are immediately above the teeth that are shed. *Hunterian.*

101. A right superior pharyngeal bone of a large fish of the genus *Cossyphus*; it is vertically bisected, showing the mode of attachment of the teeth in use, and the cavities of reserve with the germs of the successional teeth beneath them.

The centre of the pulp of the pharyngeal molar remains uncalcified long after the tooth has taken its place, and the circumference only of the base of the tooth rests upon the raised margin of the alveolus. The part of the tooth which sustains and transmits the pressure is strengthened by the development of a strong convex ridge projecting from its inner surface into the pulp-cavity; and the calcigerous tubes of this ridge, while simply following the ordinary course of development, acquire a direction the best adapted for diffusing the pressure equally to every point, by radiating from the plane of resistance. The pressure received by the border of the alveolus is transferred to the walls which divide the subjacent vaulted cavities containing the germs of the new teeth. The roof of these cavities, which forms at the same time the floor of the alveolus above, being thus relieved from the superincumbent weight, freely yields to the absorbent process consequent on the growth of the new tooth; and before the latter becomes subjected to any pressure from above, its formation has been sufficiently perfected to enable it to sustain that pressure without injury. The lateral walls of the cavities containing the reserve teeth, to which the pressure is transferred from the margins of the sockets of those in use, consist of a much denser osseous tissue than the other parts of the pharyngeal bone.

Hunterian.

102. An inferior pharyngeal bone of a *Labroid* fish, longitudinally bisected, showing the cavities of reserve of the successional teeth. *Hunterian.*

103. The upper and lower pharyngeal bones and teeth of a small *Labroid* fish, called the 'Red-mouthed Grunt' on the original label. *Hunterian.*

104. The basibranchials and hypobranchials of the third and fourth gill-arches, and the coalesced basibranchials of the fifth arch, which form the basis of support for the inferior pharyngeal teeth, of a small Wrasse or *Labroid* fish.

Hunterian.

105. The two superior pharyngeal bones and the inferior pharyngeal bone of a Wrasse or *Labroid* fish: the dentigerous surface is paved by close-set and for the most part hemispherical molars, those of the upper pharyngeals differing from each other considerably in size. *Hunterian.*

106. An inferior pharyngeal bone and teeth of a *Labroid* fish. *Hunterian.*

107. An inferior pharyngeal bone and teeth of a *Labroid* fish. *Hunterian.*

108. An inferior pharyngeal bone and teeth of a *Labroid* fish. *Hunterian.*

109. An inferior pharyngeal bone and teeth of a *Labroid* fish. *Hunterian.*

110. An inferior pharyngeal bone and teeth of a *Labroid* fish. *Hunterian.*

111. An inferior pharyngeal bone and teeth of a *Labroid* fish. *Hunterian.*

112. An inferior pharyngeal bone and teeth of a *Labroid* fish. *Hunterian.*

113. An inferior pharyngeal bone and teeth of a *Labroid* fish. *Hunterian.*

Family *Scaridæ*. Parrot-fishes.

114. The skeleton of a Parrot-fish (*Scarus*), belonging to that section of the genus characterized by two pointed denticles projecting from the back part of the alveolar border of the premaxillary bone. The number of abdominal vertebræ is 11; that of the caudal vertebræ, 12: total, 23.

The abdominal parapophyses are well developed: the ribs have an overlapping articulation with their extremities. The parapophyses from and after the seventh abdominal vertebra bifurcate, and the median prongs coalesce and form a bridge beneath the abdominal aorta: at the thirteenth vertebra they are wholly bent down and anchylosed together to form the hæmal canal. The epicoracoids are of unusual breadth, and the pubic bones are of great length, as in most thoracic fishes.

Purchased.

115. The skull, with the dried integuments, of a small Parrot-fish. It belongs to that section of the genus *Scarus* which is characterized by a single pointed tooth, projecting outwards from the back part of the dentigerous plate of each premaxillary bone. The relative position of the single inferior dentigerous

pharyngeal plate, and of the two superior pharyngeal plates is well shown in this specimen. The inferior plate is supported by the two confluent basi-branchial bones of the last branchial arch: the superior plates are supported by the pharyngobranchial pieces of the three posterior branchial arches. *Hunterian.*

116. The skull of a large Parrot-fish (*Scarus*), with the integuments remaining on the right side. The numbers indicate the names of the bones according to Table I.

The suspension of the maxillary arch through the medium of the palatine from the pre-frontal is well shown, and the correspondence of the articulation between the maxillary and the premaxillary with that between the articular and dentary pieces of the lower jaw, is very close and illustrative of their serial homology. The pretympanic and hypotympanic bones are of great breadth. The borders of the premaxillary and dentary pieces are paved with hard enameled denticles, so placed that they oppose each other by their sides instead of by their summits.

This specimen was formerly preserved in the museum of the Royal Society; and is figured in "*Willughbii de Historia Piscium*, Joannes Raius, 1686, *tab.* X. ii:—Ingentis cujusdam piscis Indici caput, an e'Turdorum genere? e M. S. R." *Mus. Brit.*

117. The right halves of the maxillary and mandibular arches, with a portion of the tympanic pedicle of the same side of a large species of *Scarus*. The constituent bones are indicated by the numbers affixed to them according to Table I. *Hunterian.*

118. The bones of the head of a small species of *Scarus*.

The anterior expansion of the vomer, and the lateral processes of the basioccipital and basi-sphenoid, which form the articular cavities for the superior pharyngeals, are worthy of notice in this specimen; as also the depression above the nasal and fore-part of the frontal bones, upon which the long nasal processes of the premaxillary bones play backwards and forwards in the protractile and retractile movements of the jaws.

Hunterian.

119. The premaxillary, premandibular, and pharyngeal bones and teeth of a small Parrot-fish, of that section of the genus in which there are no lateral out-standing pointed premaxillary teeth. *Hunterian.*

120. The premaxillary and premandibular bones of a species of *Scarus*; the denticles composing the apparently continuous enamel-casing of the beak-shaped jaws are unusually large and well defined. *Hunterian.*

121. The premandibular and premaxillary bones and teeth of a species of *Scarus*. *Hunterian.*

122. The premaxillary and premandibular bone of a large Parrot-fish (*Scarus muricatus*).

The maxillary bone is seen from its outer side where the beak-shaped portion presents a surface checkered by small lozenge-shaped plates of an enamel-like substance, arranged in a quincuncial order. The premandibular bone is seen from its inner side which exposes the marginal row of procumbent denticles, the crowns of which form the lozenge-shaped plates above mentioned. A longitudinal section has been removed from this bone to show the vertical series of twelve successive denticles anchylosed to each other and to the dense texture of the jaw, of which series the apparently enameled tessellated covering of the jaws consists: below this series one of the alveoli of a denticle not yet anchylosed is exposed; and beneath this the cavity or closed alveolus common to the germs of several successive denticles. It will be seen by the relative position of the teeth to the jaw, that the marginal series in use in the upper and lower mandibles oppose each other by their sides instead of their crowns.

Hunterian.

123. The section removed from the preceding premandibular bone, showing some of the separate denticles in the dentiparous cavity.

These denticles present the form of short, thick and conical, four-sided columns, the base forming the crown: the opposite contracted end is excavated, and contained the remains of the formative pulp. The ossification of the capsule of each matrix, by which the general confluence of the teeth with the jaw is effected, has already commenced in the cavity, and has produced a honeycomb character of the posterior surface of the outer alveolar wall: this wall is absorbed as the jaw rises in the progress of its growth, and the crowns of the denticles are thus exposed. The symphysial surface of the premandibular bone is remarkable for the regularity of the vertical series of rugged, chevron-shaped ridges by which the firm interlocking of the two premandibulars is effected. The complexity of the dental apparatus and the concomitant strength of the jaws of the Parrot-fishes (*Scarus*) relate to the peculiar nature of their food. These, for the most part tropical, fishes frequent the vast coral reefs which are in course of formation in those latitudes, and they browse upon the polypes of the lithophytes and their new-formed cells, as the ruminant quadrupeds crop the herbage of the dry land. The irritable bodies of the gelatinous polypes when touched retract into their cells, and the *Scari* consequently require a dental apparatus strong enough to detach and reduce to a pulp those calcareous habitations. The gelatinous matter of the polypes is dissolved and digested, but their calcareous parts are cast out, in the condition of nearly pure chalk, with which the intestines of the Parrot-fishes are found laden; whence these fishes have been classed amongst the geological agents by which the skeletons of the lithophytes are converted into chalk *.

Hunterian.

124. The premandibular and premaxillary bones of the *Scarus rivulatus*, Cuv. et Val. The exposed crowns of the denticles in these jaws are not so distinctly tuberculate as in the preceding species. *Hunterian.*

125. The premaxillary and premandibular bones of apparently the same species of *Scarus.*

126. The maxillary, premaxillary and premandibular bones of apparently the same species of *Scarus.* The bases of the dentigerous portions of the jaws present a green colour. *Hunterian.*

127. The premaxillary and premandibular bones of a species of *Scarus.* *Hunterian.*

128. The premaxillary and premandibular bones of a small species of *Scarus.* The symphysial surfaces of the lower jaw present a series of parallel oblique ridges. *Hunterian.*

129. The premaxillary and premandibular bones of a species of *Scarus.* The symphysial ridges decrease in size more rapidly towards the summit of the joint than in the preceding specimen. *Hunterian.*

130. The superior and inferior pharyngeal bones and teeth of a species of *Scarus.*

The superior dentigerous pharyngeals present the form of an elongated, vertical, inequilateral triangular plate: the upper and posterior margin is sharp and concave; the upper and anterior margin forms a thickened articular surface, convex from side to side, and playing in a corresponding groove or concavity upon the base of the skull; the inferior boundary of the

* Darwin, Narrative of the Voyage of H.M.S. 'Adventure' and 'Beagle,' vol. iii. p. 553.

triangle is the longest, and also the broadest; it is convex in the antero-posterior direction, and flat from side to side. It is on this lower surface that the teeth are implanted, and in most species they form two rows; the outer one consisting of very small teeth, the inner one of large teeth. These present the form of compressed conical plates or wedges, with the basis excavated, and the opposite margin moderately sharp and slightly convex to near the inner angle, which is produced into a point. These plates are set nearly transversely across the lower surface of the pharyngeal bone, and are in close approximation, one behind another: their internal angles are produced beyond the margin of the bone, and interlock with those of the adjoining bone when the pharyngeals are in their natural position; the smaller denticles of the outer row are set in the external interspaces of those of the inner row. The single inferior pharyngeal bone consists principally of an oblong dentigerous plate; its breadth somewhat exceeds that of the conjoined dentigerous surfaces of the superior pharyngeals, and it is excavated to correspond with their convexity. The lower dentigerous plate is principally supported by a strong, slightly-curved, transverse osseous bar, the extremities of which expand into thick obtuse processes for the implantation of the triturating muscles. A longitudinal crest is continued downwards and forwards from the middle line of the inferior pharyngeal plate, anterior to the transverse bar, to which the protractor muscles are attached. A longitudinal row of small oval teeth, alternating with the large lamelliform teeth like those of the superior pharyngeals, bounds the dentigerous plate on each side; the intermediate space is occupied by the larger lamelliform or wedge-shaped teeth, set vertically in the bone, and arranged transversely in alternate and pretty close-set series.

Mus. Brit.

131. The inferior pharyngeal bone and teeth, with the dentigerous portions of the superior pharyngeal bones, of a large species of *Scarus*, showing the interlocking of the superior pharyngeal teeth with each other. *Hunterian.*

132. The inferior pharyngeal bone and a vertical section of one of the superior pharyngeals, of a large species of *Scarus*. The back part of the inferior pharyngeal is turned towards the number on the tablet, and exposes the large dentiparous cavity for the supply of new teeth to replace those that have been worn out in front.

The pharyngeal denticles are developed in wide and deep cavities in the substance of the posterior part of the *lower* and of the anterior part of the *upper* pharyngeal bones. Each denticle is inclosed in its proper capsule, which contains an enamel-forming pulp and a dentinal pulp, in close cohesion with each other and with their common capsule. The teeth exhibit progressive stages of formation as they approach the posterior part of the upper and the anterior part of the lower pharyngeal bones: as their formation advances to completion they become soldered together by ossification of their respective capsules, and soon afterwards are anchylosed by ossification of the base of the dentinal pulp to the pharyngeal bone itself. The line of demarcation between the dentified and ossified portions of the pulp is well defined, so that when the pharyngeal bone and teeth are sawn through vertically, the fully formed teeth appear as hollow cones set upon wedges of bone, as shown in the specimen. *Mus. Brit.*

133. An inferior pharyngeal bone of a large species of *Scarus*, from the Bermudas. It shows well the effects of the powerful grinding action performed by the posterior jaws of the Parrot-fishes. *Presented by Prof. Owen, F.R.S.*

134. An inferior pharyngeal bone and teeth of a *Scarus*. *Hunterian.*

135. The superior pharyngeal teeth of a *Scarus*. *Hunterian.*

136. The teeth of the right superior pharyngeal bone of a *Scarus*. *Hunterian.*

137. The superior and inferior pharyngeal bones and teeth of a *Scarus*. *Mus. Brit.*

138. The right superior and the inferior pharyngeal bone and teeth of a *Scarus*. *Hunterian.*

139. The superior and inferior pharyngeal bones of a small *Scarus*. There are three series of denticles on each superior pharyngeal bone, decreasing in size from within outwards. The gubernacular orifices leading to the dentiparous cavities at the back part of the bones are well seen in this specimen. *Hunterian.*

140. The superior and inferior pharyngeal bones and teeth of a small species of *Scarus*. The superior teeth are in three series on each pharyngeal bone: the inferior pharyngeal teeth form a disc broader than it is long. *Hunterian.*

141. The superior and inferior pharyngeal bones and teeth of a small species of *Scarus*; showing the articular surfaces and the processes for muscular attachment. *Hunterian.*

142. The superior and inferior pharyngeal bones of apparently the same species of *Scarus*. *Hunterian.*

143. An anterior caudal vertebra of a Parrot-fish (*Scarus*).

The terminal cones, of which the posterior is the deepest, are ossified to their centre: they are united by firm bony matter, presenting a reticulate or fibrous aspect in the depressions at the sides and under part of the centrum. The neurapophyses are anchylosed to their centrum and to their spine; and the parapophyses, which have also united with the centrum, are bent down and have coalesced at their extremities to form the hæmal canal.

Hunterian.

144. A vertical longitudinal section of a dorsal vertebra of a large Parrot-fish (*Scarus*).

The parapophysis (marked *p*) is long, strong, and twisted: the neural spine is very long and slender. The osseous texture is not lamellated, but is coarsely and irregularly reticulate.

Hunterian.

145. A vertical longitudinal section of a caudal vertebra, with the confluent hæmapophyses and hæmal spine, of a large Parrot-fish (*Scarus*). *Hunterian.*

146. A horizontal longitudinal section of a caudal vertebra of a large Parrot-fish (*Scarus*). *Hunterian.*

Order IV. ANACANTHINI.

Family *Gadidæ*.

147. The skeleton of a Cod-fish (*Gadus morrhua*). Number of abdominal vertebræ, 18; of caudal vertebræ, 34: total, 52.

This may be regarded as a typical form of the malacopterygian skeleton, although all the *Gadidæ* resemble the *Acanthopteri*, and differ from the *Malacopteri* in the absence of the 'ductus pneumaticus.' All the rays of all the fins are flexible and jointed. The abdominal vertebræ are characterized by the great size and length of the parapophyses, and by the small size of the pleurapophyses which are appended to their extremities.

Purchased.

148. The disarticulated skull of a Cod-fish (*Gadus morrhua*), with the branchial arches.

The bones of the endo-skeleton are numbered in accordance with Table I. The four vertical segments in which they are arranged are distinguished by the colours of the tickets bearing the numbers of the bones: the yellow tint indicates the occipital segment or vertebra; the green the parietal segment; the blue the frontal segment; and the red the nasal segment. The sense-capsules are denoted by crimson tickets; the bones of the splanchno-skeleton by brown tickets; and those of the dermo-skeleton by white ones.

The bones of the occipital segment form an upper, or 'neural,' and a lower, or 'hæmal' arch: those of the neural arch encompass the medulla oblongata and cerebellum in the recent fish, and are six in number. The first and lowest, called *basioccipital* (1), is a short, strong, subrhomboidal bone, subcylindrical and truncate posteriorly, where it is excavated to form the articular cavity, united with the corresponding hollow cone on the fore-part of the body of the atlas; the anterior pointed end of the basioccipital was wedged into the basisphenoid, fitting and filling up the deep posterior cleft of that bone. The basioccipital offers on each side a rough articular surface for sutural union with two lateral bones, the *exoccipitals* (2, 2); behind which it received the anteriorly projecting base of the neural arch of the atlas, which was wedged into the posterior angle between the basi- and exoccipitals, and was firmly united to them by broad sutural surfaces. The *exoccipitals* present the form of oblong, subquadrate bones, thick, and with two rough, deeply-indented articular surfaces below, but expanded and produced outwards above: they encircled the epencephalon, and completed the contour of the foramen magnum. They are perforated for the passage of the nervi vagi, and were articulated below with the basioccipital, behind with the neurapophyses of the atlas, above with the superoccipital (3) and the paroccipitals (4), and in front with the petrosals (16).

The *superoccipital* (3) presents an elongated rhomboidal form, and was articulated by an inferior cellulo-sutural surface with the summits of the exoccipitals and the mesial angles of the paroccipitals, forming the key-stone of the neural arch: it sends upwards and backwards a strong compressed spine from the whole extent of the middle line, and a transverse 'superoccipital' ridge outwards from each side of the base of the spine to the external angles of the bone. It advanced forwards and joined the frontal, pushing aside, as it were, the parietals.

The *paroccipitals* (4, 4) were wedged into the angles between the ex- and super-occipitals: they are of a conical form, with the base towards the cranial cavity, and the apex turned outwards and backwards. Their whole outer surface is here traversed obliquely by a prominent ridge, ending at the lower and hinder projecting angle of the bone. The inner surface of the paroccipital, like that of the exoccipital, is excavated for the lodgement of part of the posterior and external semicircular canal of the large internal organ of hearing in Fishes. The outer projecting process supported the upper fork of the first piece of the hæmal or 'scapular' arch.

The second ring of bones, or that which encircled the mesencephalon (lobe of the third ventricle and optic lobes), includes the basisphenoid (5), the alisphenoids (6), the parietals (7), and the mastoids (8). The *basisphenoid* (5) is connate with the presphenoid (9), forming with it a long subtriedral bone (basi-presphenoid), usually bifurcate posteriorly, and more or less expanded beneath the cranial cavity: it is then continued forwards along the base of the interorbital space to near the fore-part of the roof of the mouth: its posterior extremity was firmly wedged by a kind of double gomphosis into the basioccipital: its expanded part supported the petrosals and alisphenoids: the presphenoidal prolongation (9) articulated with the orbitosphenoids, and it terminates forwards by a cavity which received the pointed end of the vomer.

The *alisphenoids* (6, 6) were firmly articulated by broad sutural surfaces to the expanded sides of the basisphenoid; above which their bases almost met and immediately supported the third ventricle or mesencephalon, leaving an interspace for its pituitary prolongation, which rested in a cavity or 'sella' of the basisphenoid. In the Cod the chief part of the trigeminal nerve passes out of the cranium by the anterior notch of the alisphenoid. A part of the vestibule and the anterior semicircular canal of the acoustic labyrinth usually encroach upon its inner concavity, whence some have deemed it to be the petrous bone.

The *parietals* (7, 7) would complete above the osseous cincture of the most expanded segment of the brain, but are separated from one another by the anterior prolongation of the superoccipital: they are nearly flat, and present a much smaller proportional size than in the higher classes of Vertebrata: they were articulated to the mastoids outwardly and below, to the superoccipital above, to the frontal and postfrontal before, and to the paroccipital behind.

The *mastoids* (8, 8) bear the same relation to the mesencephalic bony girdle, which the paroccipitals do to the epencephalic one; and they project outwards and backwards further than the paroccipitals, forming the second strong transverse process at each side of the cranium. This process is developed from the outer margin of the mastoid: the inner side of the bone is expanded and enters slightly into the formation of the walls of the cranial, or rather the acoustic cavity; its inner, usually cartilaginous surface lodging part of one of the semicircular canals. Each mastoid was wedged into the interspace surrounded by the ex- and par-occipitals, the petrosal, the alisphenoid, the parietal, the frontal and postfrontal bones. The projecting process lodged, above, the chief mucous canal of the head, and below, afforded attachment to the epitympanic or upper piece of the bony pedicle, from which the mandibular, hyoid, and opercular bones are suspended: its extremity gives attachment to the strong tendon of the dorso-lateral muscles of the trunk.

The basal piece of the third cranial cincture, which defends the prosencephalon, or cerebral lobes, is formed by the *presphenoid* (9), already described as connate with or produced from the basisphenoid. The sides of the prosencephalon are defended by the *orbitosphenoids* (10, 10): these are small semielliptic plates, separated from the presphenoid by the alisphenoid, to which they were articulated below and behind, whilst above they were joined to the frontal and postfrontal, completing the anterior part of the lateral walls of the cranium. The rhinencephalic crura are continued forwards above the superior interspace of the orbitosphenoids; and the optic nerves escape by their inferior interspace.

The *frontal* bone (11) completes the prosencephalic arch above, and enters into the formation of the cranial cavity, though its major part forms the roof of the orbits, which accessory function is the chief condition of the great expanse of this neural spine in Fishes. It is here single and sends up a median crest, which is united with that of the superoccipital. The frontals rest in a small part of their extent upon the orbitosphenoids, but are more constantly articulated, anteriorly, to the nasal and prefrontals, and posteriorly, with the postfrontals, the parietals, the mastoids, and the superoccipital.

The *postfrontals* (12, 12) belong to the same category of vertebral pieces as the mastoids, whose prominent crest they partly underlie and complete in the natural skull, lending their aid in the formation of the single articular cavity for the tympanic pedicle. Like the mastoids their inner surface is expanded, and enters into the formation of the otocranial cavity: they form the posterior boundary of the orbit; are articulated below to the orbitosphenoid and alisphenoid, above to the frontal, and by their posterior and upper surfaces to the mastoid.

The upper or neural arch of the segment which completes the skull anteriorly, consists of the 'vomer' (13) below, the 'prefrontals' (14) laterally, and the 'nasal' (15) above.

The *vomer* (13) is thick and expanded anteriorly, slender and terminating in a point posteriorly, where it was wedged into the under part of the presphenoid; its antero-lateral angles were articulated to the prefrontals; its upper surface supported the nasal bone by an intervening cartilage. The palatine bones abutted against the expanded anterior part of the vomer, the under side of which supports teeth.

The *prefrontals* (14) rested below upon the presphenoid and vomer, supported above the fore-part of the frontal and the back part of the nasal, and contributed to sustain the palato-maxillary arch; but their most constant relations and functions are in defence and support of the crura of the olfactory ganglions.

The *nasal* bone (15) is single, and terminates forwards in a thick obtuse extremity. It was articulated above and behind to the frontal and prefrontals, and below, by the medium of a vertical cartilage, to the vomer.

The *petrosal* (16) attains an equal size with the alisphenoid, which it resembles in form, except that the notched margin is posterior. It forms the posterior lateral wall of the cranium, and was articulated below with the basioccipital and basisphenoid, above with the mastoid and paroccipital, behind with the exoccipital, and before with the alisphenoid: it supported the cochlear division of the labyrinth containing the otolithes.

The *sclerotal* consists of two subhemispheric pieces, each with two opposite emarginations: the inner ones circumscribing the hole (analogous to the meatus internus of the petrosal), for the entry of the nerves and vessels to the essential parts of the organ of vision, and the outer or anterior emarginations supporting the cornea. The entire sclerotic, whether bony, cartilaginous, or fibrous, bears the same essential relation to the vascular and nervous parts of the organ of sight, which the petrous bone does to the organ of hearing, and which the turbinate bones do to the organ of smell.

The *palatine* bone (20) is thick and strong at its upper part, which sends off two processes; one is the essential point of suspension of the palato-maxillary arch, and articulates with the prefrontal and vomer at their point of union, the other is convex and passes forwards to be articulated to a concavity in the superior maxillary. The posterior angle of the base of the palatine is attached, in the Cod, by short and strong ligaments to the prefrontal. The thin posterior and inner border of the bone is joined by ligament to the entopterygoid, and its outer angle is dovetailed into the pterygoid. The palatine contributes to form the floor of the orbit and the roof of the mouth, but is edentulous in the Cod.

The *maxillary* (21) is here, as in most Fishes, an edentulous bone, almost wholly concealed in the recent head in a fold of the skin between the palatine and premaxillary: it lies posterior to and parallel with the premaxillary, which it resembles in form, but is longer and thinner. The expanded and bifurcate end of the maxillary is produced inwards rather than upwards, and forms a socket on which the ascending or nasal process of the premaxillary glides: a posterior tubercle at this end of the maxillary is attached to the palatine, and ligaments connect the same expanded end to the nasal, the turbinal, the vomer, and the premaxillary: the lower and hinder expanded end of the bone is attached by strong elastic ligament, in which a labial gristle is developed, to the coronoid process of the lower jaw.

The *premaxillary* (22), one of a symmetrical pair of bones, is moderately long and slender, slightly curved, expanded and notched at both extremities: the anterior end is bent upwards, forming the nasal process, and is attached in the recent head by lax ligaments to the nasal bone and prenasal cartilage, to the palatine, and to the anterior ends of the maxillary bones. The premaxillaries are moveably connected to each other by their anterior ends; the nasal processes are separated by the prenasal cartilage, the lower or outer branches project freely downwards and outwards; the labial or alveolar border of each premaxillary is beset with teeth.

The *entopterygoid* (23) is an oblong, thin, scale-like bone, attached to the inner border of the coadapted halves of the palatine and true pterygoid, and increasing the bony roof of the mouth in the direction towards the median line. It is edentulous in the Cod.

The *pterygoid* (24) forms an inequilateral but more elongated triangular plate than the palatine, with which it is dovetailed anteriorly; it becomes thicker towards its posterior end, which is truncated and firmly engrained with the anterior border of the hypotympanic and pretympanic bones; its lower border is smooth, thickened and concave: edentulous in the Cod.

The pedicle supporting the lower jaw is divided into four pieces. The superior piece, or *epitympanic* (28 *a*), is articulated to the postfrontal and mastoid by a single elongated condyle; below which it becomes compressed laterally, but much expanded from before backwards. Its lower portion is bifurcate. The anterior division articulates with the preopercular (34), the mesotympanic (28 *b*), and pretympanic (28 *c*); the posterior division is again bifurcate, supporting part of the preopercular and part of the opercular bone. A strong crest projects from its outer surface.

The *mesotympanic* (28 *b*), or 'symplectic' of Cuvier, is a slender, compressed, slightly curved, elongated, triangular bone; articulated by its upper part or base to the epitympanic and preopercular; by its lower end to the inner side of the hypotympanic, reaching almost to the mandibular trochlea, and by its anterior border to the pretympanic.

The *pretympanic* (28 *c*), to which part of the suspensory pedicle of the jaw Cuvier restricts the name 'caisse' or 'os tympanicum,' is an oblong bony scale, with the posterior margin thickened and grooved for the reception of the fore-part of the mesotympanic and the upper and fore-part of the hypotympanic.

The *hypotympanic* (28 *d*) is a triangular plate of bone, like the epitympanic reversed, bearing the articular convex trochlea for the lower jaw upon its inferior apex, and having its upper side or base more even than the opposite base of the epitympanic. The posterior margin of the hypotympanic is grooved for the reception of part of the preopercular (34);

its inner side is excavated for the insertion of the pointed end of the mesotympanic, and the anterior angle is wedged between the pretympanic and the pterygoid (24), and is firmly united to the latter: the trochlea is slightly concave transversely, convex in a greater degree from before backwards.

The *mandible* or lower jaw (29, 32) is the lower portion of the tympano-mandibular arch, being articulated to the hypotympanics above, and closed by a ligamentous union or bony symphysis with its fellow at its lower end. The term 'ramus' is applied in Anthropotomy to each half of the mandible, and each ramus consists of two, three, or more pieces in different fishes. In most fishes it consists of two pieces, one (29) articulated to the suspensory pedicle, and edentulous, and the other (32) completing the arch, and commonly supporting teeth. In the Cod and some other fishes a third small piece (30) is superadded, at the angle of the posterior piece.

The diverging or radiated appendage of the tympano-mandibular arch consists of the bones which support the gill-cover, a kind of short and broad fin, the movements of which regulate the passage of the currents through the branchial cavity, by opening and closing the branchial aperture on each side of the head. The first of these opercular bones, which forms the chief medium of the attachment of the appendage to the supporting arch, is the *preopercular* (34), which is usually the longest in the vertical direction, if not the largest of the bones: it is here, in the Cod, bifurcate above, and the lower slender angle is continued downwards and forwards to beneath the hypotympanic. Three bones usually constitute the second series of this appendage: the upper one is commonly the largest and of a triangular form, thin, and with radiated lines like a scale; it is the '*opercular* bone' (35). Below this is the *subopercular* (36). The lowermost bone, called the *interopercular* (37), is articulated to the preopercular above, to the subopercular behind, and usually to the back part of the mandible; it is attached also, in the recent head, by ligament to the ceratohyoid in front.

The third inverted arch of the skull is the 'hyoidean,' and is suspended, in Osseous Fishes, through the medium of the epitympanic bone, to the mastoid. The first portion of the arch, called *stylohyal* (38), is a slender styliform bone, which is attached at the upper end by ligament to the inner side of the epitympanic, close to its junction with the mesotympanic, and at the lower end to the apex of a triangular plate of bone, which forms the upper portion of the great cornu. To this portion is assigned the name of *epihyal* (39). The third longer and stronger piece is the *ceratohyal* (40). The key of the inverted arch or body of the hyoid is here formed by four small subcubical bones on each side, which bear the name of *basihyals* (41). The triangular flattened bone, which expands as it extends backwards, in the middle line, from the basihyals, is the '*urohyal*' (43).

The diverging appendages of the hyoidean arch have the form of simple, elongated, slender, slightly curved rays, articulated to depressions in the outer and posterior margins of the epi- and cerato-hyals: they are called 'branchiostegals' or gill-cover rays (44), because they support the membrane which closes externally the branchial chamber.

The fourth cranial inverted arch is that which is attached to the paroccipital and mastoid in the naturally articulated skull of the Cod. The superior piece of the arch, *suprascapula* (50), is bifurcate; one prong was attached anteriorly to the paroccipital, the other and shorter prong to the petrosal; they coalesce posteriorly at an acute angle, to form a slightly expanded disc, from which the second piece of the arch is suspended vertically.

This second piece, called *scapula* (51), is a slender, straight, styliform bone, terminating in a point below, and morticed into a groove on the upper and outer side of the lower and principal bone of the arch.

The pointed upper extremity of this bone, called the *coracoid* (52), projects behind the scapula and almost touches the suprascapula: below this part a broad angular plate of the coracoid projects backwards and gives attachment to the radiated appendage of the arch: the rest of the coracoid bends inwards and forwards, gradually decreasing to a point, which is connected by ligament to its fellow, and to the urohyal bone. The inner side of the coracoid is excavated, and its anterior margin folded inwards and backwards; it is continued above into the posterior angular process; but in the rest of the coracoid it is simply bent upon the inner concavity of the bone which, in the recent fish, lodges the anterior origin of the great lateral muscle of the trunk.

The branchial arches belong to the visceral skeleton and are five in number: the three first consist, first, of a short piece below, the *hypobranchial* (38), directly articulated to the median series of bones, called *basibranchials*; next, of a long bent portion, the *ceratobranchial* (47), grooved on its outer convex side for the branchial vessels, and supporting dentigerous tubercles on its inner side; and, above, of a shorter, similarly formed piece, bent inwards and forwards, the *epibranchial* (48). To the epibranchial of the second and third arches is attached a shorter and broader bone, the *pharyngobranchial*, or superior pharyngeal, which is beset with teeth. The fourth arch consists of the ceratobranchial, the epibranchial, and the pharyngobranchial pieces. The fifth arch (ib. 47′) consists simply of the ceratobranchial element: it is expanded and beset with teeth: it has been termed the inferior pharyngeal bone (*os pharyngien inférieur*, Cuvier).

149. The cranium, with the maxillary and mandibular arches and labial cartilages, of a Cod-fish (*Gadus morrhua*). The suprascapular elements of the scapular arch are also preserved.

The general form of the cranium in this, as in most Osseous Fishes, is conical, the base being behind, and perforated by the foramen magnum, the apex widely and deeply cleft transversely by the aperture of the mouth: the orbits are lateral, large, and communicate freely with one another; and there are, also, two deep lateral fissures behind, called gill-apertures, with a mechanism for opening and closing them supported by the branchiostegal rays and the opercular bones. Most of the bones of the skull present the squamous character and mode of union, being flattened, thinned off, and overlapping one another like scales; and many of them are endowed with independent movements.

The principal cavities, which are formed by the assemblage of bones, which have been specified in preceding preparations, are, the 'cranium,' lodging the brain and organs of hearing; the 'orbital' and the 'nasal' fossæ; the 'buccal' and the 'branchial' canals. These cavities are not so well defined as in the higher classes, and in no class is the exterior of the skull so broken by irregular depressions and prominent spines and protuberances. The upper surface of the cranium is commonly traversed, as in the present specimen, by five longitudinal bony ridges or crests, intercepting four channels: the principal crest is the median one, formed by the frontal and superoccipital bones; next to this is the pair formed by the parietals and paroccipitals, and the lateral pair of crests is formed by the postfrontals and mastoids: the intervening depressions lodge the anterior origins of the great muscles of the back and of the scapular arch.

Hunterian.

150. The cranium of a large Cod-fish (*Gadus morrhua*), consisting of the centrums and neural arches of the four vertebral segments of the skull.

It shows well the cavity circumscribed by the prefrontals and vomer for the elongated crura of the rhinencephalon or olfactory ganglions, and the wide anterior triangular aperture of the chamber lodging the rest of the brain.

On the right side the same numbers, on coloured tickets, are attached as in the disarticulated specimen, No. 148. On the left side the name is attached to each bone.

Hunterian.

151. The cranium of a Cod-fish (*Gadus morrhua*), vertically and transversely bisected. The bones are numbered according to Table I. Those which enter into the formation of the large cavities for the acoustic labyrinths, together with the form and extent of those cavities, are well displayed; especially the deep conical excavations of the basioccipital, and the fissures or fontanelles between the paroccipitals and mastoids. *Presented by Prof. Owen, F.R.S.*

152. The cranium of a Cod-fish (*Gadus morrhua*), horizontally and longitudinally bisected. The bones are indicated by the same numbers and colours as in the preceding specimen.

The prefrontals are detached. The vomer and nasal bone are included in the same natural division (neural arches) of the bones of the skull as those regarded as strictly cranial bones in Human Anatomy. The cranial cavity is much contracted beneath the middle of the frontal, and gradually expands to where it is encompassed by the vomer, nasal and prefrontals; it terminates by the junction of the nasal and prefrontals. It is thus divided by the frontal or interorbital constriction into two parts; the posterior, or cranium proper, lodging the epencephalon, mesencephalon and prosencephalon, whilst the anterior division is appropriated to the rhinencephalon.

Presented by Prof. Owen, F.R.S.

153. The left moiety of a vertically-bisected posterior division of the cranium of a Cod-fish (*Gadus morrhua*); showing the large cavity or 'otocrane' lodging the labyrinth. The lower compartment, lodging the sacculus and otolites, is formed by the basioccipital and the largely developed petrosal: the semicircular canals traverse compartments of the otocrane, formed by the exoccipital, paroccipital, superoccipital, mastoid and alisphenoid. *Hunterian.*

154. A natural skeleton of the head of a Cod-fish (*Gadus morrhua*). On the right side the bones are numbered on coloured tickets corresponding with the disarticulated specimen No. 146; on the left side the suborbital and supratemporal and labial scale-bones are preserved, and each bone has its name placed upon it. *Hunterian.*

155. The skull of a Cod-fish (*Gadus morrhua*), with the integuments and branchial arches; showing the premaxillary, premandibular, vomerine, branchial and pharyngeal teeth. The branchial teeth are supported on tubercles projecting from the concave sides of the branchial arches. *Hunterian.*

156. The tympano-mandibular and hyoidean arches, with the pterygoid bones of a Cod-fish (*Gadus morrhua*). The numbers indicate the names of the bones according to Table I. *Presented by Sir B. C. Brodie, Bart., F.R.S.*

157. The left side of the tympano-mandibular arch, with its opercular appendages and the pterygoid and entopterygoid bones of a Cod-fish (*Gadus morrhua*). These and all the other bones are indicated by the numbers according to Table I. *Presented by Sir B. C. Brodie, Bart., F.R.S.*

158. The tympanic pedicle with the pterygoid and preopercular bones of the Cod-fish (*Gadus morrhua*). All the bones are numbered according to Table I. *Presented by Sir B. C. Brodie, Bart., F.R.S.*

159. The opercular, preopercular and subopercular bones of the same fish. *Presented by Sir B. C. Brodie, Bart., F.R.S.*

160. The right ramus of the lower jaw of a Cod-fish (*Gadus morrhua*). The numbers indicate the articular, angular and dentary pieces, according to Table I.
Presented by Sir B. C. Brodie, Bart., F.R.S.

161. The premandibular or dentary bones of a Cod-fish (*Gadus morrhua*).
Presented by Sir B. C. Brodie, Bart., F.R.S.

162. The premandibular or dentary bones of a Cod-fish (*Gadus morrhua*), with the dried symphysial tentacle. *Presented by Sir B. C. Brodie, Bart., F.R.S.*

163. The premandibular or dentary bones of a species of *Gadus*, with the dried symphysial tentacle. *Hunterian.*

164. The premaxillary bones of a fish of the Cod-tribe (*Gadus*). Most of the teeth have been detached from the short hollow pedestals of the alveolar surface of these bones. *Hunterian.*

165. The right side of the hyoidean arch, with the opercular, subopercular and interopercular bones and the branchiostegal rays of a Cod-fish. The bones are numbered in correspondence with those in Table I.
Presented by Sir B. C. Brodie, Bart., F.R.S.

166. The inside view of the right half of the hyoid arch, and its branchiostegal appendages, of a Cod-fish (*Gadus morrhua*, Linn.). The bones are numbered in accordance with those in Table I.
Presented by Sir B. C. Brodie, Bart., F.R.S.

167. The left side of the hyoid arch, with the branchiostegal rays, of a Cod-fish (*Gadus morrhua*). *Presented by Sir B. C. Brodie, Bart., F.R.S.*

168. The hyoid arch and its branchiostegal rays, but wanting the glosso- and urohyal elements, of a Cod-fish (*Gadus morrhua*). The bones are numbered according to those in Table I. *Presented by Sir B. C. Brodie, Bart., F.R.S.*

169. The bones of the four first branchial arches of a Cod-fish (*Gadus morrhua*). They are indicated by numbers according to those in Table I. The third and

fourth ceratobranchials are supported by the same hypobranchial piece. The epibranchials support two pharyngobranchials, which are beset with recurved pointed teeth. *Presented by Sir B. C. Brodie, Bart., F.R.S.*

170. One of the superior pharyngeal bones of a Cod-fish (*Gadus morrhua*). *Presented by Sir B. C. Brodie, Bart., F.R.S.*

171. One of the inferior pharyngeal bones of a Cod-fish (*Gadus morrhua*). *Presented by Sir B. C. Brodie, Bart., F.R.S.*

172. The scapula, coracoids, and pectoral fins of a Cod-fish (*Gadus morrhua*). The bones are numbered in accordance with those in Table I. *Presented by Sir B. C. Brodie, Bart., F.R.S.*

173. The cranium and a considerable portion of the vertebral column of a Cod-fish (*Gadus morrhua*).

As in most Osseous Fishes, the neural arches and parapophyses of the trunk vertebræ have coalesced with the centrums. The parapophyses progressively elongate to the middle of the abdomen: a small supplementary parapophysis is given off behind their base. The gradual change of position until the parapophyses bend down and unite to form the hæmal canal is well shown. There is an anterior and a posterior oblique or articular process ('zygapophysis') developed from each side of the neural arch. The anterior one has its articular surface looking downwards and forwards, and rests upon the posterior zygapophysis of the vertebra in advance. The posterior zygapophyses in the tail rise independently of the neural arch. The cranium includes the same vertebral elements, viz. centrums, parapophyses, neurapophyses, and neural spines, as are shown in the vertebræ of the trunk. *Hunterian.*

174. A considerable portion of the vertebral column of a Cod-fish (*Gadus morrhua*), in which a few of the floating ribs or pleurapophyses are retained in articulation with the cavities on the sides of the centrum. *Hunterian.*

175. Some of the abdominal vertebræ of a Cod-fish (*Gadus morrhua*). *Hunterian.*

176. The skeleton of a Haddock (*Merlangus æglefinus*).

It is remarkable, as in other fishes of the Cod-tribe, for the great development of the parapophyses: they form a hæmal arch at the beginning of the caudal region by respectively sending inwards a process from the inner surface, which meets and coalesces with that of the opposite side, and is continued downwards as a hæmal spine. The pleurapophyses are very slender, and are appended to the extremities of the parapophyses. The interneural and dermoneural spines form three groups, which are the bases of as many dorsal fins. The interhæmal and dermohæmal spines are in two groups, which support the two anal fins: the anterior group extends forwards beneath the abdomen in advance of the caudal region of the vertebral column. The number of abdominal vertebræ is 20; that of the caudal vertebræ is 34: total 54.

Presented by James Syme, Esq.

177. The skull of a Haddock (*Merlangus æglefinus*). The suborbital and supratemporal dermal bones are preserved in this skull, but the hyoid and scapular arches are wanting. The bones are indicated by numbers according to those in Table I. *Presented by Sir B. C. Brodie, Bart., F.R.S.*

178. The cranium, wanting the left coracoid, of a Haddock (*Merlangus æglefinus*).

Hunterian.

Family *Pleuronectidæ*. Flat-fishes.

179. The skeleton of the Plaice (*Pleuronectes Platessa*, Linn.; *Platessa vulgaris*, Cuv.).

Like other fishes of the present family, it is remarkable for the departure from symmetry in the bones of the head. In the present instance only one orbit is completed, and both eyes are on the right side of the head. The teeth, on the other hand, are chiefly developed on the left side; they form a regular curvilinear series of about twenty in number, shaped like incisors, in the left premaxillary; and there is a similar series of about thirty teeth in the left premandibular bone: only three or four small and ill-shapen teeth are developed in the right premaxillary and right premandibular. The interneural and dermoneural spines begin to be developed above the frontal bone, and are continued without interruption to near the base of the tail, and they are of great length: there is a similarly uninterrupted series of bony interhæmal and dermohæmal spines in the caudal region of the trunk: the number of these developments of the dermal skeleton is nearly twice that of the corresponding spines of the endoskeleton to which they are attached. The proportions and relative positions of the parapophyses and pleurapophyses in the abdomen much resemble those in the Cod-tribe: the hæmal arches are formed by special processes or divisions of the parapophyses, the external portions of which continue to project outwards, as independent transverse processes, along about the anterior half of the caudal region, gradually subsiding and disappearing there. The number of abdominal vertebræ in this skeleton is 13; that of the caudal vertebræ is 31: total 44.

Purchased.

180. The skeleton of a Plaice (*Pleuronectes Platessa*). The number of the abdominal and caudal vertebræ agrees with that in the preceding skeleton.

Mus. South.

181. The last abdominal and several anterior caudal vertebræ of the Plaice (*Pleuronectes Platessa*).

The distinctive character of the caudal vertebræ is shown by the deflection and coalescence of the parapophyses, to form the hæmal canal. Both neural and hæmal spines are of great length: the first and second hæmal arches and spines have coalesced at their proximal halves, a short transverse process is sent out from the base of the second caudal parapophysis, and from the sides of the centrum in the succeeding caudal vertebræ.

Two interneural spines are attached to the summits of each of the four anterior neural spines, and two interhæmal spines to the extremity of the third hæmal spine in this specimen.

Hunterian.

182. The skeleton of the Halibut (*Pleuronectes Hippoglossus*, Linn.; *Hippoglossus vulgaris*, Cuv.).

It shows on a large scale the unsymmetrical modification of the bones of the head in the *Pleuronectidæ*. This is peculiarly manifested in the frontal, postfrontal, prefrontal, nasal and vomerine bones: only one orbit is completed, namely the right, by the great development and complete ossification of the suborbital bones, which are firmly connected by suture with the prefrontal and postfrontal bones. The arrangement of the teeth is less unsymmetrical than in the Plaice; there being as many teeth on the right premaxillaries and premandibulars as on the left: they are all conical, recurved, and sharp-pointed. The branchial arches and pharyngeal bones support similarly shaped teeth. The parapophyses progressively increase in length, bend down and unite at the seventeenth vertebra, where they coalesce with those of the eighteenth, forming a broad and deep pelvic expansion, concave anteriorly, and firmly articulated with the enormously developed anterior interhæmal spine. The pleurapophyses are short and slender, as in the Cod-tribe: the epipleural spines are attached to the parapophyses. These do not bifurcate and send out transverse processes, as in the Plaice. The number of abdominal vertebræ in this skeleton is 16; that of the caudal vertebræ, 36: total, 52.

Purchased.

183. The separated and artificially articulated bones of the head of a Halibut (*Hippoglossus vulgaris*), wanting the scapular arch and its appendages. The natural segments of the skull and their constituent bones are denoted by numerals on coloured labels, corresponding with those in No. 146, and in Table I.

The articular surface which the basioccipital (1) presents to the atlas is almost flat.

The supraoccipital (3) is pushed, as it were, by the paroccipitals upon the upper surface of the skull, where it manifests the loss of symmetry by the absence of the expanded plate on the left side of the spine: this immediately articulates, in the entire skull, with the left parietal, which is broader than the right.

The presphenoid (9) is twisted up towards the right side.

The frontal (11) has undergone still more distortion: its right posterior angle is truncated, and the rest of that side scooped out, as it were, to form the large orbit of the right side, which is bounded below by an unusually large and well-ossified suborbital bone: the left side of the bone retains its normal form: a median crest which is continuous in the entire skull with that of the supraoccipital divides the two sides.

The left side of the expanded fore-part of the vomer (13) is chiefly developed: and

The left prefrontal (14) is larger than the right.

Purchased.

184. The neural arches of the skull, and the eleven following trunk-vertebræ of the Turbot (*Rhombus maximus*). The right suprascapula and scapula are retained, with some of the epipleural spines diverging from the parapophyses, one of the pleurapophyses of the left side, and the interneural spines attached to the tenth and eleventh trunk-vertebræ. *Hunterian.*

185. Nine anterior trunk-vertebræ of a Turbot (*Rhombus maximus*): showing the progressive elongation and enlargement of the parapophyses, as the vertebræ recede from the head. *Hunterian.*

186. The last two abdominal and the first three caudal vertebræ of a large Turbot (*Rhombus maximus*): showing the formation of the hæmal arch by the deflection and confluence of the parapophyses, which are produced downwards into a long and strong spine; this, in the first caudal, is broad and concave towards the abdomen. *Hunterian.*

187. The last four abdominal and first twelve sacral vertebræ of a Brill (*Rhombus vulgaris*), with the interneural and dermoneural spines attached to the last abdominal vertebræ, and the interhæmal and dermohæmal spines attached to the anterior caudal vertebræ. The foremost interhæmal spine is of great length, curved, and imbedded in the concavity of the first long hæmal spine.

Hunterian.

188. The first and second caudal vertebræ, anchylosed together and so forming a 'sacrum,' of a large Flat-fish (*Pleuronectes*, Linn.). The neural spines have suffered fracture. *Hunterian.*

189. The last abdominal and first three caudal vertebræ, vertically and longitudinally bisected, of a Flat-fish (*Pleuronectes*, Linn.): showing the confluence of the long hæmal spines of the first two caudal vertebræ. *Hunterian.*

190. The basibranchial, hypobranchial and ceratobranchial pieces of a Flat-fish (*Pleuronectes*): showing the laniariform denticles in the ceratobranchials of the first four arches, and the close-set molars on the corresponding elements of the fifth arch, constituting the 'inferior pharyngeal bones.' *Hunterian.*

Order V. ACANTHOPTERI.

Family *Percidæ*.

191. The skeleton of a large Sea-perch (*Centropristis gigas*).

This skeleton well exemplifies the typical structure of the Acanthopterygian division of Osseous Fishes in the system of Cuvier. All the rays of the first or anterior dorsal fin are strong undivided osseous spines; and the first rays of the anal and pectoral fins are formed by similar spines. The formula of the fin-rays is:—D. 11, 1+12; A. 3+9; C. 19; P. 19; V. 1+5: that is, there are 11 spinous rays in the first dorsal (the fifth, sixth, seventh and eighth being the longest, and the first ray not one-fourth the length of the rest); 1 spinous plus 12 soft rays in the second dorsal; 3 spinous and 9 soft rays in the anal; 19 rays in the caudal; 19 rays in each pectoral; and 1 spinous plus 5 soft rays in each ventral fin.

The absence of any larger conical teeth amongst the denticles of the rasp-like bands which roughen the alveolar borders of the premaxillary and premandibular bones, removes the present specimen from the Percoid genus to which the *Serranus gigas* belongs; whilst the forms of the opercular bones and the formula of the fin-rays distinguish it from any other known species of the genus *Centropristis*, to the characters of which, as defined by Cuvier, it strictly conforms.

The suborbital bones are five in number, including the anterior large one, or 'lachrymal' bone: the third bone has a broad orbital plate directed inwards and backwards. The preoperculum is exclusively suspended from the tympanic pedicle: its lower angle is rounded and obtuse without any notch above it. The whole posterior border of this bone is finely dentated; the teeth at the angle being very little larger than the rest: the lower border is more curved than in the *Serranus gigas*, and it is not festooned.

The opercular bone terminates behind in two points, the lower one being the largest, whilst in the *Centropristis nigricans* the upper one is the largest. A strong ridge crosses the outside of the operculum; the upper border of the bone is entire and convex. The outer surface of the interopercular bone is excavated by broad but shallow depressions, as if the outer layer of the bone had been raised or scooped up at different parts, the raised parts terminating by smooth free concave edges. The subopercular bone shows this character in a slighter degree. The suprascapula presents the form of an oval scale-like bone with a longitudinal external ridge, from which two strong processes pass forward and diverge, one to articulate with the paroccipital and the other with the mastoid; it is relatively larger than in the Cod. The scapula is a long, thin, spatulate bone. The coracoids are moderately strong, deeply and widely excavated posteriorly, attached below to each other by a ligamentous symphysis. The epicoracoid consists of two pieces; one a broad flattened plate, the other an elongated subcompressed styliform bone.

There is a thin, angulolabial scale-bone, two inches and a half in length and half an inch broad, which articulates with the upper part of the broad posterior truncated end of the maxillary.

The premaxillaries support a broad band of rasp-teeth, none of which are much larger than the rest: a narrower band of the same kind of teeth is present on the premandibular bones: they are not stronger than those in the upper jaw, and do not diminish in number to two rows at the angles of the mouth. There is a small group of rasp-teeth upon the vomer and upon the fore part of each palatine.

The anal fin is rather nearer the caudal than the dorsal fin is. The rays of the caudal are supported on a compressed, vertical, bifurcate basis: the upper division supports ten rays, the first being short and spinous; the lower division supports nine rays, the undermost being short and spinous. The basis of the upper lobe consists of two strong compressed bones (neural spines); that of the lower lobe of four strong inferior or hæmal spines; the three anterior of these are detached from the centrums, and articulate to concavities at the under part of the three last centrums; two of the corresponding spines above are shorter, more slender, and take no part in the support of the caudal fin; so that a trace of the embryonal heterocercal form of the tail is here preserved: the third inferior spinous support of the caudal fin sends a short strong process upwards, outwards and backwards from each side of its base.

The neural arch of the atlas is detached from the centrum, as is the last free neural spine of the caudal vertebræ. The parapophyses begin to be developed at the eighth abdominal vertebra, progressively elongate and bend down to the fourteenth, where they unite and bend down to form the hæmal canal. The pleurapophyses are articulated to depression on the upper part of the sides of the second to the seventh vertebræ inclusive: in the eighth, ninth, tenth and eleventh vertebræ they are articulate to the upper part of the base of the parapophyses. The number of caudal vertebræ is 13, exclusive of the coalesced mass supporting the caudal fin rays; the number of free vertebræ being 26.

The specimen from which this skeleton was prepared was taken on the coast of New Zealand, and was

Presented by Capt. Sir Everard Home, Bart., R.N., F.R.S.

192. The skull, with part of the dried integuments, of a Sea-perch, of that section of the genus *Serranus* which Cuvier has called 'Barbieres.'

In addition to the usual villiform teeth of the Percoid family, there are two strong laniariform teeth in the upper jaw and four in the lower jaw, two near the symphysis, and two half-way between the symphysis and the angle of the jaw. The preoperculum is minutely dentated at its angle, and the operculum is produced posteriorly into three strong spines.

Hunterian.

193. The premandibular bones of a Sea-perch (*Serranus*, Cuv.).

Besides the series of villiform teeth common to most Percoids, it has two large laniariform teeth at the symphysis, and five or six at the middle of the alveolar series, of different lengths.

Hunterian.

194. The dried head of a small Percoid fish: showing the premaxillary, premandibular, vomerine, palatal and pharyngeal teeth: some are laniariform, most are villiform, but all are small. Both preopercular and supratemporal bones have a finely dentated free border. *Hunterian.*

195. The skull of the Barracuda Pike-perch (*Sphyræna Barracuda*); with the dried integuments remaining on the left side.

The premaxillary bones support two strong, compressed lancet-shaped teeth at their anterior ends, and a single row of smaller but similarly shaped teeth along the rest of their alveolar borders. The lancet-shaped teeth of the lower jaw are much larger: those on the palatine bones are the largest of the serial teeth: there is one tusk at the symphysis of the lower jaw of corresponding size with those above, and the summit of a second is appearing through the alveolus.

Amongst the peculiarities worthy of note in this skull, are the columnar process of the alisphenoid, which props up the postfrontal articulation for the epitympanic; the well-marked dentated suture of the pterygoid with the hypotympanic; the superior strength and degree of ossification of the pterygoid, as contrasted with the thin lamelliform entopterygoid, indicating the more constant and important character of the pterygoid. The ossicle articulated with the upper margin of the hinder end of the maxillary has a short obtuse angular process at its upper part, which bends inwards, and it resembles a rudimental ectopterygoid. The tendinous attachments of the great lateral muscles to the paroccipitals have become ossified, like the bone-tendons of the vertebral muscles of the *Moschus*, and those in the legs of Gallinaceous birds.

Hunterian.

196. The skull, wanting the scapular arch, of the Mediterranean Pike-perch (*Sphyræna vulgaris*, Cuv.).

The occipital spine projects simply backwards, and does not encroach upon the upper surface of the skull. The serial teeth of the premaxillaries are more minute and numerous than in the Barracuda, and the large compressed, sharp-pointed, lancet-shaped palatine teeth are fewer in number, and are followed by more minute teeth. The glossohyal is of unusual length, as in other species of *Sphyræna*. The outer wall of the longitudinal foramen of the alisphenoid has a similar slender form to that in the great Barracuda, resembling the similarly situated bone called 'columella' in Lizards.

Hunterian.

197. A skull, wanting the occipital segment, and with the dried integuments left on, of the *Sphyræna Barracuda*, vertically bisected.

It shows well the large size of the subcranial canal, and the position and relative size of the palatal teeth. The valvular fold of gum or buccal membrane behind the premaxillary teeth is preserved.

Hunterian.

198. The upper and lower jaws, and the palatine bones, of the *Sphyræna Barracuda*: showing the different sizes and numbers of the lancet-shaped teeth on these different bones. *Hunterian.*

199. One of the palatine bones of the *Sphyræna Barracuda*.

It supports eleven large lancet-shaped teeth. The cavities of the reserve teeth open at the inner side of the bases of those in place: the teeth appear to be shed alternately, so that a serviceable series is always kept up. The teeth in use, though implanted in sockets, are anchylosed to their parietes.

Mus. Brit.

200. The premaxillary and premandibular bones of a large Barracuda Perch-pike (*Sphyræna Barracuda*).

One of the premandibular bones has been vertically bisected, showing the anchylosis of the base of the teeth with their sockets; and one of the alveoli of reserve has been laid open: the orifices leading to these alveoli are on the inner side of the base of the teeth in place.

Hunterian.

201. The premandibular or dentary pieces of the lower jaw of the Barracuda Perch-pike.

The lancet-shaped teeth are in a single row, as on the palatine bones, but are much smaller, and decrease in size as they approach the symphysis, which supports two teeth equalling the palatine teeth in size.

Hunterian.

202. The dentary or premandibular pieces of the lower jaw of the *Sphyræna Barracuda*. *Hunterian.*

203. The premaxillary and premandibular bones of a Fish, having a single row of small, subcompressed, pointed and incurved teeth, of nearly equal size, along the alveolar border of each of these bands: two of the teeth are rather larger than the rest at the fore-part of the lower jaw. The teeth are implanted in sockets to which they are slightly anchylosed: they are separated from each other pretty regularly by alveoli, from most of which the apex of a successional tooth projects. This dentition resembles that of the Acanthopterygian genera, *Nomæus* and *Sphyræna*, especially the latter. *Hunterian.*

Family *Sclerogenidæ*, or Mailed-cheeked Acanthopteri *.

204. The skull, with part of the dried integuments, of the *Cottus quadricornis*: showing the situation of the teeth on the premaxillary and premandibular bones, on the vomer, the branchial arches and pharyngeal bones. All the teeth are of the villiform kind, those on the jaws being the strongest. The suborbital scale-bones are largely developed. *Hunterian.*

205. A similar specimen of the *Cottus scorpius*. In both these skulls the suborbital dermal bones extend backwards to the preopercular bone, and in both may be noticed the long and strong spine, developed from the preopercular, the wound from which is much dreaded by fishermen. *Hunterian.*

206. The skeleton of the long-spined *Cottus* (*Cottus bubalis*). It is remarkable for the long and strong spines developed from the opercular and preopercular bones. The number of the abdominal vertebræ is 11, that of the caudal vertebræ, 23: total, 34. *Mus. South.*

207. The skeleton of a Gurnard (*Trigla lyra*).

The skull is chiefly remarkable for the enormous development of the anterior suborbital bone, which extends from before the premaxillary to the preopercular bone; defending the

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* 'Joues cuirassés,' Cuv.

whole side of the head: whence the name of this family of fishes, *Sclerogenidæ*, or 'Hard-cheeked.' The carpal bones are unusually large, and the first three digital rays of the pectorals are thicker than the rest, from which they are detached: they are jointed and flexible, and are supplied in the recent fish with nerves, which come off from a special ganglionic swelling of the dorsal or sensory columns of the spinal cord: the summits of the interneural spines are expanded into a series of horizontal, subquadrate, bony plates. The number of abdominal vertebræ is 14; that of the caudal vertebræ is 21: total, 35.

Purchased.

208. A dried specimen of the flying Gurnard (*Trigla volitans*, Linn.; *Dactylopterus communis*, Cuv.).

The posterior prolongation of the long and pointed bony processes from the postfrontal and mastoid regions of the skull, the large suborbital dermal bones, and the strong serrated spines of the preoperculars, are worthy of notice. The six short anterior articulated rays of the pectoral are united by a membrane through four-fifths of their extent, and are detached from the rest of the pectorals: this forms on each side an enormously expanded parachute, capable of sustaining and carrying the fish through a short flight: the posterior portion of the elongated and divided rays of this part of the pectoral are strongest on the under part of the parachute: they are finely jointed at their extremities.

Purchased.

209. The skeleton of a species of *Pristipoma*.

It shows well the serrated margin of the preopercular piece of the gill-cover, a character which is signified by the generic name. The outer surface of the preopercular bone, together with that of the suborbital bones, of the supratemporal and the frontal bones, is excavated or sculptured by a bold reticulate pattern. Both the frontal and superoccipital bones are remarkable for the thickness and density of their osseous texture, which resembles ivory. The third pair of ribs is unusually broad. The anterior dermal spines of the dorsal and anal fins are unusually strong. The number of abdominal vertebræ is 10; that of the caudal vertebræ, 17; =27. The skeleton was brought from the Cape of Good Hope.

Purchased.

210. The skeleton of a Sciænoid fish (*Trachichthys pretiosus*, Lowe; *Hoplostethus mediterraneus*, Cuv. & Val.).

The external surface of the cranium is remarkable for the bold reticulate pattern in which it is excavated or, as it were, sculptured: this character is particularly manifested in the large suborbital scale-bones, from the fore-part of which a bony bridge of the same character spans across the united nasal, prefrontal and vomerine bones. The frontal crest bifurcates and diverges posteriorly: the occipital crest is simple; it is joined to the extremities of the divided frontal crest by two thin plates of bone resembling semilunar valves; but the chief peculiarity in the skull of this rare fish is the large 'bulla ossea' or basicranial cavity formed by the enormous expansion of the basioccipital and basisphenoid bones. The ceratohyal is broad and perforated; the basihyal very small and simple, and the urohyal is much expanded vertically.

The parapophyses begin to be developed from the sixth abdominal vertebra, are united together to form a hæmal canal at the seventh, and contribute to form the posterior boundary of the abdomen at the eleventh vertebra. The ribs are long and slender, and articulated, in the third, fourth and fifth abdominal vertebræ, to deep cavities at the sides of the centrum.

Presented by the Rev. R. T. Lowe, M.A., F.L.S.

211. A portion of the skull of a small Sciænoid fish, showing the coarse reticulate structure of the exterior surface of the bones of the head, which characterizes most of the fishes of this family. *Hunterian.*

Family *Sparidæ*. Sea Breams.

212. The cranium (wanting the opercular bones and the hyoidean and scapular arches), with seven anterior vertebræ of a Sparoid fish of the genus *Sargus*, Cuv.

The incisor-shaped anterior teeth are six in the upper and eight in the lower jaw, as in the *Sargus rufescens*. The superoccipital, paroccipital, and frontomastoid crests are strongly developed: and the presphenoid bone sends down a deep crest.

The centrum of the atlas is wedge-shaped, and presents eight articular surfaces; one anterior and concave for the basioccipital; one posterior and concave for the body of the axis,—these nearly meet below; two flat surfaces on the upper and fore part on which the exoccipital surfaces rest; two on the upper and back part on which the anterior zygapophyses of the axis rest; and two small deep pits above for its own neurapophyses; these elements send out short parapophyses and zygapophyses, which latter rest upon the exoccipitals. The parapophyses are developed from the base of the anchylosed neural arch in the axis; they sink upon the sides of the centrum in the third, and descend lower down in the fourth and fifth vertebræ. The anterior zygapophyses overlap the posterior ones, their relative positions being the reverse of those in Mammalia.

Hunterian.

213. A mutilated skull of a small species of Bream (*Sargus*).

The occipital, parietal and mastoid crests are strongly developed, and the postfrontal also sends out a projecting process. On the right side the tympanic pedicle and its appendages have been removed to show the form of the basisphenoid and the large basicranial canal—the entry to which is divided by a vertical bar or plate; there are six incisors in the upper and eight in the lower jaw, as in the preceding species and in the *Sargus rufescens*. In *Sargus ovis* there are eight incisors in both jaws.

Hunterian.

214. Four pairs of premaxillary bones of the same, or an allied species of *Sargus*: two of the successional incisors are shown in one of the specimens: the molariform teeth are in three rows, the middle row being the smallest and least regular in position. *Hunterian.*

215. The premaxillary and premandibular bones and the teeth of a young individual or small species of *Sargus*. *Hunterian.*

216. A similar specimen. *Hunterian.*

217. The upper and lower jaws of a Sparoid fish, with six incisors above and eight below, succeeded by numerous hemispheroid molar teeth, as in the *Sargus rufescens*. *Hunterian.*

218. The premaxillary and maxillary bones of a large *Sargus*. *Hunterian.*

219. The premandibular bones of the same fish. In the upper jaw the molars are arranged in three rows, the innermost being the largest, those of the middle row the smallest and least regular. In the lower jaw the molars are in two rows, the middle row not being developed in this jaw. *Mus. Brit.*

220. The premandibular bones and teeth of a species of *Sargus* with eight lower incisors. *Mus. Brit.*

221. A similar specimen. *Mus. Brit.*

222. The premandibular bones of a Sparoid fish (*Sargus*) with eight incisive teeth: they singularly resemble the human incisors in the size and shape of the crown; but their base is anchylosed to the substance of the jaw. *Hunterian.*

223. A similar but smaller specimen of the premandibulars of a *Sargus*, showing the crowns of the two median successional incisors protruding on the outer side of the bases of their predecessors. The orifices leading to the concealed alveoli of the successors of the other incisors, are seen in the same relative position to the bases of those incisors. In the human subject, to the incisors of which those of the *Sargus* bear a close resemblance, the successional teeth appear on the inner side of the bases of the deciduous ones. *Mus. Brit.*

224. Several detached incisor and molar teeth of a species of *Sargus*. *Hunterian.*

225. The left premaxillary and premandibular bones of a Sparoid fish (*Sargus*), showing the incisive form of the anterior teeth and the hemispheric tubercular crowns of the posterior or molar teeth: the successional teeth are exposed in some of the closed alveoli. In the Catalogue of 1832 it is referred to the '*Sparus bufonites*' of Lacépède. *Mus. Brit.*

226. The upper and lower jaws of a Sparoid fish from New Holland (*Chrysophrys australis*). The alveolar walls have been removed from the right side of both jaws, to show the germs of the successional teeth in the cavities of reserve. The section likewise shows the union by anchylosis to the jaw of the teeth in use. *Hunterian.*

227. The premaxillary bones and left dentary bone of the Gilthead Bream (*Chrysophrys aurata*). The incisors here present the form of obtuse canines; the molars are arranged irregularly, except those of the outer row: of the inner molars one is remarkable for its superior size and oval shape in each of the three bones. *Mus. Brit.*

228. The premaxillary and premandibular bones of a smaller species of *Chrysophrys*, from the Cape of Good Hope. *Presented by Dr. Leach.*

229. The right premaxillary bone of a young *Chrysophrys*. *Hunterian.*

230. The lower jaw and teeth of a Sparoid fish of the genus *Chrysophrys*.

There is a small bone wedged into the lower angle of the articular piece: the anterior conical teeth are four in number and rather obtuse: the subhemispherical molariform teeth are in two rows on each dentary bone: minute granular teeth are scattered along the inner side of these teeth.

Hunterian.

231. The right premaxillary bone of a Sparoid fish (*Chrysophrys*?), with one long and strong but obtuse laniariform tooth at the fore-part of the alveolar border, succeeded by a second of half its size, and this by a group of nine or ten much smaller and more obtuse teeth. *Hunterian.*

232. The left premaxillary bone of a smaller Sparoid fish with a similar type of dentition. *Hunterian.*

233. The premaxillary and mandibular bones of a Sparoid fish, in which the anterior teeth are shaped like minute canines, the posterior teeth being large and hemispheroidal, as in the foregoing specimens. There are two rows of these molars on each premandibular bone, and three rows on each premaxillary, the inner row being the largest. These numbers of the molar teeth indicate a transitional form between the genera *Chrysophrys* and *Pagrus.* *Hunterian.*

234. The premaxillary and premandibular bones of a Bream of the genus *Pagrus*, and of a species allied to, if not identical with, the *Pagrus orfus*, Cuv. *Hunterian.*

235. The premaxillary and premandibular bones of the same species of *Pagrus.* *Hunterian.*

236. The maxillary and mandibular arches of the Rock Bream, from the Cape of Good Hope, called by the Dutch colonists 'Stein-brass' (*Dentex rupestris*).

A portion of the outer alveolar wall of the left premaxillary bone has been removed to show the germs of the successional teeth: they make their appearance on the outside of the teeth which they displace.

Presented by Wm. Norris, Esq.

237. The premandibular bones of a Sea Bream of the genus *Dentex*, allied to *D. argyrozona*, having four long and strong laniary teeth at the fore-part of the jaw. One of these has been shed or broken away from the process of the jaw-bone to which it was anchylosed: the alveolar cavity of its successor is exposed. The fish was caught off Malemba during the Expedition to the Congo, under the command of Captain Tuckey, R.N., in 1816. *Presented by Dr. Leach.*

238. The left premaxillary bone of a species of *Dentex*: one of the large anterior tusks has been shed. *Hunterian.*

239. The premaxillary and premandibular bones of a Sea Bream of the genus *Dentex*, having in the upper jaw an outer row of moderate-sized conical pointed teeth, with an inner narrow band of villiform teeth; and in the lower jaw four

larger conical teeth, with some very small ones at the symphysis, and a single row of small conical teeth on the rest of the alveolar border. *Hunterian.*

240. The dried head of a small Sparoid fish of the genus *Lethrinus,* Cuv.; showing the premaxillary, mandibular and pharyngeal teeth. The anterior teeth on both upper and lower jaws are laniariform, the posterior ones molariform, both in a single row: behind them are numerous minute villiform teeth. The upper and lower pharyngeals present teeth 'en cardes'; those above curving backwards, those below, forwards. *Hunterian.*

241. The interneural and dermoneural spine of a large Sparoid fish; showing the peculiar interlocked or linked mode of articulation common to these parts of the dermal skeleton in many other fishes. *Hunterian.*

242. The skeleton of a Mackerel (*Scomber scombrus*). The ribs are long and slender; the epipleural spines are continued beyond the ribs from the bases of the parapophyses, after these have bent down to form the hæmal canal. The number of abdominal vertebræ is 15; that of the caudal vertebræ, 16: total, 31. *Mus. South.*

243. The right half of the skull of a Mackerel (*Scomber scombrus*), with the integuments and branchial arches; showing the valvular fringe of long ciliated processes from the concave side of the first arch, and the double row of minutely dentated tubercles from the concave sides of the succeeding arches. The rasp-like series of teeth on the upper pharyngeal bones are also well shown. *Hunterian.*

244. The left half of the branchial arches of a Mackerel (*Scomber scombrus*). *Hunterian.*

245. The dried head of a Scomberoid fish (*Trichiurus*). The maxillary and premandibular teeth are compressed and lancet-shaped: the three vomerine teeth have longer and stronger crowns, and are barbed posteriorly. The integuments are preserved on this skull.

Presented by Fr. Bennett, Esq., F.L.S.

246. A skull of the same species, vertically bisected.

Presented by Fr. Bennett, Esq., F.L.S.

247. Three caudal vertebræ of the Tunny (*Scomber Thynnus*, Linn.; *Thynnus vulgaris*, Cuv.).

The bodies are flattened laterally, the neural and hæmal arches depressed and extended horizontally backwards so as to give a four-sided shape to the vertebræ. The flattened neural and hæmal spines of one vertebra are pressed, as it were, into the neural and hæmal canals of the succeeding vertebra, so as to retain their connection, the series being naturally articulated or interlocked. A line of division may be seen at each articular extremity, between the terminal osseous cones and the intervening part of the centrum; but a vertical section through the middle of the centrum shows that they have completely coalesced at that part, and also exposes a vascular cavity continued from the hæmal canal upwards.

Hunterian.

248. The skull of a large Sword-fish (*Xiphias gladius*).

The mesotympanic has coalesced with the epitympanic, but the pretympanic and hypotympanic continue distinct. The stylohyal articulates with the upper extremity of the coalesced mesotympanic. The wide and shallow form of the basicranial canal is well shown in this specimen.

Mus. Brit.

249. The prolonged premaxillary rostrum, or sword, of a *Xiphias*, with the prefrontal and part of the frontal bones. *Hunterian.*

250. A vertically bisected incomplete skull of a Sword-fish (*Tetrapturus belone*), with the first two vertebræ.

The alveolar borders of the upper and lower jaws are beset with minute villiform teeth, and the like extend along the sides and under part of the rostrum or 'sword,' which is formed chiefly by a prolongation of the premaxillaries, and is rounded in the present genus. In both genera of Sword-fishes the whole of the anterior part of the extensive interorbital space is occupied by the prefrontals, which join each other at the median line by an extensive vertical cellular surface: they form the anterior border of the orbit, and the posterior wall of the nasal fossa; they close the cranial cavity anteriorly, and transmit the olfactory nerve to the capsule by a central foramen. They are almost entirely covered by the frontals above, which they support by a broad flat surface; a very small portion only appearing on the upper surface of the skull at the anterior angle of the orbital ridge. Were the frontals separated, the prefrontals would then appear, as in the frog, at the median line: were the suture between the two prefrontals to be obliterated in *Xiphias*, an 'os en ceinture' would be produced like that of the frog. The nasal bone of the Sword-fish, which Cuvier calls 'ethmoïde,' presents a cellular structure of its base, designed to break the force of the concussion arising from the blow which is delivered by the 'sword.' But the prefrontals manifest more extensively this peculiar cellular structure, which Cuvier well says, "l'on prendrait presque pour les cellules de l'ethmoïde d'un quadrupède."

Mus. Brit.

251. The lower jaw of a Sword-fish, showing the rasp-like disposition of the minute teeth upon its alveolar borders. *Mus. Brit.*

252. The skeleton of the Rose-coloured Dory (*Zeus roseus*, Lowe).

The parapophyses are developed, and form hæmal arches from the fifth, sixth, seventh, eighth, ninth and tenth abdominal vertebræ; the eleventh arch articulates with a long anterior interhæmal spine, which forms the posterior boundary of the abdominal cavity, and indicates the first caudal vertebra. The stylohyal is articulated to the junction of the epitympanic and mesotympanic; the ceratohyal is much expanded, of a subquadrate form; the glossohyal is of great length; the urohyal is of great breadth, and bent upon itself upwards on each side, forming a concavity towards the branchial arches articulating with part of the extremity of the ceratohyal. The number of abdominal vertebræ in this skeleton is 11; that of the caudal vertebræ 21, =32.

Presented by the Rev. R. T. Lowe, M.A., F.L.S.

253. The skeleton of a Dory (*Zeus faber*).

The mouth of this fish being remarkably protractile the tympanic pedicle is of great length, and the nasal processes of the premaxillary surpass the alveolar ones in length: they play upon a smooth concavity above the nasal and frontal bones. The expanded summits of the interneural spines form broad and irregular osseous scales on each side the origin of the dermoneural spines. The same modification is repeated with the interhæmal spines below, and a chain of homotypal osseous scales is continued from the first caudal interhæmal spine to the pelvic bones, and from these to the urohyal bone. The parapophyses begin to be developed at the eighth abdominal vertebra, and immediately meet below its centrum, circumscribing a canal for the aorta: they are continued under the same form, and are similarly united in the succeeding abdominal vertebræ to the fifteenth, where they are suddenly produced downwards to the commencement of the anal fin: a pair of very slender pleurapophyses is continued from the lower united part of the parapophyses of the six posterior abdominal vertebræ: similar ribs are continued from the under part of the bodies of some of the vertebræ anterior to these. The number of abdominal vertebræ is 12; that of the caudal vertebræ is 18, =30.

Mus. South.

254. The skeleton of the Opah-fish (*Lampris guttata*).

The abdominal parapophyses are short: the pleurapophyses are articulated to depressions at their back part; they progressively elongate as they approach the posterior part of the abdomen, where they are of unusual length. The fronto-occipital spine rises to a great height, and its base extends from the foramen magnum to the nasal bone. The lateral ridges formed by the cranial parapophyses, viz. the postfrontals and mastoids, are almost equally developed horizontally. The coracoids are much expanded inferiorly, they meet along an extensive symphysial surface, and form a large and equable concavity directed backwards. The ulna is large and perforated; but the radius is enormously developed and meets its fellow below and behind the coracoids, like a second arch. The epicoracoid consists of two pieces; the upper expanded portion is attached to the coracoid, the lower elongated and slender portion adheres to the posterior margin of the radius; it is of very great length. The pubic bones are attached to the lower united ends of the radius. The terminal anchylosed bodies of the caudal vertebræ send out a horizontal ridge on each side. The number of abdominal vertebræ is 20; that of the caudal vertebræ is 28, =48.

Mus. South.

255. The skull of the Cock-fish (*Argyreiosus Vomer*, Cuv.).

The suborbital bones and the left half of the maxillary and mandibular arches have been removed to show the proper bones of the cranium, the hyoid, and the branchial arches. The silvery pigment is laid upon both the inner and outer sides of the large suborbital, the opercular, the subopercular and interopercular bones; but not upon the preopercular bone.

The stylohyal is articulated to the interspace or ligamentous joint between the epitympanic and the mesotympanic, and it is connected by a strong fascia to the pretympanic; it articulates at an acute angle with the epihyal, which is a flat triangular bone: the ceratohyal is a larger and broader plate. The basihyals form a bony cell, convex forwards, supporting, above, the glossohyal, which is shagreened with minute teeth; and having articulated to their posterior concavity, the urohyal, which expands into a very broad, thin triangular plate, whose base is attached by ligament to the coracoid symphysis.

The first branchial arch sends forwards from its anterior concave border a series of compressed, long and narrow triangular ossicles dentated on their inner border: these ossicles are nearly as long as the gill-filaments that project from the opposite border. The inner side of this branchial arch supports a series of tubercles minutely shagreened, and fitting into the intervals of a similar series from the contiguous side of the next arch. No anterior processes are sent off from the second or succeeding arches; the fifth or pharyngeal arch supports a long inequilateral triangular patch of short villous teeth.

Presented by Prof. Owen, F.R.S.

256. The skeleton of the Arthritic Chætodon (*Platax arthriticus*).

Like all deep-bodied fish, it is remarkable for the length of the neural and hæmal spines, and of the dermal spines supporting the dorsal and anal fins; but it is peculiarly distinguished by the development of masses of osseous matter at different parts of the skeleton. The anchylosed spines of the cranial vertebræ form a large compressed triangular piece like the crest of a helmet, thick and convex in front, sharp-edged behind. A second smaller mass of bone is developed at the summit of the first interneural spine. The neural spines of the second, fourth, sixth and eighth caudal vertebræ are similarly developed, and the third caudal spine in a slighter degree. The base of the first interhæmal spine swells into a large oval tubercle, and the extremity of the hæmal spine of the eighth caudal vertebra expands into a similar but smaller tubercle. The two pelvic bones are expanded into pyriform tubercles, and four of the middle pairs of ribs are similarly expanded, but in a slighter degree. The heads of the ribs articulate with deep cavities in the sides of the bodies of the abdominal vertebræ.

The teeth of the *Platax* are very small and numerous, as in the rest of the Chætodont family, but are distinguished by their tricuspid summits.

Fig.—Phil. Trans. lxxxiii. tab. v. and vi. from this specimen.

Habitat.—The Indian Seas.

Sent to England by William Bell, Esq., and presented to Mr. Hunter by Sir Joseph Banks, Bart.

"The skeleton is very singular, many of the bones having tumours, which, in the first fish I saw, I supposed to be exostoses arising from disease; but on dissecting a second, I found the corresponding bones had exactly the same tumours, and the fishermen informed me they were always found in this fish: I therefore conclude them to be natural to it. In Mr. Hunter's collection are two or three of these bones, but I never knew what fish they belonged to; they were supposed to be from the back of some of the large Rays. What advantage can arise from these large tumours is difficult to say. Those on the spines of the vertebræ seem to answer no evident purpose, nor those at the origin of the dorsal and anal fins. The particular form of the sternum, to which the ventral fins are joined, seems to be intended to give greater surface for the attachment of the muscles, and to increase their action." —*Extract from Mr. Bell's paper on this fish, in the* 'Philosophical Transactions,' *read January* 17*th*, 1793.

Hunterian.

257. The premandibular and premaxillary bones of a *Chætodont* fish, which, from the trifid character of the summits of the teeth, belongs to the genus *Platax*.

The following are the Hunterian specimens referred to by Mr. Bell:—

258. One of the expanded ribs of the *Platax arthriticus*. *Hunterian.*

259. The long interhæmal spine of the first caudal vertebra of the *Platax arthriticus*, the distal extremity of which expands into a very large bony mass, and presents articulations for the two anterior spines of the anal fin. *Hunterian.*

260. The fourth caudal vertebra of the *Platax arthriticus*; showing the osseous tubercle of its spinous process; small anterior and posterior zygapophyses, forming accessory neural arches, are developed from its base. *Hunterian.*

261. The eighth caudal vertebra of the *Platax arthriticus*, in which a bony tubercle is developed upon both the neural and hæmal spines, the latter being the largest. *Hunterian.*

262. Two specimens apparently of interneural spines of a *Chætodont* fish, with the summits expanded into large oval bony tubercles, which show no articulation for a dermal spine. *Hunterian.*

263. A similar spine, apparently of the same fish, but with its summit much less expanded.

In this, as in No. 262, the thickened summits are bent nearly at right angles with the spine.

Hunterian.

264. An interneural and dermoneural spine, joined together by the usual linked articulation. The interneural spine has an elongated pyramidal form with four sharp ridges, one anterior, one posterior, and two lateral. *Hunterian.*

265. An interneural spine supporting two dermoneural spines, by the usual linked articulation. The summit of the interneural spine expands into a very thick irregular mass of osseous matter grooved posteriorly; the dermoneural spines are very short and thick. The specimen is probably from a species of *Ephippus.* *Hunterian.*

266. A similar specimen. *Hunterian.*

267. A similar but smaller specimen. The interneural spine is less expanded at its summit in proportion to its length. *Hunterian.*

268. A similar specimen, with the base of the interneural spine less expanded. *Hunterian.*

269. A similar specimen, with the base of the interneural spine less expanded. *Hunterian.*

270. A similar specimen, with the base of the interneural spine reduced almost to its normal proportions. *Hunterian.*

271. A similar specimen, with the anterior of the two dermal spines broken away. *Hunterian.*

272. An interneural spine of the same species, with a considerably expanded summit. *Hunterian.*

273. A similar specimen. *Hunterian.*

274. A similar specimen. *Hunterian.*

275. A similar specimen. *Hunterian.*

276. An interneural spine supporting two dermoneural spines by the usual linked articulation: the summit of the interneural spine is much expanded, but it differs from the preceding specimens by having a ridge posteriorly instead of a groove. Both of the spines, which are short and thick, are grooved along their anterior border. *Presented by Sir Everard Home, Bart., F.R.S.*

277. The cranium and six anterior vertebræ of the trunk of a Light-horseman fish (*Ephippus*). The midfrontal bone and superoccipital spine are remarkable for their thickness. The neural arch of the atlas is almost excluded from the body by the approximation of that of the axis to the exoccipitals. *Hunterian.*

278. The cranium of a large *Ephippus*. In this, as in the preceding specimen, may be noticed the three concave articular surfaces formed respectively by the postfrontal, mastoid, and paroccipital bones, for the attachment of the tympano-mandibular, hyoidean and scapular arches, which surfaces and connections illustrate the parapophysial character of those bones. The palato-maxillary arch is directly suspended from the prefrontal, which is the neurapophysis of the anterior vertebra of the skull. *Hunterian.*

279. The partially disarticulated bones of the cranium with the larger otolites of an *Ephippus*. They are numbered conformably with Table I. *Hunterian.*

280. A cranium of the Light-horseman fish (*Ephippus*), transversely bisected through the middle of the cranial cavity. *Presented by George Bennett, Esq., F.L.S.*

281. A vertical longitudinal section of the cranium of an *Ephippus*.

It shows the three principal divisions of the otocrane; the upper and posterior excavated in the paroccipital, the upper and anterior in the postfrontal, the lower one in the alisphenoid and basioccipital: in the middle of these is a portion of the mastoid, which presents two small but deep depressions, the posterior depression being continued into the exoccipital. This portion of the mastoid, which contributes to form the 'otocrane,' may be regarded as part of the true capsule of the organ of hearing, connate with the proper mastoid, as the entire capsule, or petrosal, becomes in birds and mammals. The alisphenoid gives exit to the chief divisions of the fifth pair of nerves by three or four distinct apertures. It sends a horizontal plate inwards, which meets and unites with a corresponding one of the opposite bone to form the proper floor of the cranial cavity; and it sends a broad and deep plate downwards to the basisphenoid forming the antero-lateral part of the basicranial canal. As this canal lodges the origins of the recti muscles of the eye, it may be regarded as a posterior prolongation of both orbits; it is partially divided by a descending azygous process from the line of junction of the horizontal plates of the alisphenoids; the plate is perforated behind this process.

In this section the compact and finely granular texture of the large fronto-occipital crest and of the thickened frontal is well shown.

Presented by Prof. Owen, F.R.S.

282. The dried head of a species of *Chætodon*; showing the numerous rows of bristle-shaped teeth in its jaws, to which the name of the genus relates.

Hunterian.

283. The skull of a small *Chætodont* fish, with a single close-set row of long slender denticles having simple obtuse summits, and a stronger recurved laniariform tooth terminating the series posteriorly, in each jaw.

The orifices of the cavities of the reserve teeth open externally to the bases of those in place. The cranium presents a triangular form; the occiput is smooth and convex; the mastoid ridges are thin, but high, and converge and meet upon the parietal region of the cranium. The orbits suddenly expand in front of the contracted cranium; they intercommunicate widely, and are completed below by a slender chain of suborbitals.

Hunterian.

284. The premandibular and dentary pieces of a large *Chætodont* fish from Sumatra. The teeth, though small, are stronger than usual in this family, and differ from those of the *Platax* in having simple conical pointed crowns. These and the two preceding specimens were transmitted to Hunter, from Sumatra, by his former assistant and artist, Mr. William Bell. *Hunterian.*

285. A broad interneural spine, with a long dermoneural spine, of a large *Chætodont* fish. *Hunterian.*

286. A large interneural spine, singularly expanded and excavated, decreasing in size to its articular end, to which a short dermoneural spine is articulated by the usual bony link. *Mus. Leverian.*

287. A long interneural spine, supporting a still longer dermoneural spine, linked together in the usual way. A short tubular process extends upwards from the base of the interneural spine, behind the articulation. *Hunterian.*

288. Two interneural spines, each supporting two dermoneural spines, by the usual linked articulation. *Hunterian.*

289. A similar but smaller specimen of an interneural spine supporting two dermoneural spines, from a *Chætodont* fish of the South Seas. *Hunterian.*

290. A similar specimen longitudinally bisected, showing the thin compact walls, including the coarse cancellous texture, of the proper interneural spine: the expanded portion consists of an outer compact and an inner cancellous structure surrounding the compact walls of the spine, the expanded mass resembling an exostosis produced by thickening of the periosteum of the proper spine. *Presented by Prof. Owen, F.R.S.*

291. A very long interneural spine, with two dermoneural spines united to its expanded summit by the linked mode of articulation, of a *Chætodont* fish. The first of these spines is very short, and fits into a depression at the forepart of the base of the longer spine. It probably serves, by the action of muscles, to keep that spine erect, as in the *Balistes*. *Hunterian.*

292. The right coracoid with the radius and ulna of an unknown *Chætodont* fish. The lower part of the coracoid is characterized by an oblong trihedral mass of bone filling its posterior concavity. *Hunterian.*

Family *Tænioïdei.* Riband-fishes.

293. The skeleton of the Scabbard-fish (*Lepidopus argyreus*).

The superoccipital is smooth and convex posteriorly; the spine begins to be developed at its upper and anterior part. The paroccipitals are of great length. Each premaxillary has a row of about twenty compressed lancet-shaped teeth, and there is the same number in the premandibular part of the lower jaw: both are implanted in sockets. Behind the fore-part of the premaxillary row of teeth there are two or three teeth much longer than the rest, compressed, recurved, pointed, and slightly barbed. The anterior suborbital bone is of considerable size. The number of abdominal vertebræ is forty-two. The pleurapophyses are moderately long and slender, and articulate with the middle of the sides of the centrum; the parapophyses do not begin to be developed until the thirty-ninth vertebra. The interneural and dermoneural spines are continued from the superoccipital to the end of the tail, and support a continuous dorsal fin. Interhæmal and dermohæmal spines support a similarly continuous anal fin throughout the region of the tail: fifty-one caudal vertebræ are preserved in this skeleton.

Purchased.

Family *Fistularidæ.*

294. The cranium of the *Fistularia tabaccaria.* It is peculiar amongst fishes for the convex articular surface presented by the basioccipital for junction with the atlas. *Hunterian.*

295. The cranium and some of the anterior vertebræ of the trunk, including the first four modified and elongated vertebræ, of the Tobacco-pipe fish (*Fistularia tabaccaria*). *Hunterian.*

296. The four anterior trunk-vertebræ of the *Fistularia tabaccaria.* They are remarkably elongated, the bodies are immoveably joined together by deeply indented sutures, and the spines and parapophyses overlap each other and form three continuous ridges, constituting a firm inflexible support to the similarly modified and elongated vertebræ of the skull. *Hunterian.*

Family *Gobiidæ.*

297. The skeleton of the Sucking-fish (*Echeneis Remora*).

The skull is remarkable for the breadth and flatness of its upper surface, which supports the sucking apparatus. The basioccipital offers a small concave surface to the body of the atlas, but the chief part of the articulation is formed by the two oblong surfaces presented by the exoccipitals. These elements meet above the foramen magnum, where they form part of the upper surface of the head. The paroccipitals present the usual concave surface for the suprascapula. The superoccipital forms a horizontal slightly convex plate surrounded by the exoccipitals, paroccipitals, mastoids and parietals. The mastoids have a great transverse extent. The frontals are of unusual size, are joined together by the frontal suture, and form the middle part of the upper surface of the cranium. The nasal bones are of considerable breadth, and are united by a thin layer of bone at the middle line. A membranous fontanelle has existed between them and the frontals. The orbit is completed below by a chain of suborbital bones. The tympanic pedicle articulates by the epitympanic with the mastoid, and, apparently, by the pretympanic with the postfrontal. The hyoid arch supports ten branchiostegal rays on each side. The coracoids are bent upon themselves so as to form a deep channel on their convex side. The pubic bones, which are attached to the inner side of the coracoids, send backwards a small process from their symphysial union. The neural spines begin to rise at the sixth and seventh vertebræ, beneath the posterior extremity of the suctorial disk. The osseous basis of this disk is formed by the interneural spines, which expand into transverse bars at their summits and receive at their interspaces the transversely developed dermal spines which overlap each other, and support each a finely denticulated transverse ridge along the middle of their upper surface: these ridges incline backwards, and are flexible. The bodies of the vertebræ are smooth, elongated, and much compressed in the middle. The parapophyses are moderately long, and extend horizontally outwards and a little forwards: the epipleural spines begin to be developed from those of the atlas, and the pleurapophyses from those of the third vertebra. The first pleurapophysis is short, increases in breadth as it descends, and bifurcates at its lower extremity: the rest of the pleurapophyses are simple, and progressively decrease in length from the fifth to the tenth: those of the eleventh pair bend inwards and meet below, but the hæmal arch of the succeeding vertebra is formed by a similar disposition of the parapophyses. The epipleural spines continue to be developed from the first five caudal vertebræ: in the eight anterior abdominal vertebræ they extend outwards and backwards, and form, with the elongated parapophyses, the basis of support to the suctorial disk.

Presented by George Bennett, Esq., F.L.S.

298. The skull, with the integuments and sucking disk, of a large *Remora*. The two large exoccipital condyles and intermediate basioccipital concavity are well shown, as also the characteristic extension of the teeth upon the exterior surface of the jaws. *Presented by George Bennett, Esq., F.L.S.*

299. The branchial arches of the Sucking-fish (*Echeneis Remora*).

The first pair sends off from its anterior border a series of pointed processes and from its posterior margin a series of tubercles; corresponding tubercles are developed from the sides of the second, third and fourth arches. They interlock with each other like the teeth of a cogwheel, and prevent the entry of food or other foreign irritating matters into the interspaces of the gills. The modified fifth branchial arch, forming the upper and lower pharyngeal jaws, has its inner surface covered with fine villiform teeth.

Presented by George Bennett, Esq., F.L.S.

Family *Blenniidæ.*

300. The skeleton of a Wolf-fish (*Anarrhicas Lupus*).

The occipital region is smooth and convex; a very small occipital spine is developed from its upper part. The supratemporal scale-bone presents the form of a mucous tube, and the mucous canal perforates the ridge which divides the occipital from the lateral surfaces of the cranium. The lateral surfaces are smooth, excavated, and almost meet upon the parietal region of the cranium, forming a surface analogous to that for the attachment of the great temporal muscles in the Wolf and other carnivorous quadrupeds. The suborbital bones are well-ossified, and are perforated by mucous ducts. The stylohyal is attached to the fibro-cartilage uniting the epitympanic to the mesotympanic. The parapophyses progressively increase in length as the vertebræ recede from the head, then bend down, and unite below the twenty-fifth vertebra. The short pleurapophyses are attached to the back part of their extremities, and the epipleural spines are sent off near the place of their attachment, and from the parapophyses themselves at the back part of the abdomen. The carpal bones are of unusual breadth.

Mus. South.

301. The skull, wanting the hyoid and scapular arches, and with the first four abdominal vertebræ attached, of the Wolf-fish (*Anarrhicas Lupus*).

In this skull may be remarked the extraordinary downward development of the basipre-sphenoid and the expansion of the vomer, which is beset with large crushing teeth. The premaxillary and anterior mandibular teeth are long, strong, pointed and divergent, adapted to grapple with hard shells or crustaceous animals, which the posterior mandibular, the palatine and vomerine teeth are adapted to crush. The suborbital scale-bones are thick, strong, well-ossified, and completely circumscribe the orbital cavities.

Hunterian.

302. The skull, wanting the hyoid and scapular arches, of a Wolf-fish (*Anarrhicas Lupus*). Portions of the premaxillary and mandibular bones have been removed from the bases of the teeth, showing the absence of cavities and teeth of reserve in the substance of those bones. *Presented by Prof. Owen, F.R.S.*

303. The skull and some of the anterior vertebræ of the Wolf-fish (*Anarrhicas Lupus*), longitudinally and vertically bisected; showing the short and wide infundibuliform basicranial cavity, and the coarse cellular structure of the strong and

deep vomer above the denser part to which the large molar teeth are anchylosed. The names of the bones are indicated by the numbers according to Table I. *Hunterian.*

304. The vomerine, palatal and premaxillary bones of a Wolf-fish (*Anarrhicas Lupus*); showing the laniary teeth on the premaxillaries, the molar teeth on the vomer, and both kinds of teeth on the palatines. *Hunterian.*

305. The left ramus and a section of the lower jaw of the same fish. The cut surfaces show the solid structure and the mode of attachment of the teeth. *Hunterian.*

306. The right ramus of the lower jaw of a Wolf-fish (*Anarrhicas Lupus*). *Hunterian.*

307. The right ramus of the lower jaw of a Wolf-fish (*Anarrhicas Lupus*), from the symphysis of which a vertical section has been removed; showing the line of separation between the bases of the teeth and the summits of the dentigerous processes of the jaw, to which the teeth are partially anchylosed, by root-like divisions of their base. *Presented by Prof. Owen, F.R.S.*

308. The premandibular or dentary pieces of the lower jaw of a Wolf-fish (*Anarrhicas Lupus*). *Hunterian.*

Family *Lophiidæ*.

309. The skeleton of the Angler (*Lophius piscatorius*).

It is chiefly remarkable for the enormous development of the head, to which both pelvic and pectoral fins are articulated, the great length of the branchiostegal rays, the fin-like development of the subopercular bone, the ray which extends from the upper part of the opercular bone, the confluence of the suprascapular and scapular bones, the diminutive size of the ulna and radius, and the great length and strength of the two carpal bones, especially of the one on the radial side of the wrist. The oblique overlapping joints of the phalangial rays are well shown. There are no vertebral ribs (pleurapophyses) in the trunk, and the parapophyses, which begin to be developed from the lower and lateral angles of the centrum of the seventh abdominal vertebra, do not project outwards: the broad bases of these processes extend before and behind into short angular projections, corresponding with the zygapophyses developed from the neural arches, and they contribute to the interlocking mode of union of the different vertebræ with each other: the bases of the parapophyses are likewise perforated directly for the passage of the blood-vessels, as those of the neurapophyses are for the passage of the nerves above.

The terminal coalesced caudal vertebræ present a transverse ridge on each side. The number of the abdominal vertebræ is 12; that of the caudal vertebræ, 16: total, 28.

Purchased. Mus. South.

310. The first and second trunk vertebræ of the Angler (*Lophius piscatorius*). The anterior surface of the atlas presents a middle, almost flat, transversely oblong articulation for the basioccipital, and two lateral vertically elongated and concave surfaces for the exoccipitals, besides the two anterior zygapophyses articulating with the upper surface of the exoccipitals. The neurapophyses have coalesced with the centrum: the spinal nerves have perforated the bases of the neurapophyses. *Hunterian.*

311. A dorsal vertebra, vertically and longitudinally bisected, of the Angler (*Lophius piscatorius*). *Presented by Prof. Owen, F.R.S.*

312. A more posterior dorsal vertebra of the Angler (*Lophius piscatorius*).

The terminal concave articular surfaces intercommunicate by a minute foramen at the middle of the centrum. The parapophyses form the sides of a deep open groove along the under surface of the centrum.

Presented by Prof. Owen, F.R.S.

313. A caudal vertebra of the Angler (*Lophius piscatorius*).

The parapophyses are produced downwards and united together, completing the hæmal canal, and then extend obliquely backwards into a spine (marked *h* in the specimen). The confluent neurapophyses are similarly produced upwards and backwards into a spine (marked *n*). Both neural and hæmal canals are left, by the oblique position of their protecting arches, open, opposite the centrum, where they are closed by the neural and hæmal arches of the vertebra in advance. The bases of the neurapophyses and of the left parapophysis are perforated. The osseous texture of the vertebræ of the Lophius is reticulate, cellular, and remarkably light.

Hunterian.

314. The interneural spine with two of the attached dermal spines of the Angler (*Lophius piscatorius*). The latter are extremely long, slender and flexible: they are articulated by the same linked articulation as in the more completely ossified fishes. *Hunterian.*

315. The premandibular bones of a large Angler (*Lophius piscatorius*). *Hunterian.*

316. A similar specimen of smaller size. *Hunterian.*

317. The premandibular bones of an Angler (*Lophius piscatorius*).

The circumstances under which the specimen was taken to which these bones belonged are worthy of note. The animal was caught in the North Atlantic Ocean, 1000 miles from land, in a bunch of Sargasso sea-weed, by *William Irish, Esq.*, Commander of the 'Admiral Berkeley,' from Rio de la Plata, 16th May, 1809.

Presented by Capt. W. Irish, R.N.

318. A transverse section of the premandibular bone of a *Lophius piscatorius*, showing the ligamentous union of one tooth and the anchylosis to the bone of two other teeth, with the pulp-cavities of the latter still unobliterated. The dental ligaments are elastic in the recent fish.

See the Wet preparation, Physiological Series, No. 381.

Presented by Prof. Owen, F.R.S.

319. The fore-part of the dentary bone of a *Lophius piscatorius*, showing the ligamentous mode of attachment of the inner row of teeth to the bone.

Hunterian.

320. A section of the right dentary bone of the lower jaw of the *Lophius piscatorius*. Here, as in the preceding preparation, the largest teeth form the inner row.

Presented by Prof. Owen, F.R.S.

321. The left dentary piece of the lower jaw of the *Lophius piscatorius*. *Hunterian.*

322. The superior and inferior pharyngeal bones of the *Lophius piscatorius*.

Hunterian.

323. The right dentigerous pharyngobranchial bones, apparently of a *Lophius*.

Hunterian.

324. The left inferior pharyngeal bone and teeth of a large *Lophius*. *Hunterian.*

325. The fore part of the dried head of a Lophioid fish (*Malthæa*). The fore part of the cranium is prolonged into a rostrum. The premaxillary, premandibular, vomerine, palatal and pharyngeal bones are all beset with numerous minute villiform teeth. *Hunterian.*

Order VI. PLECTOGNATHI.

Family *Balistidæ*. File-fish.

326. The skeleton of a File-fish (*Balistes*).

The anterior interneural spine is bent abruptly forwards, and its summit is much developed and articulated to the back part of the occipital spine: it is excavated at its upper and posterior surface, and in this cavity two dermoneural spines lie concealed when recumbent. These spines are articulated to the fore part of the interneural expanded plate by the peculiar linked form of joint common to such species: when both are erected, the fore part of the base of the smaller anterior spine fits into the back part of the base of the large one, and fixes it in the erect position like the lock of a gun at full cock. The small spine requires to be moved by its muscles before the larger one can be bent back.

The orifices for the spinal nerves are pierced through the middle of the base of the neurapophyses. The pelvic bones and the epicoracoids are both remarkably developed.

The number of abdominal vertebræ is 6, that of the caudal vertebræ, 11: total, 17.

Purchased.

327. The skull of a File-fish (*Balistes forcipatus*) with the skin left on the right side, showing the rough ganoid surface of the scales. The exposed bones on the opposite side are indicated by the numbers, according to those in Table I.

The pelvic bones are of remarkable length; they are attached to the symphysis of the coracoids. The mesotympanic is unusually long and slender, reaching almost to the joint for the lower jaw: it is continuous in the recent fish with the cartilage which enters the cavity of that jaw. The palatine bone is small and hammer-shaped; one end of its expanded head articulates with the prefrontal, the opposite end with the maxillary: the coalescence of this bone with the premaxillary and of the articular with the dentary piece in the lower jaw are the characters signified by the name 'Plectognathi,' which Cuvier has given to the family of fishes to which the genus *Balistes* belongs. The extraordinary downward development of the vomer and the large basicranial canal are worthy of notice in this specimen.

Mus. Brit.

328. The premaxillary, premandibular, and one of the maxillary bones of the *Balistes forcipatus*.

In this species the teeth of the upper jaw are 14 in number, and are arranged in two rows, seven in each intermaxillary bone, four in the front row and three behind. In the lower jaw there are eight teeth corresponding with the front row above. The anterior or external teeth of the upper resemble those of the lower jaw; they are strong, conical, subtrihedral, hollow at the base, which is obliquely truncated, and rounded and obtuse at the apex. The mesial pair is slightly curved, and is the largest; the rest decrease in size to the outermost. The external facet of each tooth is covered with a smooth, dense, enamel-like substance, which, towards the apices of the teeth, presents a yellow colour, and calls to mind the peculiar colour of the enamel in some of the Rodentia. These outer maxillary teeth are arranged in close contact with one another. The form of the alveolus in which the base of each tooth is fixed, is peculiar in the dental system, resembling rather the surface of attachment for the claw in the ungual phalanges of the feline quadrupeds. A conical process of the bone rises from the middle of the alveolar depression, and is adapted to the cavity in the base of the tooth. The circumference of the base of the fully-formed tooth is attached by a slight anchylosis to the margin of the alveolus, but the confluence of the tooth with the bone is much less complete than in many other fishes. In the left premaxillary the successors of the external teeth have been exposed by removing the outer wall of their alveoli. These cavities communicate with the outer side of the jaw by foramina situated on the outer side of the base of the teeth in place. The teeth of the posterior row, which are peculiar to the upper jaw, are six in number, three in each intermaxillary bone; they present the form of elliptical plates, compressed laterally, rounded at the base and slightly pointed at the apex. The anterior tooth is the largest, measuring six lines in length and three in breadth, but scarcely half a line in thickness; the two other teeth progressively diminish in size. These posterior teeth lie in close juxtaposition with the outer row, and like the posterior small upper incisors of the hare and rabbit, receive part of the appulse of the inferior teeth. They are affixed by a very oblique and slightly excavated base to a shallow alveolus, having a convex rising of bone in its middle. They are also deciduous, and the presence of well-developed reserve teeth in cavities of the jaw, immediately internal to those of the exterior row, would indicate that the succession of teeth of the inner row is likewise unlimited. The foramina leading to the cavities of the successional teeth are seen immediately above the bases of the teeth in place; the germs of the successors of the inner row of teeth are exposed in their alveoli in the left intermaxillary bone.

Hunterian.

329. The branchial and pharyngeal arches of the *Balistes forcipatus*, with the dried gills.

The pharyngeal teeth are small, conical, compressed, curved and sharp-pointed: there are two regular and equal rows above, one on each of the posterior pharyngobranchial bones. The inferior pharyngeal bone supports two unequal rows of teeth, the anterior the smallest. The curvature of the upper and that of the lower pharyngeal teeth are reversed, and they thus form a kind of carding-machine, well-adapted for 'teasing' the bruised and coarsely divided sea-weeds and other marine nutrient substances. The orifices of the alveoli of the concealed germs of the successional teeth may be seen behind the bases of the posterior row, and in front of those of the anterior row of the lower pharyngeal teeth.

Hunterian.

330. The dried head of a File-fish (*Balistes*).

The oblique shallow sockets, with their basal eminences for the attachment of the teeth by reciprocal gomphosis, are shown in the premaxillary bones: one of the large incisive teeth is in place in the left premandibular: the right has been displaced to show the apex of its successor.

Hunterian.

331. A portion of the skull and dried integuments of a species of File-fish (*Balistes*).

It shows the downward extension of the compressed presphenoid; the bony projections from the bottom of the shallow sockets of the incisors; and the rough character of the ganoid scales from which the fish has received its vernacular name.

Hunterian.

332. A similar but more mutilated specimen of the same species. *Hunterian.*

333. The upper and lower jaws of a small species of File-fish (*Balistes*).

The teeth are narrower in proportion to their length and more pointed than in the preceding specimens. Their apices have a reddish brown colour, like that of the enamel of the incisors of some Rodentia.

Hunterian.

Family *Ostracionidæ*. Trunk-fish.

334. A dried specimen of a small pyramidal Trunk-fish (*Ostracion turritus*), wanting the tail, showing the partially ossified ganoid scales of the integuments.

Mus. Brit.

335. A dried specimen of the *Ostracion nasus*. *Hunterian.*

336. A dried specimen of an *Ostracion*. *Mus. Brit.*

337. A dried specimen of an *Ostracion*. *Mus. Brit.*

338. A dried specimen of the horned Trunk-fish (*Ostracion cornutus*). The greater development of the tail relates probably to the more vigorous movements required in the wielding of the peculiar weapons with which this species is armed. *Mus. Brit.*

339. A dried specimen of a smaller *Ostracion cornutus.* *Mus. Brit.*

340. A similar, but smaller specimen. *Mus. Brit.*

341. A similar, but smaller specimen. *Hunterian.*

342. A small dried specimen of a Trunk-fish (*Ostracion nasus*), showing the single row of small slender subacute teeth in both jaws. *Mus. Brit.*

Family *Gymnodontidæ.* Globe-fish.

343. A portion of the cranium of a large Porcupine-fish (*Diodon Hystrix*). The numbers on the different bones indicate their names according to Table I. The three subequal concavities presented by the basioccipital and the exoccipitals for articulation with the centrum and neurapophyses of the atlas, and the wide expanse of the roofs of the orbits, are worthy of note. *Hunterian.*

344. The skull of a *Diodon*, with the skin dried on. *Hunterian.*

345. A mutilated skull of a large Porcupine-fish (*Diodon*), with the upper and lower jaws and dental armature.

The alveolar borders of both jaws, which are shaped like the beak of the Parrot, appear to be sheathed with a hard adamantine dentine, which swells behind into a broad convex triturating mass: a cavity is exposed above the upper and below the lower dental tubercle, which contains in the recent fish the persistent matrix for renewing the dental substance. The complex nature of this is demonstrated in the following specimen.

Hunterian.

346. The upper jaw, consisting of the maxillary and premaxillary bones, and the premandibular part of the lower jaw, of a large *Diodon.*

Sections have been removed from the premaxillary bone, exposing the pulp-cavities of the marginal denticles which coalesce to form the exposed border of the bone, and of the broad superimposed horizontal plates that coalesce to form the posterior tubercle.

Presented by Prof. Owen, F.R.S.

347. The upper and lower jaws of a large species of *Diodon*, from Sumatra. Part of the left maxillary bone has been broken away. *Hunterian.*

348. The premaxillary and maxillary bones of a large *Diodon*. *Hunterian.*

349. The premaxillary and left maxillary bones of a large *Diodon*.

The pulp-cavity of the lamelliform teeth of the crushing tubercle is laid widely open, and the upper finely-reticulate surface of the last-formed plate is exposed. A vertical section has been attempted, apparently by the common saw, which has been arrested at the dense dentine of the crushing tubercle, which the saw has not been able to penetrate.

Hunterian.

350. The premaxillary and maxillary bones of the *Diodon*.

The outer alveolar border of the beak-shaped premaxillary has been removed to expose the germs of the denticles, which coalesce to form the adamantine dentigerous coating of the margin of that bone.

Presented by Prof. Owen, F.R.S.

351. The premandibular and articular pieces of the lower jaw of the same *Diodon*. Fig. in Owen's Odontography, pl. 38. fig. 1. *Presented by Prof. Owen, F.R.S.*

352. A similar specimen, vertically bisected, to show the order of succession and superposition of the marginal and larger posterior crushing dental plates. Fig. in Owen's Odontography, pl. 38. fig. 2. *Presented by Prof. Owen, F.R.S.*

353. The premaxillary and premandibular bones of a small species of *Diodon*. *Hunterian.*

354. The premandibular and articular bones of the lower jaw of a large *Diodon*. *Hunterian.*

355. A dried skin of a species of *Diodon*, showing the bony network formed by the overlapping of the triradiate bases of the spiny ganoid scales. The anterior ray in most of these is directed forwards and overlaps the posterior rays of those in advance. *Hunterian.*

356. A dried and inflated skin of a species of *Diodon*, in which the spiny osseous scales are smaller and more numerous. *Hunterian.*

357. The skeleton of a Globe-fish (*Tetrodon*).

In this may be noticed the absence of ribs, the clamped mode of union of the anterior abdominal vertebræ with each other and with the skull, and their double spinous processes, which converge and unite into one at the fifth vertebra. The number of abdominal vertebræ is 7; that of the caudal vertebræ, 10: total, 17.

Purchased.

358. A portion of the cranium, including the upper and lower jaws of a small Globe-fish (*Tetrodon*).

The four seemingly single teeth are composed of smaller laminated denticles, cemented together by a common outer coat of enamel. The upper ends of the plates give the appearance of a dentated suture to the contiguous margins of the premaxillary bones, and the same appearance is manifested in a less degree at the symphysis of the lower jaw.

Hunterian.

359. The upper and lower jaws, with the interlocked portions of the palatine and tympanic pedicles of a Globe-fish (*Tetrodon*).

The present specimen well illustrates the serial homology of the palatine (20) with the hypo-tympanic (28), of the maxillary (21) with the articular (30), and of the premaxillary (22) with the premandibular (32).

Hunterian.

360. The upper and lower jaws of a Globe-fish (*Tetrodon*).

The premaxillary with its beak-shaped dentinal coating represents, above, the similarly shaped and similarly armed premandibular below: the edentulous maxillary with its concave articulation for the palatine represents the articular piece of the lower jaw with the concave articulation for the tympanic pedicle: the palatine which presents the condyle to the maxilla answers above to the tympanic which presents the condyle to the mandible below: and the palatine and tympanic are connected together by the medium of the pterygoid bone.

Hunterian.

361. The dried skin of a *Tetrodon*, in which the spines are so small and numerous as to give it a hirsute character. *Purchased.*

362. The principal bones of a mutilated skull of the Sun-fish (*Orthagoriscus mola*).

They show the light fibrous semiossified character of the bones of this singular fish; the osseous tissue having the appearance of decayed wood. The premaxillary bones are anchylosed together, and the premandibular bones, in like manner, at the symphysis: the alveolar borders of both bones are coated with a layer of hard dentine, with trenchant margins, and are shaped like the beak of a Turtle. The names of most of the bones are indicated by numbers corresponding with those in Table I.

Presented by Capt. Sulivan, R.N.

Order VII. LOPHOBRANCHII.

363. A dried specimen of a large Pipe-fish (*Syngnathus Typhon*), showing the peculiar development of its ossified dermoskeleton and the prehensile flexibility of its tail. *Presented by Henry Earle, Esq., F.R.S.*

364. A dried specimen of the *Hippocampus guttulatus*, showing the longitudinal series of spines developed from its exoskeleton. *Hunterian.*

365. A dried specimen of the foliated Hippocamp (*Hippocampus foliatus*), with the tail mutilated. *Hunterian.*

366. A dried specimen of foliated Hippocamp, with the head mutilated. *Hunterian.*

367. A dried specimen of a large Australian species of *Hippocampus*. *Presented by Geo. Bennett, Esq., F.L.S.*

368. A similar specimen. *Presented by the Very Rev. Dr. Buckland, F.R.S.*

Order VIII. GANOIDEI.

Family *Salamandridæ*.

369. The skeleton of the Pike-headed Gar-fish (*Lepidosteus lucius*), showing the progressive diminution of size of the caudal vertebræ, and their continuation into the upper lobe of the tail, together with the great length of the hæmal arches and spines which support the rays of the lower lobe: these arches are not anchylosed to the centrums: the number of the abdominal vertebræ is 43, that of the caudal vertebræ, 25: total, 68. *Prepared from a specimen presented by Dr. Bigelow of Boston, U.S.*

370. The tympanic pedicle with its opercular appendage and part of the suborbital series of bones of the same *Lepidosteus*. *Presented by Dr. Bigelow of Boston.*

371. A dried sepcimen of the slender-nosed Gar-fish (*Lepidosteus osseus*), wanting

the tail, showing the arrangement of the enameled or ganoid osseous scales. Those which form the lateral line are perforated by the mucous ducts.

Fig.—Willoughby: *Pisc. tab.* P. 8. *f.* 2. from this specimen. Bloch, *Ichth.* vi. *pl.* 390.

Habitat.—The lakes and rivers of the warmer parts of North America.

This specimen was formerly preserved in the Museum of the Royal Society at Gresham College.

Mus. Brit.

372. The dried skin of a *Lepidosteus*, showing the unsymmetrical or heterocercal form of tail. Both this form of tail and the structure of the scales are extremely rare in existing fishes, the *Lepidosteus* being the only existing genus of osseous fishes which is known to combine them. But the characters are very common amongst extinct fishes, especially those of the older secondary formations.

Purchased.

Family *Sturionidæ.*

373. The mutilated skull of the Paddle-fish (*Planirostra Spatula*).

It is remarkable for the rostral prolongation of the nasal and vomerine bones, the rostrum being flattened horizontally and expanded like the mandibles of a Spoon-bill. The sides of the rostrum are strengthened by a reticulate disposition of bony matter in the form of stars, the rays of which anastomose. The upper part of the cranium is also imperfectly ossified. There is a long vacuity between the frontal, parietal, postfrontal and mastoid bones: the tympanic pedicle is a simple elongated piece of bone expanded at both ends. The mandibular and hyoidean arches are suspended by a short cartilage to the end of the tympanic bone: the palatines are extremely small. The premaxillary and maxillary bones seem to have coalesced; they expand as they extend backwards to become attached to the cartilage supporting the mandibular arch. The slightly ossified pterygoids run parallel with them along the inner sides to the same part. The articular and dentary pieces of the lower jaw have coalesced, but there is a trace of a slender splenial piece on the inner side of the mandible. All the bones of the mouth are edentulous, but the membrane covering the extremities of the upper and lower jaw is roughened by extremely minute denticles in the recent fish. The ceratohyals are partially ossified: the rest of the hyoidean arch is cartilaginous. A branchiostegal appendage in the form of an irregular elongated flattened bone, resolved posteriorly into osseous fibres, extends from each side of the commencement of the hyoidean arch. A similar but larger opercular appendage extends backwards from the extremity of the tympanic pedicle.

Presented by Prof. Owen, F.R.S.

374. The skull of a Sturgeon (*Acipenser Sturio*).

The suprascapular dermal plate is supported by a distinct cartilage of a subtrihedral form, with the angles of its base slightly produced and articulated by ligament, the one to the end of the mastoid cartilage, the other to the exoccipital cartilage. The scapulo-coracoid cartilage expands as it descends, sends inwards and forwards a broad wedge-shaped plate, and presents a large perforation at its thick posterior part, immediately above the articulation of the pectoral fin. The expanded under part of the cartilage sends a thin plate inwards and forwards and another outwards, which forms the lower boundary of a wide smooth groove below the prominence supporting the pectoral fin: above this is another groove communicating by a small foramen with the larger excavation above mentioned.

The form of the upper piece and its connections answer to those of the suprascapula, but there is no separate styliform scapular piece, as in the Osseous Fishes.

Presented by Prof. Owen, F.R.S.

375. A dried specimen of a young *Acipenser Sturio*, showing the external or dermal skeleton.

There are five longitudinal rows of dermal bones on the trunk of the Sturgeon, one along the mid-line of the back, two along the sides, and two along the belly; but the lateral bones are most numerous; these are continued over the opercular flap to the plate which lies between the eye and the nose.

Hunterian.

376. The palato-maxillary, mandibular and hyoidean arches of a large Sturgeon (*Acipenser Sturio*).

These are the only ossified parts of the endo-skeleton in this fish. The bones are numbered in accordance with those of the articulated skulls, and with Table I. The maxillary (21) is extremely small, as in most osseous fishes. The premaxillaries (22) send a process outwards and downwards to the mandibular joint, where they are articulated to two small labial bones. Each branch of the mandible consists of a single osseous piece. The palatine (20) and pterygoid (24) bones are confluent. There is a small separate centre of ossification on each side in the soft palate anterior to the pterygoids. The epihyals, ceratohyals and basihyals are only partially ossified.

Hunterian.

377. The palato-maxillary and mandibular arches of a Sturgeon (*Acipenser Sturio*). The constituent bones are numbered as in Table I. *Hunterian.*

378. One of the lateral dermal ganoid plates of a large Sturgeon (*Acipenser Sturio*).

Hunterian.

379. One of the median dorsal dermal ganoid plates of a Sturgeon (*Acipenser Sturio*): it is the homologue of the dermoneural spine in ordinary Osseous Fishes.

Hunterian.

Order IX. PROTOPTERI.

Family *Sirenidæ.*

380. The skeleton of the African Lepidosiren (*Protopterus annectens*, Owen).

The chief peculiarities of this skeleton consist in its imperfect, or rather partial ossification, and in the green colour of the ossified parts, in which latter respect it resembles the *Belone vulgaris*. The parts which continue permanently in the cartilaginous condition are the petrous elements of the temporal, containing the auditory vestibules; the branchial arches; and the bodies of the vertebræ: these, moreover, are not separated to correspond with the pairs of neurapophyses and ribs, as in the Plagiostomous Cartilaginous Fishes, but retain, as in the Lampreys, their primitive confluent condition as a round continuous chord, extending from the occiput to the end of the tail. This chord consists of an external, firm, elastic yellowish capsule, enveloping a softer subgelatinous material, as in the Sturgeon and Cyclostomous Fishes.

The ribs are 36 pairs, in the form of short, slightly-curved, or straight and slender styles; encompassing, with the spine, about one-sixth part of the cavity of the abdomen. These ribs are attached to the lower part of the side of the fibrous sheath of the central vertebral chord; their pointed free extremities are connected to the intermuscular fasciæ.

The neural spines are throughout separate from the neurapophyses; and these, at the anterior and posterior regions of the spinal column, are not anchylosed together at their upper extremities. Hæmal spines are developed in the caudal region, and both these and the neural spines have articulated to them dermal osseous spines, of equal length, with their distal extremities expanded.

The rudimental filiform fins were supported each by a cartilaginous ray composed of many joints.

The *Protopterus annectens* manifests an additional important evidence of its essentially ichthyic nature, by having its scapular arch directly suspended to the skull, but with this peculiarity, that it is connected by a synovial joint with the exoccipitals only.

In all osseous fishes, and in those Ganoids, as the Sturgeons, *e. g.*, that come nearest to the Lepidosiren in some parts of their structure, the scapula is suspended by two processes to the paroccipital and to the mastoid.

The Plagiostomous Cartilaginous Fishes on the other hand have no cranial point of suspension for the scapular arch, and in the Shark-tribe the arch has no fixed point at all.

Hab. The Gambia river.

Prepared from a specimen presented by Thomas Weir, Esq.

381. The partly osseous, partly cartilaginous skull of the African Lepidosiren (*Protopterus annectens*).

With regard to the vertebral bodies, ossification is limited to the cranial end of the notochord, and there extends along the under and lateral part of its sheath forwards to the presphenoid and backwards to beneath the atlas and axis, the posterior slightly expanded end of this ossified part supporting, as in the *Squatina*, the neurapophyses of the atlas, the bases of which expand and meet above that end of the ossified chorda, and below the spinal canal. Ossification of the fibrous sheath of the chorda, commencing posteriorly at its under part, ascends upon the sides as it advances forwards, and incloses it above, where it supports the medulla oblongata, and the lateral bony plates (neurapophyses) called 'exoccipitals,' leaving behind a wide oblique concavity lodging the anterior unossified end of the 'chorda,' which does not extend further upon the basis cranii. The exoccipitals expand as they ascend, and converge to meet above the foramen magnum, which they complete. A small mass of cartilage connects their upper ends together, and with the overhanging, backward projecting point of the occipito-frontal spine. This cartilaginous mass answers to the base of the superoccipital in better ossified Fishes: a similar cartilage connects the exoccipitals with the occipital spine in the *Tetrodon*. It is plain, in the *Lepidosiren*, that ossification, advancing on the common cartilaginous mould of the plagiostomous skull, has marked out the posterior cranial vertebra, and not only its neurapophyses, but also its centrum; the neural spine being left in a less completely ossified state than in the vertebræ of the trunk. The occipital pleurapophyses ('scapulæ') are much more developed, and appear as two strong, bony, styliform appendages, articulated by a synovial capsule and joint, one on each side, to the persistent cartilaginous base of the neurapophyses (exoccipitals) and partly to the centrum or basioccipital.

To the lower and less expanded ends of these pleurapophyses are attached the extremities of the hæmapophyses ('coracoids'); and thus is completed the hæmal arch of the occipital vertebra; here greatly expanded, as in other fishes, in relation to its office of protecting the heart and pericardium: the hæmapophyses or coracoids belong to the same category of vertebral elements as the sternal ribs which protect the heart in higher Vertebrata. The costal or hæmal arch of the occipital vertebra of the *Lepidosiren* supports an appendage projecting outwards and backwards, like the simple diverging appendages to the abdominal pleurapophyses of better ossified Fishes, and like the costal appendages in the thorax of Birds; but it is here cartilaginous, and consists of many segments. It forms, in fact, the rudiment (a solitary ray) of the pectoral fin: it is the key to the general homology of the anterior or upper limbs of the higher Vertebrata; showing them to be appendages of the hæmal arch (usually called 'scapular'), of the occipital or posterior cranial vertebra. The suspension of the scapular arch directly to the skull is an evidence of the piscine nature of the *Lepidosiren*.

In the second (parietal) and third (frontal) cranial vertebræ, ossification extends along the basal and along the spinal elements, but not into the neural or lateral elements; these remain cartilaginous in continuation with the cartilage surrounding the large capsule of the internal ear. The basal ossification, representing at its posterior end the body of the atlas, then the basioccipital, expands as it advances along the base of the skull in the situation of the sphenoids, constituting the floor of the cerebral chamber, supporting the medulla oblongata, the hypophysis, the crura and lobes of the cerebrum, and terminating a little in advance of the olfactory lobes by a broad transverse margin, bounding a triangular space left between it and the converging palatine arches, which space is filled by cartilage, representing the vomer. The occipital part of this basicranial bone may be defined by a slight transverse depression, where also terminates a median longitudinal groove, traversing the under part of the thus defined occipital portion of the bone; and indicating, like the corresponding membranous fissure in the *Cestracion*, the primitive place of the cranial end of the notochord. The expanded sides, originally arches of the cartilaginous portion, bend down to abut against the bases of the pterygoid plates. In this expansion of the basisphenoid the *Lepidosiren* resembles the *Plagiostomes*, and also the Batrachian Reptiles.

Two ridges rise from the upper surface of the occipito-sphenoidal plate, near its outer margin, and support the cartilaginous lateral walls of the cranium. The cranial cavity is defended above by a longitudinal bony roof, nearly co-extensive with the bony floor beneath; the roof commences behind by the spine or point which overhangs the exoccipitals, gradually expands as it advances, resting upon the cartilaginous walls of the cranium, is then suddenly contracted, and is united anteriorly by fibrous ligament to the ascending process of the palato-maxillary arch, and to the base of the nasal plate. A strong sharp crest or spine rises from above the whole of the middle line of the cranial roof-bone, which may be regarded as representing the mid-frontal, the parietal, and superoccipital bones, or, in more general terms, the neural spines of the three cranial vertebræ; but this supra-cranial bone not only covers the medulla oblongata, cerebellum, optic lobes, pineal sac and cerebral hemispheres, but also the olfactory lobes.

The lateral cartilaginous walls of the cranium are continued forwards from the acoustic capsule between the basal and superior osseous plates: the part perforated by the fifth pair of nerves and protecting the side of the optic lobes, represents the great ala of the sphenoid: the next portion in advance, protecting the sides of the cerebral hemispheres and perforated by the optic nerve, answers to the orbital ala of the anterior sphenoid: and the cartilage terminates by a part which is perforated by the olfactory nerve, and which abuts laterally against the ascending or palatine process of the maxillary arch.

The outward extension of the lateral cartilages of the cranium downwards, in the form of a broad triangular plate, the apex of which forms the articulation for the lower jaw, is like that which we see in the *Chimæra*; but ossification has extended along two tracts, which converge as they descend, one from behind to the outer, the other from before to the inner side of the cartilaginous maxillary joint, which these bony plates strengthen and support like the backs of a book. The posterior of these bony arches is obviously the homologue of the tympanic pedicle in the *Squatina*: the anterior bony arch as plainly answers to the pterygoid buttress in Osseous Fishes; but it is here confluent with the coalesced palatine and superior maxillary bones, the dentigerous part of which extends outwards, downwards, and backwards, but does not reach, as in the Sharks and Rays, the mandibular joint.

From the upper part of the palato-maxillary portion a compressed sharp process ascends obliquely backwards, and terminates in a point; the inner side of this process is closely attached by ligament to the fore and outer part of the frontal portion of the epicranial bone; the outer side of the process is excavated for the reception of the outer and anterior process of the postfrontal bone. This bone, in connection with the ascending process of the maxillary, forms the upper part of the orbit, and behind this connection it sends out the post-orbital process, beyond which it extends backwards, freely overhanging the fronto-occipital, and gradually decreasing to a point, which terminates just above the occipital spine, in the position of the mastoid, in bony Fishes, and giving attachment to the anterior end of the great dorso-lateral muscles of the trunk. This bone is flat above like a scale, and from its superficial position might be classed with the dermal skeleton: the strong temporal muscle is attached to the two surfaces divided by the ridge on its inferior part: it is moveable up and down upon its anterior ligamentous union. In its relative position and functions it combines the characters of postfrontal and mastoid; and, since the basilar elements of these cranial vertebræ are confluent, and their spinal elements also form one piece, we may here have an example of a similar confluence of the parapophyses of two distinct vertebræ.

The midfrontal constitutes the anterior part of the epicranial bone, which is connected with the postfrontals and the cartilage perforated by the olfactory nerves and representing the prefrontals.

A more remarkable and less easily determinable bone is that triangular horizontal plate, the broad posterior base of which is attached by a ligament to the midfrontal, to the postfrontal, and to the prefrontal processes of the palato-maxillary arch; whilst the apex forms the anterior extremity of the cranium, and supports at its under part two vertical sharp-pointed teeth. According to the analogy of the cranial structure of the *Murænidæ,* in which the intermaxillaries are absent, and the nasal bone dentigerous, this bone should be the nasal. It is moveable, up and down, upon its basal joint.

Each ramus of the lower jaw is composed of an articular and a dentary piece, the latter anchylosed together at the symphysis, and completing the inverted tympano-mandibular arch. The articular piece is a simple slender plate, strengthening the outer part of the articular concavity of the jaw, and closing the outer groove of the dentary, along which it is continued forwards to near the symphysis, where it ends in a point. The articular trochlea is formed by a persistent cartilage, which penetrates the cavity in the dentary, escapes from the forepart of the groove on the outer surface of the dentary, and joins its fellow, in a small cartilaginous mass, which fills the hollow in front of the symphysis. The dentary piece sends up a strong coronoid process, and has the notched and trenchant dentinal plate anchylosed to it, corresponding with that of the maxillary arch, and playing upon the posterior surface of the edge of that arch.

The triangular prefronto-vomerine cartilage closes the anterior and under part of the cranial cavity, and supports the origins of the olfactory nerves, which perforate it in their passage to the cartilaginous nasal capsules. Behind the tympanic pedicle is the preopercular bone, elongated, pointed at both ends, trihedral, with the outer surface concave: its lower two-thirds is attached by ligament to the mandibular or tympanic pedicle. Behind and below this is the interopercular, which is an inequilateral triangular bone closely attached by ligament to the expanded cranial end of the hyoidean arch.

Only a single ceratohyal is ossified on each side: they complete the arch by a ligamentous junction of their lower extremities, having no intervening basihyal: their upper expanded ends are suspended by a short ligamentous mass to the cartilage immediately behind the tympanic pedicle.

The capsules of the organs of sense are of nearly equal size; the eye is the smallest, the nose the largest. The acoustic capsules are principally buried in the lateral cartilages of the skull; but one of the otolithes protrudes through a moderately wide hole into the cranial cavity. The eye-ball occupies the space between the pre- and post-frontals above, and the outward prolongation of the maxillary below; its capsule, the sclerotic, is cartilaginous. The nasal capsules are also cartilaginous, with vertical slits closed by membrane; they are situated on each side and below the nasal plate.

Presented by Prof. Owen, F.R.S.

Order X. HOLOCEPHALI.

382. The pelvis with the pelvic or ventral fins and claspers of a male *Chimæra*.

The short narrow processes which extend above the place of articulation of the ventral fins are like rudimental iliac bones: the expanded portions which meet below represent the ischio-pubic bones: they are each of them perforated by a large round aperture filled by membrane and resembling the obturator foramen. The claspers or sexual holders are long, subcylindrical and hollow, communicating in the recent fish with a glandular blind sac opening into the base of the clasper. The cartilage, answering to the tibia, supports the rays of the ventral fin and the clasper.

Hunterian.

383. Part of the dried cartilaginous skull of the Southern Chimæra (*Callorhynchus Australis*).

The left upper jaw and teeth have been vertically bisected; each upper jaw has one small anterior dental plate and a large posterior one, of an inequilateral triangular form, with a sinuous crushing surface. The upper surface of each of these teeth is concave from side to side, so that it encases the alveolar border of the upper jaw, in a manner analogous to the broad teeth of the *Cestracion*. Both the anterior and posterior dental plates in the upper jaw meet at the median line of the mouth. The two dental plates of the lower jaw are of a subtriangular form, with the posterior and external sides gently curved; the broad grinding surface is convex on the inner and concave on the outer side; a trenchant margin divides this from the lateral surfaces of the dental plate. In the longitudinal vertical section of these teeth their coarse tubular structure is evident to the naked eye. There is a large pulp-cavity at the posterior parts of both the upper and lower dental plates, and, when the pulp is removed, the exposed surface of the base of the tooth presents a reticulate character from the large areæ of the medullary tubes into which the processes of the pulp are continued. These tubes radiate towards the grinding surface of the tooth, and dichotomize as they proceed. As these tubes advance towards the surface their cavity becomes gradually obliterated by calcareous salts, deposited in concentric layers and perforated everywhere by minute calcigerous tubes; thus the substance of the tooth increases in density as it approaches the triturating surface.

Hunterian.

Order XI. PLAGIOSTOMI.

Family *Cestracionidæ.*

384. The skull of the Port-Jackson Shark (*Cestracion Philippi*).

The scapular arch being detached from the occiput and displaced backwards in Plagiostomous fishes, is not here preserved. The turbinal capsules of the organs of smell are well shown; as likewise the characteristic concavity in the basioccipital.

Presented by George Bennett, Esq., F.L.S

385. The tessellated dental covering of the lower jaw of the Port-Jackson Shark (*Cestracion Philippi*). *Hunterian.*

386. The first, second, and part of the third cervical vertebræ of the Port-Jackson Shark (*Cestracion Philippi*).

The anterior surface of the atlas presents a deep conical cavity, which is applied to a similar cavity in the basioccipital of the skull. The vertical transverse section of the body of the third vertebra shows a series of nine bony plates, radiating from the centre to the circumference, disposed in the long axis of the vertebra, and giving off short processes as they diverge.

Presented by George Bennett, Esq., F.L.S.

387. The maxillary and mandibular arches of the Port-Jackson Shark (*Cestracion Philippi*).

The teeth are arranged, as in the Plagiostomes generally, in several antero-posterior rows, along the margin and inner surface of both jaws; but the rows are more oblique than in the Sharks, although less so than in certain Rays (*Rhina*). The teeth at the anterior part of the jaws are the smallest; they present a transverse, subcompressed, conical figure, with the apex produced into a sharp point; these points are worn away from the used teeth at the anterior and outer parts of the jaw, but are strongly marked in those which still lie below the margin. There are six subvertical rows of these small cuspidate teeth on each side of the jaw, together with a median row close to the symphysial line; and from twelve to fourteen teeth in a row. Behind the cuspidate teeth, the five consecutive rows of teeth progressively increase in all their dimensions, but principally in their antero-posterior extent; the sharp point is converted into a longitudinal ridge, traversing a convex crushing surface; and the ridge itself disappears in the largest teeth. As the teeth increase in size they diminish in number in each row; the series of the largest teeth includes from six to seven in the upper, and from seven to eight in the lower jaw. Behind this row the teeth, although preserving their form as crushing instruments, progressively diminish in size, while at the same time the number composing each row decreases. From the oblique and apparently spiral disposition of the rows of teeth, their symmetrical arrangement on the opposite sides of the jaw, and their graduated diversity of form, they constitute the most elegant tessellated covering of the jaws which is to be met with in the whole class of Fishes. By the modifications of the form of the teeth above described, the anterior ones are adapted for seizing and retaining, and the posterior for cracking and crushing the animals that become the prey of the *Cestracion*, and which chiefly consist of the shell-clad Mollusks and Crustaceans.

Hunterian.

Family *Notidanidæ.*

388. A portion of one of the jaws of a Shark (*Notidanus griseus*).

The number of recumbent or successional teeth does not exceed two behind each tooth in place: the azygous symphysial tooth deviates considerably from the typical form of the teeth in this genus, as do likewise the small teeth at the extremities of the jaw.

Presented by Dr. Leach, F.L.S.

Family *Spinacidæ.*

389. The skeleton of the Piked Dog-fish (*Spinax Acanthias*). The number of vertebræ is 110, of which 34 support short ribs. *Mus. South.*

390. A considerable proportion of the vertebral column of a Piked Dog-fish (*Spinax Acanthias*).

Lateral sections have been removed from the anterior of some of the middle vertebræ, to show the form of the concave articular extremities of the bodies, and the intervening osseous texture. The interneural plates equal the true neurapophyses in size; these are perforated at their base.

Hunterian.

391. A portion of the vertebral column of a smaller Piked Dog-fish (*Spinax Acanthias*). *Hunterian.*

392. The maxillary and mandibular arches of a Piked Dog-fish (*Spinax Acanthias*).

The teeth are alike in both upper and lower jaws; they are thin triangular plates with the apex inclined backwards, so that the anterior edges are opposed to each other; the enamel does not terminate below in a horizontal line, but is continued along the middle of the bony base.

Presented by Prof. Owen, F.R.S.

393. The maxillary and mandibular arches of a Piked Dog-fish.

Presented by Mrs. Robinson.

Family *Scylliidæ.*

394. A chain of the dried bodies of the vertebræ of a Spotted Dog-fish (*Scyllium Canicula*).

A thin layer of ossific matter, in the form of a hollow cylinder expanded at both ends, has been developed for each vertebra, in the capsule of the gelatinous notochord, constricting it at intervals, but not obliterating it at any part.

Hunterian.

395. The upper jaw and teeth of a Spotted Dog-fish (*Scyllium Canicula*).

The teeth in this genus present a triangular form with a large middle cusp, complicated, at least in the young animal, with one or two small cusps on each side of its base; the base is always more or less furrowed longitudinally.

Presented by Prof. Owen, F.R.S.

396. The maxillary and mandibular arches of a species of Dog-fish (*Scyllium Thylacina*) from South Australia. *Presented by Governor Grey.*

Family *Nictitantes.*

397. The skeleton of a Tope (*Galeus communis*). It shows 20 ribs. The number of vertebræ is 140, of which 20 support short straight ribs: the hæmal canal begins to be formed at the 43rd vertebra. *Hunterian.*

398. Four vertebral bodies of a Tope (*Galeus communis*).

The interspace between the terminal cones is filled by a compact ossification. The parapophyses have been removed from one side to show the shallow cavities against which their bases are applied. The neurapophyses are supported by processes of the centrum, which are directly perforated by the motor roots of the spinal nerves. A distinct interneural piece is wedged into each of the interspaces of the neurapophyses.

Presented by Prof. Owen, F.R.S.

399. A series of vertebræ of the *Galeus communis.*

A terminal one has been vertically bisected to show the compact texture of the osseous matter between the terminal cones. The neural cavities extend into the processes supporting the neurapophyses.

Mus. Brit.

400. A series of vertebræ from the *Galeus communis*. *Mus. Brit.*

401. Four caudal vertebræ of the *Galeus communis*. *Mus. Brit.*

402. The jaws of a Shark (*Galeus ferox*). *Mus. Brit.*

403. The jaws of a Shark (*Galeus ferox*).

Not any of the erect series of teeth are broken in this specimen, but the places of attachment of the shed teeth are visible exterior to these. The form of tooth characteristic of the genus *Galeus* is better adapted to resist fracture, the base being broader and stronger, than in the *Carcharias*.

Mus. Brit.

404. The upper and lower jaws of the same species of *Galeus*. *Mus. Brit.*

405. The upper and lower jaws of a smaller individual of the same species of *Galeus*. *Hunterian.*

406. A portion of one of the jaws of a *Galeus ferox*, showing the modifications of the characteristic form of the teeth in this genus, observable in those situated at the middle and at the extremities of the jaw. *Hunterian.*

407. A section of one of the jaws of a *Galeus ferox*, showing three of the vertical or successional series of teeth.

The middle series consists of one tooth, erect and in use at the margin of the jaw, and four recumbent teeth attached to its posterior surface. They are covered by a fold of the buccal membrane in the recent fish, and show progressive stages of development as they approach the teeth in use.

Presented by Prof. Owen, F.R.S.

408. The skull and bodies of the anterior vertebræ of the trunk of the Blue Shark (*Carcharias glaucus*).

The pillars of the rostrum, the cartilaginous cavities for the nasal capsules, the wide anterior fontanelle, the pterygoid arches confluent at both ends with the base of the skull, and other characteristics of the skull of the Shark, are well shown in this specimen. The anterior vertebræ are, as it were, clamped to the skull by the backward extension on each side of firm cartilaginous processes from the occiput. On the summit of the occiput are the two closely approximated oval fenestræ which lead to the cartilaginous capsules of the organs of hearing: they are covered by the skin in the recent fish. The hyoid arch is suspended from the ends of the tympanic pedicles, behind the lower jaw. The jaws exhibit the modifications of form, the numerous rows, and the mode of succession, of the teeth.

Hunterian.

409. A centrum, or vertebral body, of a Blue Shark (*Carcharias glaucus*).

The intervening ossification between the articular cones has obliterated all the vacuities except the two marked (*n*) which supported the neurapophyses, and the two marked (*p*) which supported the parapophyses, and which continue to be filled with clear cartilage in the recent vertebra.

Presented by Prof. Owen, F.R.S.

410. A series of vertebral bodies of the same species of *Carcharias*. *Mus. Brit.*

411. A series of vertebral bodies of the same species of *Carcharias*, showing the dried remains of the cartilage in the neural and hæmal vacuities. *Mus. Brit.*

412. A series of the bodies of the caudal vertebræ of the same species of *Carcharias*. *Mus. Brit.*

413. A series of seven vertebral bodies of a larger species of a Blue Shark (*Carcharias vorax*). One of these has been vertically bisected, showing the compact but somewhat coarse osseous texture, which fills the interspaces between the terminal articular cones and between the neural and hæmal vacuities. No distinct concentric cylinders nor longitudinal plates are present in these ossified parts. *Presented by Prof. Owen, F.R.S.*

414. One of the teeth of a large Blue Shark (*Carcharias vorax*). It is from the jaws of a specimen which measured twenty-five feet in length. One of the fossil teeth of an extinct species (*Carcharias megalodon*) is preserved with it.

Hunterian.

415. The jaws of a Shark (*Carcharias vorax*), which show that the teeth of the outer row have the crown usually broken off before the base is shed.

Mus. Brit.

416. A section of the jaw of a *Carcharias*, in which part of the membranous covering of the recumbent teeth is preserved in a dry state.

Presented by Prof. Owen, F.R.S.

417. The maxillary and mandibular arches of the Long-finned Shark (*Carcharias macropterus*). The pointed summits of the teeth of the lower jaw are longer, narrower, and continued more abruptly from the base, than those of the upper jaw. *Hunterian.*

Family *Lamnidæ*.

418. The cranium with the maxillary and mandibular arches, and the body of the atlas, of the Porbeagle Shark (*Lamna cornubica*).

It shows well the tripodal rostrum and the form and succession of the teeth. The maxillary arch is suspended by its palatal basis; the apex being attached to the vomerine extremity of the basicranial cartilage. A portion of the right tympanic pedicle is preserved.

With this skull is placed the fossil tooth of a gigantic extinct Shark, having the same characteristic processes at the base of the crown, to which its generic name, *Otodus*, has reference.

Mus. Brit.

419. A cranium of the Porbeagle Shark (*Lamna cornubica*).

It shows the fractured occipital surface which was anchylosed with the body of the atlas, the wide anterior vacuity in the cartilaginous parietes of the cranium, the pterygoid arches connate at both ends with the basis cranii as in the embryos of Osseous Fishes, and the three peculiar rostral processes which converge and coalesce at their anterior extremities to form the framework of a kind of cut-water, which prolongs the skull in advance of the jaws. A great proportion of the semiossified cartilage is covered by the pavement of fine ganoid tubercles forming the substance called "shagreen."

Presented by Dr. Leach, F.L.S.

420. A series of vertebral bodies of the Porbeagle Shark (*Lamna cornubica*).

Presented by Dr. Leach, F.L.S.

421. A series of vertebral bodies of the *Lamna cornubica*.

One extremity shows the terminal cone ossified to the centre; at the other end a vertical section of the centrum shows the longitudinal osseous plates which unite together the terminal cones.

Presented by Dr. Leach, F.L.S.

422. A vertical transverse section of a vertebral body of the *Lamna cornubica.*

A vestige of the concentric cylinders may be discerned near the centre of the body; but the chief part of the intervening osseous matter is so disposed as to connect the articular cones in the form of longitudinal converging plates, with interspaces, which are filled with clear cartilage in the recent vertebra, but form vacuities in the dried specimens.

Presented by Prof. Owen, F.R.S.

423. A vertebral body of the *Lamna cornubica.*

There are fewer and wider interspaces between the longitudinal osseous plates in this species than in the *Selache maxima*; the widest spaces being the two marked (*n*) which support the neurapophyses, and the two marked (*p*) which support the parapophyses in the entire vertebra.

Presented by Prof. Owen, F.R.S.

424. The upper and lower jaws of a Shark (*Odontaspis*): some of the exterior teeth have had their crowns broken off. *Mus. Brit.*

425. The upper and lower jaws of another species of *Odontaspis*, in which the teeth are characterized by a small accessory point on each side of their base.

The inner walls of the jaws have been removed near the symphysis of each, to show the series of successional teeth. The teeth decrease in size from this part to the angles of the jaws, where they lose their points and become adapted by their numbers and close arrangement for a coarse mastication of the food.

Hunterian.

426. The upper and lower jaws of a nearly allied species of *Odontaspis.* *Mus. Brit.*

427. The upper and lower jaws of a Shark (*Galeolamna Greyi*) from South Australia; the teeth in the upper jaw resemble those of the *Galeus*; those of the lower jaw are intermediate in form between the teeth of *Lamna* and *Carcharias.*

Presented by Governor Grey.

428. A vertical section of the lower jaw, and of one of the vertical series of teeth of a large Shark (*Lamna Latro*).

It shows the progression, calcification and consolidation of the teeth as they approach the alveolar border of the jaw. One tooth is erect, and a second and third are in positions intermediate between the erect and the recumbent teeth: these are covered by a duplicature of the thick mucous gum. The exterior layer of each tooth consists of a modification of dentine as hard as enamel, called 'vitrodentine.'

Fig. in Owen's Odontography, pl. 5. fig. 1. *Presented by Prof. Owen, F.R.S.*

429. A section of one of the jaws of a *Lamna*, with three of the vertical or successional rows of teeth.

The change from the recumbent to the erect position is more gradual and progressive, and the number of teeth in reserve is greater, than in the preceding genera. Eight teeth may be counted in one of the rows of the present specimen.

Presented by Prof. Owen, F.R.S.

Family *Alopeciidæ*.

430. The dried skin of a Fox Shark (*Alopias Vulpes*). *Hunterian.*

Genus *Selache*.

The specimen of Basking Shark (*Selache maxima*) from which the specimens Nos. 431 to 433, presented by Sir Everard Home, were taken, was a male, caught in fishing nets off Hastings, November 13th, 1808. The length of the animal was 30 feet 6 inches. A brief account of its anatomy is given in the 'Philosophical Transactions' for 1809, p. 177. A second example, also a male, was taken on 21st November 1810, in the herring nets off Dieppe, and was described by M. de Blainville in the 'Annales du Muséum,' t. xviii. (1811) p. 88. Some of its tissues were the subjects of the able analyses of M. Chevreul, which are detailed in the same volume.

A third specimen of the Basking Shark, from which Nos. 435 to 438 were taken, was captured at Brighton in the year 1812.

431. A vertebra of a Basking Shark (*Selache maxima*).

It shows the two deep terminal articular concavities characteristic of the class of Fishes. The sides of the centrum show the margins of the longitudinal bony plates and their interspaces, which were filled in the recent fish by hyaline cartilage. The upper surface is excavated by two deep conical depressions here partly filled by the dried remains of the denser cartilage which constituted the neural arch. On the under surface are two similar cavities which were closed by the similarly dense cartilage forming the hæmal arch.

Presented by Sir Everard Home, Bart., F.R.S.

432. A similar specimen. *Presented by Sir Everard Home, Bart., F.R.S.*

433. The centrum of a vertebra of the same Shark, from which the cartilaginous neural and hæmal arches have been removed, together with some of the longitudinal plates on one side, to show the outermost perforated concentric cylinder. *Presented by Sir Everard Home, Bart., F.R.S.*

434. The centrum of a caudal vertebra of the *Selache maxima,* bisected vertically and transversely.

This is one of the vertebræ of the animal surmised to be a 'Sea-serpent,' which was cast on shore at Stronsa, in the Orkneys, September 1808: it is described by Dr. Barclay in the 'Wernerian Transactions,' vol. i., who transmitted the vertebra to Sir Everard Home.

It shows the arrangement of the osseous matter between the two terminal bony cones, which chiefly constitute the vertebral centrum. These cones are united together at their circumference by longitudinal bony plates arranged parallel with the axis of the vertebra: the rest of the intervening space between the cones is occupied by concentric circular plates or cylinders of bone, which are minutely perforated: both the longitudinal and cylindrical plates are interrupted by the neural and hæmal conical excavations: these and the intervals of the several plates are filled by clear or hyaline cartilage in the recent fish.

Presented by Sir Everard Home, Bart., F.R.S.

435. The terminal osseous cones of a vertebral centrum of the *Selache maxima.*

The opposite surfaces of each show at their periphery the converging lines to which the longitudinal plates were attached, and at the rest of their surface the concentric lines to which the progressively decreasing bony cylinders were attached. The smooth articular surfaces of the cones show only concentric lines: ossification has obliterated their originally intercommunicating foramen.

Presented by Sir Everard Home, Bart., F.R.S.

436. A longitudinal section of two vertebral centrums of the *Selache maxima.*

It shows the coarse irregular osseous texture of the terminal cones, the sides of the peripheral longitudinal diverging plates, and the cut edges of the central concentric cylinders. One of the centrums has been bisected transversely, to show more clearly the twofold arrangement of the bony laminæ between the terminal cones: also the perforations of the cylindrical plates, and the transition from the concentric to the diverging lamellar structure: the outer cylinder being, as it were, broken up into processes which join the irregular inner edges of the longitudinal plates.

Presented by Sir Everard Home, Bart., F.R.S.

437. A longitudinal section of four vertebral centrums of the *Selache maxima,* showing the dried elastic capsules by which the margins of the terminal cones are joined together. *Presented by Sir Everard Home, Bart., F.R.S.*

438. The opposite section of the same vertebræ.

Presented by Sir Everard Home, Bart., F.R.S.

Family *Scymniidæ*.

439. A dried specimen of a small Shark of the genus *Scymnus*.

The teeth of the upper jaw are small, conical, subcompressed, with slightly recurved points. The teeth of the lower jaw are about eight times larger than those above: they are straight, flattened, symmetrical, lancet-shaped plates, with finely dentated margins: one of them crosses the line of the symphysis of the lower jaw.

Presented by F. D. Bennett, Esq., F.L.S.

Family *Squatinidæ*.

440. The cranium with the maxillary and mandibular arches and the labial cartilages of the Monk-fish (*Squatina Angelus*). *Mus. Heaviside.*

441. The maxillary and mandibular arches of the Monk-fish (*Squatina Angelus*). *Hunterian.*

442. The skull, with several anterior abdominal vertebræ and the branchial arches, of the Monk-fish (*Squatina Angelus*).

This specimen has been vertically bisected, showing the form of the cranial cavity and of the biconcave spaces between the bodies of the vertebræ. The body of the atlas has coalesced with the basioccipital, but the neural arch remains distinct; the gelatinous mass between the atlas and axis has been ossified and has coalesced with the body of the axis. The distinction between the hyoidean and the branchial arches is well shown. The hyoidean arch is suspended from the tympano-mandibular joint, and supports six branchiostegal rays. The upper or epibranchial element of the first gill-bearing arch almost meets its fellow beneath the anterior abdominal vertebra, to which it is attached by a ligament. The bases of the cerato-branchials expand into triangular plates which underlie the extremities of the hypobranchial processes. The last arch presents an exception to this structure.

Presented by Joseph André, Esq.

443. The cranium, with the upper and lower jaws, of the Hammer-headed Shark (*Zygæna laticeps*, Cantor).

It is chiefly remarkable for the extension of two long processes outwards from the antero-lateral parts of the cranium; which processes bifurcate at the extremity where they form the orbits. On the left side some of the elongated muscles of the eye are preserved. The rostral prolongation is short and obtuse, but is supported by three processes as in the normal Sharks, and is connected by the anterior fold of integument to the cartilaginous peduncle of the orbit. The maxillary arch is suspended by its palatal processes to the sides of the vomerine region of the basis cranii: the tympanic pedicles are wanting. The occiput presents three facets for the atlas, one on the basioccipital and two on the exoccipitals.

Presented by Dr. Cantor.

444. The dried head of a Hammer-headed Shark (*Zygæna*). The teeth have an inequilateral triangular crown, bent obliquely towards the angles of the mouth, but sharp-pointed and with a finely serrated margin. *Mus. Brit.*

445. A dried specimen of a young Saw-fish (*Pristis antiquorum*). It shows the equal size of the large rostral teeth, and the very minute size of those of the jaws. *Hunterian.*

446. A dried specimen of a young Saw-fish (*Pristis antiquorum*). *Hunterian.*

447. The anterior extremity of the prolonged rostrum of a Saw-fish (*Pristis*), with three teeth *in situ* on the left side, and the sockets of the corresponding teeth of the right side exposed.

The teeth which are lodged in these sockets are elongated, compressed in the same plane as that of the body of the saw, and the margins converge to a sharp point, which is situated a little behind the axis of the tooth; the anterior border of the tooth is convex, but grows sharper towards the point; the posterior margin is concave or grooved, and the groove glides upon a corresponding ridge which projects into the back part of the socket. The rostral tooth is solid, as shown in the posterior one of the right side; its base is slightly concave and porous, like the section of a cane, but the pores are finer and more numerous. The walls of the socket are formed by ossification of the rostral cartilage to the adequate extent; but as undue weight under any circumstances, and especially at the fore end of the fish, would be a cumbrous impediment to its motions, the spaces between the sockets are filled with a gelatinous medulla. A large vascular canal, traversed by branches of the facial artery and of the second division of the fifth pair of nerves, and inclosed in a cellular and gelatinous tissue, runs parallel with the axis of the saw along the back part of the alveoli, and supplies the materials for the increase of the teeth, which are not shed and renewed like the maxillary teeth, but grow with the growth of the body by constant addition of fresh pulp-material, progressively ossified at their base.

Presented by Prof. Owen, F.R.S.

448. The rostrum of a Saw-fish (*Pristis antiquorum*). *Hunterian.*

449. The rostrum of a Saw-fish (*Pristis antiquorum*). *Hunterian.*

450. The rostrum of a Saw-fish (*Pristis antiquorum*). *Hunterian.*

451. The head and rostrum of a Saw-fish (*Pristis pectinatus*). *Hunterian.*

452. The rostrum of a Saw-fish. *Hunterian.*

453. The rostrum of a Saw-fish. *Hunterian.*

454. The rostrum of a Saw-fish. *Hunterian.*

455. The rostrum of a Saw-fish. *Hunterian.*

456. The rostrum of a Saw-fish. *Hunterian.*

457. The rostrum of a Saw-fish. *Hunterian.*

458. The rostrum of a Saw-fish. *Hunterian.*

459. The rostrum of *Pristis pectinatus.* *Hunterian.*

460. The rostrum of *Pristis pectinatus.* *Hunterian.*

461. The rostrum of a young Saw-fish. *Hunterian.*

462. The rostrum of a young Saw-fish. *Hunterian.*

463. The rostrum of *Pristis pectinatus.* *Hunterian.*

464. The rostrum of *Pristis pectinatus.* *Presented by Capt. Sir W. E. Parry, R.N.*

465. The rostrum of *Pristis pectinatus.* *Presented by Capt. Sir W. E. Parry, R.N.*

466. The rostrum of *Pristis pectinatus.* *Presented by Capt. Sir W. E. Parry, R.N.*

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472. The rostrum of *Pristis pectinatus.* *Presented by Capt. Sir W. E. Parry, R.N.*

473. The rostrum of a Saw-fish (*Pristis cuspidatus*). *Hunterian.*

474. The rostrum of a Saw-fish.
Presented by Capt. Sir Everard Home, Bart., R.N., F.R.S.

475. The rostrum of a Saw-fish. *Hunterian.*

476. The rostrum of a young Saw-fish. *Hunterian.*

477. The rostrum of a young Saw-fish. *Hunterian.*

478. The rostrum of a Saw-fish (*Pristis antiquorum*). *Hunterian.*

479. The rostrum of a Saw-fish, *Squalus Pristis* (*Pristis antiquorum*). *Hunterian.*

480. The rostrum of a Saw-fish, *Squalus Pristis* (*Pristis antiquorum*). *Hunterian.*

481. The rostrum of a Saw-fish. *Hunterian.*

482. The rostrum of a Saw-fish. *Hunterian.*

483. The rostrum of a Saw-fish. *Hunterian.*

484. The rostrum of a Saw-fish.

In this species the rostrum is broad at its base, with from eighteen to twenty-four teeth on each side, thick and channeled at their posterior part, inclining to an edge in front.

Mus. Brit.

485. The rostrum of a Saw-fish (*Pristis pectinatus*). The animal was killed near the mouth of the Kaloogungah or Black river, near Caltura, 24 miles south of Columbo. It was about 12 or 15 feet in length, and "as large about the body as a sentry-box!" *Presented by Sir Alexander Johnston.*

486. A similar specimen of the rostrum of the *Pristis pectinatus.*

In this species the rostrum is narrower in proportion to its length than in the *Pristis antiquorum*; the teeth are longer and more slender, and are from twenty-five to thirty-six on each side.

Hunterian.

487. The rostrum of a Saw-fish (*Pristis cuspidatus*). *Hunterian.*

488. A similar specimen. *Mus. Brit.*

489. A similar specimen.

In the *Pristis cuspidatus* the teeth are broad, flat, and lancet-formed; and twenty-eight on each side.

Hunterian.

490. The rostrum of the small-toothed Saw-fish (*Pristis microdon*). *Mus. Brit.*

491. A similar specimen. *Presented by Sir William Blizard, F.R.S.*

492. A similar specimen.

In the *Pristis microdon* the rostrum is long, and the teeth exceedingly short. The specimen to which this name was applied was but twenty-eight inches in length, and, most probably, immature; when the shortness of the spines would be the consequence of their being nearly concealed by a membrane that extends itself laterally on each side of the snout, sometimes even to the extremity of the spines; this membrane disappears in the adult.

Hunterian.

493. The rostrum of a young Saw-fish (*Pristis pectinatus*). *Hunterian.*

494. The rostrum of a young Saw-fish (*Pristis pectinatus*). *Hunterian.*

495. A dried specimen of the *Pristis cirratus.*

In this species the rostral teeth vary in length, there being from three to five smaller ones interposed between the longer teeth; these are sharp-pointed and slightly recurved; their base is expanded and excavated more deeply than in the common Saw-fish, and becomes anchylosed to the walls of the alveolus. The rostral series of teeth extends backwards on each side of the head to beyond the angles of the mouth. The maxillary teeth are more developed than in the *Pristis antiquorum.*

Fig.—Linn. Trans. ii. pl. 26. f. 5. and pl. 27.

Habitat.—Port Jackson, in New Holland.

Hunterian.

Family *Rhinobatidæ*.

496. The maxillary and mandibular arches of the *Rhina*, showing the quincuncial pavement of obtuse, striated denticles covering the alveolar tract of the jaws, and characteristic of this genus. *Hunterian.*

Family *Raiidæ*.

497. The skeleton of a Homelyn or Sand-Ray (*Raia maculata*). The skin has been left upon the dorsal aspect. *Purchased.*

498. The skeleton of a large male Skate (*Raia Batis*), showing the cartilaginous supports of the claspers continued from the hinder margin of the ventral fins. *Hunterian.*

499. The skeleton of a small male Skate (*Raia Batis*). *Hunterian.*

500. The skeleton of a large female Skate (*Raia Batis*). *Mus. South.*

501. The skeleton of a female Skate (*Raia Batis*).
Presented by Joseph Henry Green, Esq., F.R.S.

In all these specimens may be noticed the confluence of the anterior vertebræ of the trunk and the adhesion of the scapular arch to the continuous spinous ridge of those vertebræ.

502. The cranium with the branchial arches and anterior coalesced abdominal vertebræ of a Skate (*Raia Batis*).

The hyoidean arch is extremely slender, is suspended from the back part of the proximal end of the tympanic pedicle, and is attached lower down to the first branchial arch.

The rostral process of the cranium is much prolonged.

Presented by Sir B. C. Brodie, Bart., F.R.S.

503. The cranium with the anterior coalesced and some of the free vertebræ, and with the maxillary, mandibular, hyoidean, and scapular arches of a small Ray (*Raia maculata*). *Presented by Sir B. C. Brodie, Bart., F.R.S.*

504. The anchylosed cervical, abdominal and anterior caudal vertebræ of a Skate (*Raia Batis*). The number of nerve-outlets in the coalesced anterior portion of the column indicates that of the vertebræ which form it. The parapophyses of the anterior vertebræ form articular surfaces for the two condyles of the occiput. *Hunterian.*

505. The vertebral column of a young Skate (*Raia Batis*). *Hunterian.*

506. A similar specimen. *Hunterian.*

507. A similar specimen. *Hunterian.*

In each of these may be noticed the great breadth of the neural and hæmal spines, which are fewer in number than the bodies of the vertebræ themselves.

508. A vertebral column of a young Skate (*Raia Batis*).

A vertical section has been removed from the connate anterior portion, showing the central element modified or metamorphosed as in the cranium of higher vertebrate animals into a flattened bony plate, connate with similarly flattened and expanded walls of the neural canal.

Presented by Prof. Owen, F.R.S.

509. The vertebral column of a young Skate.

510. A similar specimen.

511. A longitudinal section of the anterior vertebræ of a Skate (*Raia Batis*).

The anterior centrums have coalesced into a flattened plate, continuous with the similarly uniform walls of the neural canal. The section of the posterior vertebræ shows the ossified terminal plates united chiefly by longitudinal plates with interspaces that were filled with cartilage. The neurapophyses are short and directly perforated by the motor roots of the nerves: the interneurapophyses are larger and are perforated by the sensory roots. The parapophyses are bent and interlocked, the anterior angle of one fitting into a posterior notch of the vertebra in advance.

Presented by Prof. Owen, F.R.S.

512. A portion of the abdominal and caudal vertebræ of a Skate (*Raia Batis*), showing the bending-down of the parapophyses in the first and second caudal vertebræ to form the hæmal canal. The neurapophyses (*n*), the interneurapophyses (*i*), and the neural spines (*s*), are well shown in this specimen.

Presented by Prof. Owen, F.R.S.

513. The maxillary and mandibular arches of a Skate (*Raia Batis*), showing the crucial ligaments which connect them together on each side. *Hunterian.*

514. The maxillary and mandibular arches of a small Skate (*Raia Batis*).
Presented by William Clift, Esq., F.R.S.

515. The upper and lower jaws of a large Skate (*Raia Batis*). *Hunterian.*

515 *a.* Part of the dental covering of the jaws of a large Skate (*Raia Batis*).
Hunterian.

516. The dental covering of the jaws of a large Skate (*Raia Batis*). *Hunterian.*

517. The maxillary and mandibular arches with the teeth of a Thornback (*Raia clavata*). *Hunterian.*

518. The maxillary and mandibular arches with the teeth of a Thornback (*Raia clavata*). *Hunterian.*

519. The maxillary and mandibular arches with the teeth of a Thornback (*Raia clavata*). *Hunterian.*

520. The mandibular arch and its dental covering, together with that of the maxillary arch, of a Thornback (*Raia clavata*). *Hunterian.*

521. The dental covering of the maxillary and mandibular arches of a Thornback (*Raia clavata*). *Hunterian.*

522. The maxillary and mandibular arches of a species of Ray (*Raia acutidens*), from South Australia. They are more completely ossified than in the common species (*Raia Batis*), and the points of the teeth are more produced.
Presented by Governor Grey.

523. The maxillary and mandibular arches of a species of Ray (*Raia parvidens*), from South Australia, characterized by the minute size of the teeth.
Presented by Governor Grey.

524. The maxillary and mandibular arches of a species of Ray (*Raia molaridens*), from South Australia, characterized by the large size and obtuse or flat summits of those teeth which have been in use. *Presented by Governor Grey.*

525. The maxillary and mandibular arches of a species of Ray, from South Australia. *Presented by Governor Grey.*

526. The maxillary and mandibular arches of a species of Ray, from South Australia. The azygous symphysial row of teeth on the mandible are very distinctly shown in this specimen. *Presented by Governor Grey.*

527. The upper and lower jaws of a species of Ray, from South Australia. *Presented by Governor Grey.*

528. The upper and lower jaws of a species of Ray. *Hunterian.*

529. The maxillary and mandibular arches of a species of Ray, from the Cape of Good Hope. *Presented by William Norris, Esq.*

530. The tail of an exotic species of Ray. *Hunterian.*

531. The tail and serrated spine of the Fire-flare or Sting-Ray (*Trygon pastinaca*). *Hunterian.*

532. A similar specimen. *Hunterian.*

533. The tail of the *Trygon pastinaca*, with two serrated spines. *Hunterian.*

534. The caudal serrated spine of the *Trygon pastinaca*. *Hunterian.*

535. The skeleton of a small Eagle Ray (*Myliobates Aquila*). *Purchased.*

536. The tail of an Eagle Ray (*Myliobates Aquila*). *Hunterian.*

537. The tail of an Eagle Ray (*Myliobates*), showing a series of five serrated spines in succession. The tail measures 7 feet 8 inches in length, from the base of the first spine. *Hunterian.*

538. The tail of a smaller *Myliobates*, showing two, fractured, serrated spines. *Hunterian.*

539. Part of the tail of another species of *Myliobates*, with a single and longer serrated spine. The skin of the tail is granulated with small placoid tubercles. *Hunterian.*

540. The caudal serrated spine, apparently, of a *Myliobates*. *Hunterian.*

541. A portion of the dental pavement of a lower jaw of a true *Myliobates*: this subgenus is characterized by one broad middle series, and by several narrow lateral series of denticles. *Hunterian.*

542. The upper and lower jaws of a small specimen of a *Myliobates*, with the dental plates.

The upper series of plates is convex, both transversely and longitudinally, but more so in the latter direction: the plates of the lower series are narrower and are nearly horizontal. Its anterior extremity projects beyond the jaw, and can be used like a spade in digging out shell-fish, crustaceans, &c., from the sandy bottoms frequented by these Rays.

Hunterian.

543. A portion of the dental covering of the upper jaw of an Eagle Ray (*Zygobates*). *Mus. Brit.*

544. A portion of the upper jaw with the dental pavement of a *Zygobates*. *Hunterian.*

545. A portion of the upper jaw, with its dental pavement, of a *Zygobates*.

This genus is characterized by the great breadth of the series of teeth on each side the middle series. The outer rows, two or three in number, are composed of small prismatic teeth. There are two rows on the right and three on the left of the present specimen.

Hunterian.

546. A portion of the dental pavement of the upper jaw of a *Zygobates*.

There are two rows of small denticles on both sides in this specimen. The difference of thickness in the anterior worn denticles, and the posterior later developed ones intended to replace them, is worthy of notice. The bases of the denticles show the fissures by which the vessels and nerves penetrate the medullary cavities and canals of the dental substance.

Hunterian.

547. A portion of the dental pavement of a lower jaw of a *Zygobates*. The series next the middle one, on the left side, is divided into two, which renders the pavement unsymmetrical,—an anomaly without doubt accidental and peculiar to the individual from which the specimen was derived. *Hunterian.*

548. A portion of the lower jaw and dental pavement of the same species of *Zygobates*. The abnormal division is not present in either of the lateral series of denticles, and their arrangement is symmetrical. *Hunterian.*

549. The right moiety of a small, dried, bisected specimen of an Eagle Ray (*Ætobates*), showing the disposition of the massive crushing dental plates of the palato-maxillary and mandibular arches.

The palato-maxillary series is distinguished by its greater degree of curvature: it is placed vertically with the convex grinding surface turned backwards and downwards, the lower and anterior border working upon the almost horizontal surface of the mandibular pavement.

Hunterian.

550. A part of the dental pavement of the upper jaw of an *Ætobates*. The grinding surface is convex antero-posteriorly, and sinuous transversely, being slightly concave in that direction at the sides. *Hunterian.*

551. Part of the dental pavement of the upper jaw of a very large *Ætobates*.

Mus. Brit.

552. A portion of the upper jaw, with the dental pavement, of an *Ætobates*. This subgenus is characterized by the single series of teeth, which are of unusual breadth; the anterior ones show the effects of attrition depending upon the position of the entire series in relation to those in the lower jaw, as shown in the preceding specimen. *Mus. Brit.*

553. The dental pavement of the under jaw of an *Ætobates*; two of the teeth or dental plates have been detached from the anterior worn end, to show their chevron-shape and the grooved basis by which they adhere to the mandibular cartilage. *Hunterian.*

554. A portion of the mandible, with the dental pavement, of the *Ætobates angustus.* *Mus. Brit.*

555. Portions of the upper and lower jaws, with their dental pavements, of an *Ætobates.* *Hunterian.*

556. A portion of the dental pavement of the lower jaw of a large Eagle Ray (*Ætobates*).

The pores visible on the posterior fractured surface are the orifices of the medullary canals of the minute denticles, the aggregate of which denticles composes each of the transverse dental plates: the antero-posterior parallel grooves on the under or attached surfaces of these plates are well seen in this large specimen, together with the canals continued upwards from the posterior part of the grooves, which canals lead to a continuous transverse channel running along the back part of the grooved basis of the tooth. The vessels and nerves of the denticles pass out of the canal by the pores with which it is perforated. By this arrangement the delicate vascular matrix is effectually defended from the superincumbent pressure which is transmitted by the margins of the longitudinal lamellæ beneath the dental canal upon the jaw-bone.

Hunterian.

557. The dental pavement of the lower jaw of a large *Ætobates.* *Hunterian.*

558. The dental pavement of the lower jaw of an *Ætobates.* *Mus. Brit.*

559. The dental pavement of the lower jaw of an *Ætobates.* *Mus. Brit.*

560. Two of the chevron-shaped dental plates of the mandibular pavement of an *Ætobates.* *Hunterian.*

Family *Cephalopteridæ*.

561. A portion of the head of a large exotic Ray (*Cephaloptera*).

It is remarkable for the complete detachment of the anterior angles of the pectoral fins from the rest of those members, and their attachment to the lateral productions of the wide anterior rostral portion of the skull; thus appearing to be cephalic fins, whence the name of the genus. Each of these fins contains 26 jointed rays, which do not bifurcate until near their extremities. The maxillary and mandibular arches present the form of flattened transverse bars of cartilage covered by a pavement of minute ossicles: the dentary borders are coated by a pavement of minute rhomboidal flattened teeth.

Presented by Prof. Owen, F.R.S.

562. A portion of the skull of a *Cephaloptera*, showing the anterior dismemberments of the great pectoral fins, which are attached to the ends of the tympanic pedicles and to the sides of the rostral production of the skull. The pavement of minute teeth is preserved on both jaws.

Presented by Dr. Bigelow.

MISCELLANEOUS AND UNDETERMINED.

563. The glossohyal, or lingual plate, of the great Sudis (*Arapaima gigas*): its upper surface is beset with small granular teeth, and the Indians of South America, to the great rivers of which this fish is peculiar, use this part of it for a rasp.

In Edwards's 'Voyage to the Amazon River' is the following reference to this part:—"A teaspoonful of Guarana grated into a tumbler of water makes a pleasant beverage, but when drunk to excess its narcotic effects greatly injure the system. The grater used for this and other purposes is the rough tongue-bone of one of the large river-fish." (p. 157.)

Hunterian.

564. Four epibranchial bones and three pharyngo-branchials, supporting series of small conical curved teeth with the same parts of the opposite side, of an Osseous Fish. *Hunterian.*

The following specimens of the Calcareous Concretions from the Ear-sac of Fishes were prepared and presented by Sir Anthony Carlisle, F.R.S.

565. The larger Otolites of the Ling (*Lota molva*).

566. The larger Otolite of the Herring (*Clupea Harengus*).

567. The larger Otolite of the Dace (*Leuciscus vulgaris*).

568. The larger Otolite of the Gudgeon (*Gobio fluviatilis*).

569. The larger Otolite of the Sole (*Pleuronectes Solea*).

570. The larger Otolite of the Plaice (*Pleuronectes Platessa*).

571. The larger Otolite of the Cod (*Morrhua vulgaris*).

572. The larger Otolite of the Haddock (*Morrhua æglefinus*).

573. The larger Otolite of the Sword-fish (*Xiphias Gladius*).

574. The larger Otolite of the Sturgeon (*Acipenser Sturio*).

575. The larger Otolite and the two smaller Otolites of some very large Osseous Fish. *Presented by Charles Darwin, Esq., F.R.S.*

Class REPTILIA.

Order BATRACHIA.

Genus *Siren*.

576. One of the anterior vertebræ of the Siren (*Siren lacertina*), which supports short pleurapophyses or costal appendages.

The whole vertebra is remarkable for its strongly ridged exterior: the body presents a deep conical excavation at each end: the neural spine forms a strong ridge above the arch, and bifurcates posteriorly to terminate upon the posterior zygapophyses. A strong hypapophysial ridge is left, by defect of ossification on each side, to form the under surface of the centrum. A parapophysial ridge extends from a short anterior parapophysis to the longer parapophysial part of the transverse process at the posterior part of the vertebra. A diapophysial ridge extends above and nearly parallel with the former, from the anterior zygapophysis to the diapophysial part of the transverse process. A third short ridge is continued from the former to the posterior zygapophysis. The vacuities between these several ridges resemble those which are common in the incompletely ossified vertebræ of fishes.

Hunterian.

576 *a*. The skull and four following vertebræ of the *Siren lacertina*.

The cranial cavity has been laid open, and the large otolite and vestibular sac are exposed in the right otocrane. The body of the atlas articulates by two almost flat vertical articular surfaces to two similar condyles from the exoccipitals. A continuous broad flat expanse of bone represents the bodies of the cranial segments.

The confluent paroccipital and mastoid project backwards as a broad compressed plate, from the upper part of which a mastoid ridge extends forwards along the side of the cranium, and gives attachment to the tympanic, which arches forwards and downwards, increasing in thickness and forming a three-sided cone, the base of which forms the articular cavity for the broad convex condyle of the lower jaw: both the frontal and nasal bones are divided by a median suture. The premaxillaries consist of a short, transverse, trenchant, alveolar plate, and a long and slender nasal part, the point of which is wedged between the nasal and frontal. The prefrontal, notched by the olfactory nerve, extends from the frontal, which overarches it, to the vomer and palatine below. The palatine is beset with eight short oblique rows of denticles, and four similar rows extend backwards on short pterygoids.

The lower jaw consists of articular, angular, splenial and dentary pieces. The angular and splenial seem to be confluent. There is no coronoid process. The horny, trenchant covering of the alveolar plate of the maxillary terminates behind in an angular elevation of that margin. On the inner side, between the trenchant plate and the splenial piece, there is a narrow longitudinal patch of denticles.

The body of the atlas extends forwards like a short odontoid process above the interspace between the occipital condyles. A short parapophysial and diapophysial plate is developed from each side of the atlas, which has posterior but not anterior zygapophyses. In the second vertebra, which has increased in length, the par- and di-apophysial plates have united to form a compound transverse process, which supports a short straight pleurapophysis; and a strong hypapophysial ridge is developed from the whole length of the under surface of the centrum. A ridge is continued from the diapophysial ridge to the posterior zygapophysis. Two vertical ridges diverging to the same processes from the fore part of the neural arch represent the neural spine. In the third vertebra the characters are assumed, which have been noted in the description of No. 576.

Hunterian.

577. Five caudal vertebræ of the *Siren lacertina.*

Each vertebra is compressed, and its vertical extent increased, by the bending down of the parapophysial plates, to form two vertical walls, intercepting a hæmal canal which protects the vascular trunks of the tail. The diapophysial ridge is continued outwards from the side of the centrum. The neural arch has coalesced with the centrum in this, as in other Batrachia.

Hunterian.

578. A vertically and longitudinally bisected vertebra, from the middle of the back of the *Siren lacertina.* It shows the depth and shape of the terminal articular excavations of the centrum, which were filled, as in fishes, by unossified remains of the notochord, in the condition of concentric ligamentous layers, with intervening gelatinous fluid, the whole inclosed in a capsule, and giving a certain elasticity to the vertebral column *. *Hunterian.*

579. The horny dental sheaths of the jaws, with the palatal villiform teeth of the *Siren lacertina.* *Hunterian.*

Genus *Proteus.*

580. A considerable portion of the vertebral column, with the mandible and hyoid apparatus of the *Proteus anguinus.*

In the entire skeleton the third to the ninth vertebræ support minute ribs attached to the lower (parapophysial) half of the transverse process: they are wanting in the twenty-one following vertebræ, and re-appear well developed in the thirty-first vertebra, where they form, with broad cartilaginous hæmapophyses, a pelvic arch.

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* See the Wet Preparation, No. 246. Physiological Series, Gallery.

The bodies of the vertebræ are long, slender, deeply excavated at both ends, and joined together as in the *Siren lacertina*.

Presented by Prof. Owen, F.R.S.

Genus *Axolotes*.

581. The cranium of the Axolotl (*Axolotes marmoratus*).

The basioccipital is represented by a posterior prolongation of the common broad and flat basicranial bone which represents the bodies of the cranial vertebræ. The exoccipitals are separated below by the basioccipital process, and above by a thin dried cartilaginous representative of the superoccipital. Each exoccipital developes a small, almost flattened condyle, anterior to which it is perforated by the eighth pair of nerves; it articulates above with the parietal and mastoid, and is separated from the alisphenoid by the large cartilaginous petrosal capsule, to which a small discoid representative of the stapes is attached, closing the homologue of the 'fenestra ovalis.' The basisphenoidal portion of the basicranial plate sends an angular process outwards on each side, which supports the alisphenoid. The surfaces of the alisphenoid are directed forwards and backwards, instead of from side to side, and it constitutes chiefly the anterior parietes of the otocrane; the inner and anterior border is notched by the great trigeminal nerve. The parietals are long and broad, divided by the sagittal suture, and impressed at the posterior and outer angle by the anterior attachment of the great dorsal trunk-muscles. The mastoids are articulated to this part of the parietal and to the exoccipitals, and overarch the cartilaginous petrosals; they give attachment to the tympanic pedicle. The orbitosphenoids are divided by a membranous tract of some extent from the alisphenoids, and articulate above with the extremity of the parietal, the frontal and prefrontal bones. There are neither paroccipitals nor postfrontals. The vomerine portion of the basicranial plate is chiefly cartilaginous. The nasal bones are very small, and separated from each other by the junction of the premaxillaries with the frontals. The nasal processes of the premaxillaries are unusually long and narrow. The small maxillaries are subbifurcate anteriorly, one part being attached to the palatine, the other to the premaxillary; the rest of the bone extending backwards into a short and slender pointed process. The alveolar border of both premaxillaries and maxillaries supports a single row of small equal and sharp-pointed denticles. Two bones attached to the anterior and outer part of the basicranial bone, and which may be regarded either as vomerine or palatal, support each a narrow rasp-like group of minute denticles, which are continued backwards upon the beginning of the pterygoids; the pterygoids continued from these bones and from the sides of the basicranial bone expand as they extend backwards and apply themselves to the inner side of the tympanic pedicle. A bristle is passed through the dried nasal meatus of the right side, showing its posterior termination between the beginning of the pterygoids and the end of the maxillary bones. Besides the ordinary row of denticles upon the dentary piece of the lower jaw, there is a second shorter series upon the splenial piece.

Presented by Prof. Owen, F.R.S.

Genus *Menobranchus*.

582. The cranium of the Menobranchus (*Menobranchus lateralis*).

In this skull the basioccipital is represented by the narrow posterior border of the common basicranial plate, which bounds the foramen magnum below and separates the occipital condyles. These are transversely oblong, convex vertically, concave transversely, developed from the exoccipitals, which are separated above by a membranous or thin cartilaginous plate, representing the superoccipital: each exoccipital forms the posterior half of the otocrane, is perforated by the nervus vagus, and articulates above with the parietal and mastoid. The basisphenoid is very broad and flat: the alisphenoids bound the fore part of the otocrane, transmit the trigeminal nerve, and abut against the tympanic pedicle in its course backwards to the mastoid. The parietals are divided by the sagittal suture and develope a small ridge there posteriorly: each parietal sends down a process in front of the alisphenoid, which rests upon the pterygoid, representing the so-called columella in Lizards. There are no maxillary bones. The alveolar border of the premaxillaries, which supports a single row of long and slender teeth, ten in number in each bone, terminates in a point projecting freely outwards and backwards. The vomero-palatine bones unite together anteriorly, but diverge posteriorly, where they give attachment by their outer margin to the pterygoids. There is a single row of long and sharp denticles upon the alveolar border of the vomero-palatines, and behind this there is a series of six or seven denticles on the outer and anterior border of each pterygoid. The anterior teeth of the lower jaw pass into the interspace between the premaxillary and vomerine teeth. The pterygoid teeth are opposed by a row of five or six teeth, forming a group behind and distinct from those on the anterior half of the dentary bones.

Presented by Prof. Owen, F.R.S.

Genus *Menopoma*.

583. The skeleton of the Menopome or Salamander of the Alleghany Mountains (*Menopoma Alleghaniense*). The number of vertebræ is 35.

The first vertebra is without ribs; the eighteen succeeding vertebræ have short, free, or false vertebral ribs, 'pleurapophyses,' articulated to the extremities of transverse processes, formed by 'parapophyses' and 'diapophyses' which intercept, prior to their confluence, an arterial canal. These processes are enlarged in the twentieth vertebra, and a second rib-like piece is articulated to the short and thick rudimental rib, the inferior or hæmal arch being completed by semi-ossified cartilage. The bones of the hinder extremity are articulated to the junction of the second rib-like piece with the cartilage. The vertebra, completed by this inferior arch, represents a sacral vertebra; the second division of its rib answers to the ilium; the cartilage completing the arch, to the 'ischium' or 'pubis.' Transverse processes, progressively decreasing in length, are developed from the six succeeding vertebræ. Osseous rudiments of ribs are attached to the first of these, and cartilaginous rudiments to the three following. Hæmal arches are anchylosed to the under part of the centrum of the second to the twelfth caudal vertebra inclusive: the neural arches are complete to the fourteenth caudal vertebra. Some of the terminal vertebræ are wanting from this skeleton.

The hæmal arch answering to that attached to the occiput in Fishes is naturally detached from that segment, and has been freely suspended in the flesh opposite the fourth vertebra from the occiput. The upper element or 'supra-scapula' is cartilaginous: the 'scapula' is ossified, and sends a broad plate forwards from its humeral half; the broad 'coracoids' are cartilaginous. The extremities of the humeri and femora, of the bones of the fore-arm and of the leg, of the carpus and tarsus are cartilaginous, as in the embryos of the higher animals, and continue so through life in the Menopome. The fore-foot has four digits; the hind-foot five.

The numbers on the bones of the skull indicate their names according to Table I. of SYNONYMS.

Mus. South.

584. The atlas of the Menopome.

The body of the atlas presents anteriorly an odontoid process separating the two articular surfaces for the occipital condyles; it is deeply excavated posteriorly. The neural arch terminates above in a ridge: it developes posteriorly two oblique processes, 'zygapophyses,' whose articular surfaces look downwards. This vertebra has neither diapophyses nor pleurapophyses.

Hunterian.

585. Eight abdominal or dorsal vertebræ of the Menopome, wanting the pleurapophyses.

The basal interspace between the confluent parapophysis and diapophysis answers to the foramen in the transverse process of the 'cervical vertebræ' of birds and mammals, and gives passage to an artery, which has here been injected, answering to the vertebral artery in the same classes. The centrum terminates below in a longitudinal ridge, and has a deep conical excavation at both extremities. The neural arch has coalesced with the centrum: it is broad and depressed, with a tubercular rudiment of a spine posteriorly: it sends out two prezygapophyses looking upwards and two postzygapophyses looking downwards.

Hunterian.

586. A longitudinal section of a dorsal vertebra of the Menopome, showing the form and depth of the anterior and posterior articular cavities. The arterial canal in the compound 'transverse process' is exposed.

Prepared by Prof. Owen, F.R.S.

587. Seven abdominal and five caudal vertebræ, with the intervening sacral vertebra, of the Menopome.

The pleurapophyses are preserved on the left side; that of the sacrum is longer, thicker, and more curved than the rest. The neural tubercle is developed into a spine at the fifth caudal vertebra.

Hunterian.

588. Some of the cranial bones, partially disarticulated, of the Menopome; they are numbered according to Table I. of SYNONYMS. *Hunterian.*

Genus *Triton*.

589. The skeleton of a Newt (*Triton cristatus*).

It resembles that of the Menopome in its general characters. The only ossified parts of the hæmal arches of the trunk are short pleurapophyses. The long tail is supported by numerous caudal vertebræ, compressed, and extended in the vertical direction by long neural and hæmal spines, so as to constitute the chief natatory organ of this aquatic Batrachian.

Mus. South.

Tribe ANOURA (Tail-less Batrachia).

Genus *Rana*, Cuvier.

590. The cranial and vertebral column of the trunk of the Bull-frog (*Rana boans*).

The tympanic bone, vomer, pterygoid, palatine, maxillary and premaxillary bones have been removed from the right side, and the rami of the lower jaw are separately preserved. Each ramus consists of three pieces, an articular, an angular, and a dentary piece; but the latter is edentulous. Teeth are developed only in the upper jaw, viz. upon the premaxillary, maxillary and vomerine bones. The membrana tympani is preserved, together with the columelliform stapes which extends between it and the cartilaginous petrosal. The number of vertebræ of the trunk, exclusive of the coccygeal style, is nine; the first or atlas has no diapophyses, but these are present, and of great length, in the rest; especially in the third, fourth and ninth vertebræ; in the latter they are very thick, stand outwards, and support by their truncated extremities two other long, curved, compressed, rib-like bones, which expand at their distal extremities and unite there to two partially anchylosed bony plates which complete the inferior or hæmal arch of the ninth segment of the trunk.

The bones of the hinder extremities are attached to the point of union of the above costal and hæmal pieces, one of which answers to the ilium and the other to the ischium. The superior development of this arch relates to the great size and strength of the hinder extremities in the Tail-less tribe. The bodies of the vertebræ are articulated by ball-and-socket joints, the cup being anterior, the ball posterior, a modification which relates to the more terrestrial habits and locomotion of these higher-organized Batrachia. The caudal vertebræ are represented by a single, elongated, cylindrical style, having an anchylosed neural canal. In the seven vertebræ, between the atlas and the sacrum, two prezygapophyses looking upwards, two postzygapophyses looking downwards, and a short spinous process, are developed from each neural arch.

The bones of the cranium are numbered according to Table I. of SYNONYMS.

Hunterian.

591. The scapular arch and sternum of the same Bull-frog (*Rana boans*).

The suprascapula is in great part ossified: the scapula divides at its humeral end into an acromial and coracoid process; the latter articulates with the true coracoid bone, the acromion with the expanded extremity of the clavicle: the glenoid cavity is formed by both processes of the scapula, and by the coracoid. An episternal bone, supporting a broad cartilage, is articulated to the mesial union of the clavicles, from which a bony bar is continued backwards between the expanded and partially conjoined ends of the coracoids. The sternum is articulated to the posterior part of the same extremities of the coracoids.

Hunterian.

592. The humeri, antibrachial bones, portions of the carpal bones, and some phalanges, from the same Bull-frog (*Rana boans*).

The proximal end of the humerus is an epiphysis; the distal end presents a hemispherical ball between a small external ridge and a large internal condyloid process. The antibrachial bones have coalesced, but an anterior and posterior indentation at the distal half indicates the radius and ulna; their distal articular extremities are represented by a single epiphysis. The ulnar portion of the bone developes a short and broad olecranon.

In the carpal series are preserved the large scapho-lunar bone, the cuneiform, the magnum and the unciform bones.

Hunterian.

593. The bones of the hinder extremities of the same Bull-frog (*Rana boans*).

Both the proximal and the distal extremities of the femur are in the condition of epiphyses. The tibia and fibula are connate: a longitudinal impression on the front and back part of the expanded distal end indicates their division, but a single epiphysis, partially anchylosed, forms the proximal extremity, and a similar one the distal extremity, of the connate bones; they are perforated near their middle, from before backwards, by a vascular canal.

The astragalus and calcaneum are much elongated; the former is slightly bent, the latter straight; they have coalesced at their proximal and also at their distal extremities with each other, and with the scaphoid and cuboid bones. Two cuneiform bones remain detached, and immediately support the three inner toes.

Hunterian.

594. The skeleton of the common Frog (*Rana temporaria*). The number of vertebræ from the atlas to the sacrum inclusive is nine; there are no ossified pleurapophyses, and in most other respects the skeleton resembles that of the larger species, *Rana boans*. *Presented by Henry Cline, Esq.*

595. A skeleton of the common Frog. *Mus. South.*

596. A skeleton of a species of *Rana*, apparently the male of *Rana temporaria*, with the ridge continued from the internal condyle, or the shaft of the humerus, unusually developed. *Purchased.*

Genus *Bufo*.

597. The skeleton of the common Toad (*Bufo vulgaris*).

The number of vertebræ is the same as in the common Frog, but the diapophyses of the third and fourth vertebræ are relatively longer, those of the sacral vertebræ relatively shorter, broader, more depressed and expanded at their extremities. The modified pleurapophyses of the sacrum, or 'iliac bones,' are relatively shorter and more arched. The femora are shorter than the ilia, and the tibiæ are shorter than the femora. The hind-foot is also much shorter than in the Frog. The bones of the fore-extremity are relatively larger; the deltoid ridge of the humerus is more developed, but those which extend from the outer and inner condyles are less developed than in the Frog.

Mus. South.

Genus *Cystignathus*.

598. The skeleton of the thick-legged Toad (*Cystignathus pachypus*).

It differs from the common Toad chiefly by the singular form of its humerus, arising from the great development of the osseous ridges extending from the outer and inner condyles, which pass backwards, converge, and unite with a broad plate of bone developed from the whole of the back part of the humerus. Two ridges arise from the fore part of the upper half of the humerus, viz. an outer deltoid, and an inner pectoral ridge. The proximal end of the humerus is an epiphysis. The clavicles are stronger than in the common Toad, and nearly equal the coracoids in thickness. The antibrachial bones are shorter in proportion to the humerus. The pollex is short and rudimental. A broad, irregular plate of bone is developed from the metacarpal bone of the index digit, which is probably a sexual peculiarity, and indicates the present skeleton to have belonged to a male. The sacral diapophyses are subcylindrical. The tibia is longer than the femur, and the bones of the hind-foot, in their length and slenderness, accord with those characters in the Frog tribe.

Purchased.

Genus *Ceratophrys.*

599. The skeleton of a large species of horned Toad (*Ceratophrys*).

The bones of the skull have a rough, granulated, exterior surface. The diapophyses of the atlas are compressed and truncated at their extremities; those of the fourth, fifth and sixth vertebræ are subcylindrical and elongated; those of the sacrum are long, strong, depressed and expanded. The coccygeal style has a simple, anchylosed, neural canal. There is a semi-ossified tubercle upon the proximal extremity of each iliac bone; these are confluent at their distal extremities with each other and with the ischium. The humerus presents a long deltoid ridge, but those which extend to the outer and inner condyles are almost obsolete. All the bones of the mouth are edentulous, but a trenchant ridge is developed from the lower part of each palatine.

Purchased.

600. The natural skeleton of a small species of Toad with rough cranial bones like the *Ceratophrys*, but in which the neural arches of the six vertebræ between the axis and sacrum present a smooth concavity or depression above, instead of a spine. *Purchased.*

Genus *Pipa.*

601. The skeleton of the Surinam Toad (*Pipa monstrosa*).

This species presents eight vertebræ from the atlas to the sacrum inclusive, and the coccygeal style is anchylosed to the sacrum: it would seem that the first vertebra answered to both atlas and axis, as in the ordinary Toads and Frogs, since it is longer than the succeeding ones, and developes a long diapophysis on each side. The vertebræ of this toad are united by ball-and-socket joints, but the ball is anterior instead of being posterior, as in the ordinary Toads and Frogs. The diapophyses of the second and third vertebræ are of unusual length, and support semi-ossified, short, flattened pleurapophyses. The diapophyses of the four succeeding vertebræ are very short and slender; those of the sacrum have the form of depressed, remarkably expanded, triangular plates, and rest upon the anterior halves of the iliac bones. The suprascapula is bifurcate, its anterior and longer branch resting upon the diapophysis of the atlas. The acromial ridge of the scapula has coalesced with the long and slender clavicle. The coracoids remain distinct, and are unusually expanded beneath the thorax. The tibia is shorter than the femur. A calcaneal sesamoid is developed in the extensor tendon of the foot. The long tarsal bone representing the coalesced body of the calcaneum and cuboid, is three-sided, the angles forming sharp ridges. The astragalus presents a similar form.

Hunterian.

General Observations on the Skeletons of the Batrachia.

In commencing the study of the skeletons of Reptiles in the lowest, and most fish-like of the class, we find a much less complex condition of the osseous framework of the body than in the Bony Fishes; this will be immediately manifest by a comparison of the skeleton of the Menopome (No. 583), which may be taken as an example of the perennibranchiate *Batrachia*, with the skeleton of the Trout (No. 45), or of the Haddock (No. 176).

The difference tends greatly to elucidate the true nature of the complexities of the Fish's skeleton, since it chiefly consists in the simplification of that of the Batrachian by the non-development of the parts of the dermal skeleton, which characterize that of the Fish. The suborbital, supraorbital and supratemporal scale-bones are removed, together with the opercular bones from the head; and the interneural and dermoneural spines, with the interhæmal and dermohæmal spines, are removed from the trunk: and the endo-skeleton is also reduced to a very simple condition; the advance characteristic of the higher class being appreciable only by a comparison of it with the skeleton of the most batrachoid of Fishes—the Protopterus (No. 380) and Lepidosiren.

We then perceive that the bodies of the vertebræ, in the true Batrachian, are distinctly ossified, though preserving, in the perennibranchiate species, a deep, conical, jelly-filled cavity both before and behind: they have also coalesced with the neural arches, as these have with their spines, which are, however, scarcely developed except in the tail. The transverse processes are developed not only from the centrum but from the base of the neural arch, and are formed by both parapophyses and diapophyses; and they coexist with distinct hæmapophyses in the tail: with these, likewise, coexist cartilaginous pleurapophyses in the second, third and fourth caudal vertebræ; short ossified pleurapophyses being developed from the ends of the diapophyses in the first caudal to the vertebra dentata inclusive.

By this instructive condition of the skeleton of the Menopome we perceive at once that the hæmapophyses are neither transverse processes, nor ribs bent down or displaced, but are elements of vertebræ, as distinct as the neurapophyses above. The neural arches are now articulated together by well-developed zygapophyses with synovial articulations, which are absent in the Protopterus, as in most Fishes.

In the Protopterus, as in the Squatina and some other cartilaginous fishes, the neural arch of the atlas rests upon a backward production of the basioccipital; in the Batrachians it is confluent with its own proper centrum, which developes two articular surfaces for two occipital condyles. The hæmal arch of the occipital segment which is attached to its proper vertebra in the Lepidosiren, as in Osseous Fishes, is detached and displaced backwards in the Batrachians, as in the Plagiostomes. In the completion of the hæmal arch of the sacral vertebra in the Menopome, by the enlargement of its transverse process and by its pleurapophysis extended to join a hæmapophysis below, we have the key to the essential nature of the pelvis in all air-breathing animals. The ultimate subdivisions of the radiated or diverging appendages of the scapular and pelvic arches do not exceed five in any existing air-breathing animal, and their further complexity is due to the specialization of each digit, so as to combine in associated action, instead of their indefinite multiplication which causes the seeming complexity of the same appendages in Fishes.

Order OPHIDIA.

Family *Constrictores.*

Genus *Python.*

602. The skeleton of the Tiger Boa (*Python tigris*).

It measures 11 feet 2 inches in length. It has 74 anterior vertebræ, with hypapophyses or inferior spines from the body of the vertebra; 179 vertebræ bearing moveable ribs, but no hypapophyses; and 38 caudal vertebræ, all of which have hypapophyses, and mostly in pairs. The ribs commence at the third vertebra: they are 'pleurapophyses' or consist of the vertebral portion only, and terminate freely at the opposite extremity, where, in the recent animal, they support short cartilaginous hæmapophyses connected with the large, thick, abdominal scutes, and, in connection with their elevation and depression, aid, like limbs, in locomotion. There is no sternum.

Anchylosis has occurred between the 148th and 149th vertebræ. The 166th and the 167th vertebræ have been more completely and abnormally blended together, so as to seem but one vertebra on the left side, where that half of the neural arch and spine have completely coalesced, whilst on the right side each vertebra supports its own rib. A similar abnormality occurs between the 184th and 185th vertebræ. The first caudal vertebra has free pleurapophyses, which are bifurcate, the upper prong being the shortest: in the second caudal the left pleurapophysis is free, the right one anchylosed to the diapophysis; the forks are of equal length in this and the two following: in the fifth caudal the upper prong is again shorter, and in the sixth is reduced to a mere tubercle: here the hypapophyses begin to lengthen and bifurcate, and progressively increase to the sixteenth caudal, and thence gradually diminish. The neural canal, with the neural arch, its spine and zygapophyses, maintain their normal characters to the penultimate vertebra, and the spinal cord continues undivided or unresolved into nervous fasciculi to the same extent.

Purchased.

603. A considerable portion of the spinal column, including 156 vertebræ, wanting the ribs, of a large *Python* from Jessore.

The characteristics of the vertebræ of the typical Ophidian Reptiles may be well studied in this specimen. In the Pythons, as in other known *Ophidia*, all the autogenous elements, except the pleurapophyses, coalesce with one another in the vertebræ of the trunk; and the pleurapophyses also become anchylosed to the diapophyses in those of the tail. There is no trace of suture between the neural arch and centrum. The outer substance of the vertebra is compact, with a smooth or polished surface. The vertebræ are 'procœlian,' that is, they are articulated together by ball-and-socket joints, the socket being on the fore part of the centrum, where it forms a deep cup with its rim sharply defined; the cavity looking not directly forwards, but a little downwards, from the greater prominence of the upper border:

the well-turned prominent ball terminates the back part of the centrum rather more obliquely, its aspect being backwards and upwards. The hypapophysis is developed in different proportions from different vertebræ, but throughout the greater part of the trunk presents a moderate size. A vascular canal perforates the under surface of the centrum, and there are sometimes two or even three smaller foramina. A large, vertically oblong, but short diapophysis extends from the fore part of the side of the centrum obliquely backwards: it is covered by the articular surface for the rib, convex lengthwise, and convex vertically at its upper half, but slightly concave at its lower half. The base of the neural arch swells outward from its confluence with the centrum, and developes from each angle a transversely elongated zygapophysis; that from the anterior angle looking upwards, that from the posterior angle downwards, both surfaces being flat, and almost horizontal, as in the Batrachians. A thick rounded ridge connects the anterior with the posterior zygapophysis on each side, extending along the base of the neural arch. The neural canal is narrow, with a subtrihedral area, and with a narrow longitudinal ridge on each side. The neural spine is of moderate height, which scarcely equals its antero-posterior extent; it is compressed and truncate. A wedge-shaped process (the 'zygosphene'*) is developed from the fore part of the base of the spine; the lower apex of the wedge being, as it were, cut off, and its sloping sides presenting two smooth, flat, articular surfaces. This wedge is received into a cavity (the 'zygantrum'†) excavated in the posterior expansion of the neural arch, and having two smooth articular surfaces to which the zygosphenal surfaces are adapted.

Thus the vertebræ of Serpents articulate with each other by eight joints in addition to those of the cup and ball on the centrum; and interlock by parts reciprocally receiving and entering one another, like the joints called tenon-and-mortice in carpentry.

The neural spine is broad, moderately high, compressed and truncate superiorly. The hypapophysis of the anterior vertebræ is narrower and more pointed; in the middle and posterior abdominal vertebræ this process is represented by a low tubercle, which in the posterior abdominal vertebræ terminates in a ridge. In the caudal vertebræ the hypapophysis is double, the transition being effected by a bifurcation of the tubercle in the posterior abdominal vertebræ. The diapophyses become much longer in the caudal vertebræ, and support in the anterior ones short ribs which usually become anchylosed to their extremities. In the present series of vertebræ, two of the caudal vertebræ present the anomaly of being anchylosed with each other, with the interposition of an additional left half of the neural arch, a left diapophysis, and left division of the neural spine: the left half of the neural arch belongs to the second vertebra, whilst the left supernumerary diapophysis and hypapophysis are developed from the first or anterior vertebra.

Presented by Dr. Wallich, F.R.S.

604. The atlas or first trunk-vertebra of a large African constricting Serpent (*Python regius*).

The hypapophysial part of the centrum seems to form the entire body of the vertebra; it is wedge-shaped, as usual in Reptilia, and is articulated by suture on each side to part of the

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* *Ζυγὸς, a yoke, σφὴν, a wedge.*   † Ζυγὸς, and *ἄντρον, a cavity.*

neurapophyses: it also presents a concave articular surface anteriorly for the lower part of the basioccipital tubercle, and a similar surface behind for the detached central part of the body of the atlas, or 'odontoid process of the axis.' The base of each neurapophysis has an antero-internal articular surface for the exoccipital tubercle, the middle one for the hypapophysis, and a postero-internal surface for the upper and lateral parts of the odontoid: they thus rest on both the separated parts of their proper centrum. The neurapophyses expand and arch over the neural canal, but meet without coalescing. There is no neural spine. Each neurapophysis developes from its upper and hinder border a short zygapophysis, and from its side a still shorter diapophysis.

Purchased.

605. The axis or second vertebra of the trunk, with the partially coalesced body of the atlas or 'odontoid process' of the same Python.

The odontoid presents a convex tubercle anteriorly, which fills up the articular cavity in the atlas for the occipital tubercle: below this is the surface for the hypapophysial part of the atlas, and above and behind it are the two surfaces for the atlantal neurapophyses: the whole posterior surface of the odontoid is anchylosed to the proper centrum of the axis, and in part to its hypapophysis.

The neural arch of the axis developes a short ribless diapophysis from each side of its base; a thick sub-bifid zygapophysis from each side of the posterior margin; and a moderately long bent-back spine from its upper part. The centrum terminates in a ball behind, and below this sends downwards and backwards a long hypapophysis.

Purchased.

606. An anterior trunk-vertebra or cervical vertebra of a Python, showing its characteristic, long, retroverted hypapophysis. *Purchased.*

607. Two anterior vertebræ of the trunk of a Python characterized by the inferior hypapophysis. *Purchased.*

608. Two vertebræ from the middle or posterior region of the trunk of a Python, in which the hypapophysis is reduced to a small tubercle. The interlocking of these vertebræ by their characteristic complex zygapophyses and oblique, deep, ball-and-socket union, limits their reciprocal movements to a slight amount of rotation on the horizontal plane. *Purchased.*

609. Two posterior abdominal vertebræ of the trunk of a Python, in which the hypapophysis is replaced by a ridge and tubercle. The ribs which are here

preserved show the concavo-convex form of their articular extremities, which are adapted to corresponding modifications of the articular diapophyses.

Purchased.

610. A vertically bisected abdominal vertebra of a Python, showing the texture of the centrum and neural arch, the oblique position of the articular ball and cup, and the longitudinal ridge at the side of the neural canal. The compact tissue is here seen to be thickest at the fore part of the neural spine and at the under part of the centrum. *Presented by Prof. Owen, F.R.S.*

611. A horizontally bisected abdominal vertebra of a Python, showing the thick, compact tissue at the sides of the centrum, the thin layer of the same at its articular ends, the small medullary cavity in the middle, and the cancellous texture which forms the chief part of its substance. The medullary cavity communicates with the vascular canals which lead to the two foramina on the upper and the two on the under surface of the centrum.

Presented by Prof. Owen, F.R.S.

612. The neural arch, removed by horizontal section from the centrum, showing the small medullary cavity in each neurapophysis which communicates with a vascular canal opening into the zygantrum.

Presented by Prof. Owen, F.R.S.

613. Two pleurapophyses or vertebral ribs of the right side of a Python, showing their oblong articular surface, concave above and almost flat below, with a tubercle developed from the upper part and a rough surface excavated on the fore part of the expanded head for the insertion of the precostal ligament.

Purchased.

614. A rib of a Python which has been fractured near its distal end and united.

Purchased.

615. A rib of a Python which has been fractured near its middle and united.

Purchased.

616. A longitudinal section of a rib of the great Python, showing its medullary cavity, the density of its parietes, and the cancellous structure of the articular proximal end. *Presented by Prof. Owen, F.R.S.*

617. A longitudinal section of another rib of the same Python, taken in the opposite direction. *Presented by Prof. Owen, F.R.S.*

618. Two posterior abdominal vertebræ of a Python, characterized by the inferior ridge of the centrum and its bifid terminal tubercle. *Purchased.*

619. An anterior caudal vertebra of a Python, in which the pleurapophysis or vertebral rib is bifurcate and anchylosed to the centrum. *Purchased.*

620. Two of the bifurcate ribs of the anterior caudal vertebra of a Python, which have retained their moveable articulation with their respective diapophyses. *Purchased.*

621. A more posterior caudal vertebra of a Python, in which the pleurapophyses are anchylosed, short and straight, and the bifurcation is limited to their extremities. *Purchased.*

622. A more posterior caudal vertebra of a Python, in which the anchylosed pleurapophyses are simple and extend outwards and backwards, like long transverse processes. *Purchased.*

623. Two middle caudal vertebræ of the Python, in which the simple pleurapophyses are confluent with the extremities of the diapophyses, and form with them long deflected transverse processes. Two diverging hypapophyses are developed from the under part of the centrum. *Purchased.*

624. Two caudal vertebræ from nearer the extremity of the tail, where the transverse processes are shorter, and the two hypapophyses are parallel or convergent at their extremities. *Purchased.*

625. The skeleton of a small specimen of Python (*Python tigris*). 67 vertebræ have hypapophyses descending from the anterior part of the body; 101 bear

moveable ribs, but no hypapophyses; and of the 70 caudal vertebræ, 62 have hypapophyses in pairs. *Mus. South.*

626. The neural arches of the occipital, parietal, and frontal vertebræ of a large Python.

From the back part of the cranium a longitudinal vertical section has been removed, to show the thickness and density of the walls of that cavity, and the mode in which the occipital arch is wedged into the posterior expanded part of the parietal one, analogous to that in which the neural arches of the trunk are interlocked together. The long and slender columelliform stapes is preserved in this specimen. The numbers on the bones indicate their names according to Table I. of SYNONYMS.

The exoccipitals meet above the foramen magnum. The paroccipital is an exogenous process. The petrosal is quite excluded from the cranial cavity, the otocranial plates of the exoccipital, alisphenoid and superoccipital bones uniting by a triradiate suture. Ossification extends from the frontal into the neurapophysial walls of the prosencephalic cavity, and is continued from below inwards and upwards so as again to join the upper plate of the frontal, forming a septum at the fore part of the cranial cavity, like an ossified falx, and completely surrounding the part through which the rhinencephalon is continued. The unusual strength of the cranial parietes, and the tile-like imbrication of one thick and dense bone over another, relate to the requisite provision of unusual resistance against the numerous causes of injury to which a creature doomed to crawl along the surface of the earth is liable from falling bodies, blows, and the heavy tread of large quadrupeds.

Presented by Prof. Owen, F.R.S.

627. The tympanic, pterygoid and transverse bones of the same Python.

Presented by Prof. Owen, F.R.S.

628. The disarticulated bones of the skull of the Tiger Boa (*Python tigris*). They are numbered according to Table I. of SYNONYMS.

In studying the osteology of the head of the Python, as the type of the Ophidian Order, by the aid of the following description, the student should compare the disarticulated skull with that of the large skeleton, No. 602.

The basioccipital (1) is subdepressed, broadest anteriorly, subhexagonal; smooth and concave at the middle above, with a rough sutural tract on each side; and a hypapophysis below, produced into a recurved point. The hinder facet of the basioccipital is convex, forming the lower half of the occipital condyle: the two lateral borders are defined by a produced angle: the front facet forms a straight transverse sutural surface for the basisphenoid. The articular tubercle is supported on a short peduncular prolongation, on each side of the base of which there is a small sharp process. The basioccipital unites above and laterally with the exoccipitals and alisphenoids, and in front with the basisphenoid, upon which it rests obliquely, and it supports the medulla oblongata on its upper smooth surface.

The exoccipitals (2, 2) are very irregular subtriangular bones; each is produced backwards into a peduncular process supporting a moiety of the upper half of the occipital condyle: at the outer side of the base of the peduncle is an obtuse process, forming the upper part of the ridge continued upon the basioccipital. The outer and fore part of the exoccipital expands into the irregular base of the triangle, is perforated by a slit for the eighth pair of nerves, articulates below with the basioccipital, is excavated in front to lodge the petrosal cartilage where it articulates with the alisphenoid, and unites above with the superoccipital. The superoccipital (3) is of a subrhomboidal form, sends a spine from its upper and hinder surface, expands laterally into oblong processes, is notched anteriorly and sends down two thin plates from its under surface, bounding on the mesial side the surface for the cerebellum, and by the outer side forming the inner and upper parts of the acoustic cavities. The superoccipital articulates below with the exoccipitals and alisphenoids, and in front with the parietal, by which it is overlapped in its whole extent. The occipital vertebra is as if it were sheathed in the expanded posterior outlet of the parietal one, the centrum resting on the oblique surface of that in front, and the anterior base of the neural spine entering a cavity in and being overlapped by that of the preceding neural spine: the analogy of this kind of 'emboitement' of the occipital in the parietal vertebra with the firm interlocking of the ordinary vertebræ of the trunk is very interesting: the end gained seems to be, chiefly, an extra protection of the epencephalon—the most important segment to life of all the primary divisions of the cerebro-spinal axis. The thickness of its immediately protecting walls (formed by the basi-, ex- and super-occipitals) is equal to that of the same vertebral elements in the human skull, but they are moreover composed of very firm and dense tissue throughout, having no diploë: the epencephalon also derives a further and equally thick bony covering from the basisphenoid and the parietals, the latter being overlapped by the mastoids, which form a third covering to the cerebellum.

The basisphenoid (5) and presphenoid (9) form a single bone, and the chief keel of the cranial superstructure. The posterior articular surface looks obliquely upwards and backwards, and supports that of the vertebral centrum behind, as the posterior ball of the ordinary vertebræ supports the oblique cup of the succeeding vertebræ: here, however, all motion is abrogated between the two vertebræ, and the co-adapted surfaces are rough and sutural. The basisphenoid presents a smooth cerebral channel above for the mesencephalon, in front of which a deep depression (sella) sinks abruptly into the expanded part of the bone, and there bifurcates, each fork forming a short cul-de-sac in the substance of the bone. The transverse processes from the under and lateral surfaces are well-marked, strong, but short, much thicker in the Python than in the Boa: a sharp ridge is produced from the middle of the under surface of the basisphenoid: the under surface of the presphenoidal prolongation is smooth and convex.

The alisphenoids (6) form the anterior half of the fenestra ovalis, which is completed by the exoccipitals; and in their two large perforations for the posterior divisions of the fifth pair of nerves, as well as in their relative size and position, the alisphenoids agree with those of the Frog. Each alisphenoid is a thick suboval piece, with a tubercular process on its under and lateral part: it rests upon the basisphenoid and basioccipital, supports the posterior part of the parietal and a portion of the mastoid (8), and unites anteriorly with the descending lateral plate of the parietal bone.

The parietal (7) is a large and long, symmetrical roof-shaped bone, with a median longitudinal crest along its upper surface, where the two originally distinct moieties have coalesced. It is narrowest posteriorly, where it overlaps the superoccipital, and is itself overlapped by the mastoid: it is convex at its middle part on each side the sagittal spine, and is continued downwards and inwards, to rest immediately upon the basisphenoid. This part of the parietal seems to be formed by an extension of ossification along a membranous space, like that which permanently remains so in the Frog, between the alisphenoid and orbitosphenoid: the mesencephalon and the chief part of the cerebral lobes are protected by this unusually developed spine of the mesencephalic vertebra. The optic foramina are conjugational ones, between the anterior border of the lateral plate of the parietal and the posterior border of the corresponding plate of the frontal.

The frontals (11) rest by descending lateral plates, representing connate orbitosphenoids, upon the attenuated, pointed prolongation of the basisphenoid: the upper surface of each frontal is flat, subquadrate, broader than long in the Boa, and the reverse in the Python, where the roof of the orbit is continued outwards by a detached superorbital bone: there is a distinct, oval, articular surface near the anterior median angle of each frontal to which the prefrontal is attached: the angle itself is slightly produced to form the articular process for the nasal bones. The smooth orbitosphenoid plate of the frontal joins the outer margin of the upper surface of the frontal at an acute angle; the inner side of each frontal is deeply excavated for the prolongation of the cerebral lobes, and the cavity is converted into a canal by a median vertical plate of bone at the inner and anterior end of the frontal. The frontals join the parietals and postfrontals behind, and, by the anchylosed orbital plates, the presphenoid below, the prefrontals and nasals before, and the superorbitals at their lateral margins. The orbitosphenoids have their bases extended inwards, and meet below the prosencephalon and above the presphenoid, as the neurapophyses of the atlas meet each other above the centrum. The anterior third part of such inwardly produced base is met by a downward production of the mesial margin of the frontal, forming a septum between the olfactory prolongations of the brain, but is not confluent with the frontal bone: the outer portion of the orbitosphenoids ascends obliquely outwards, and is confluent with the under part of the frontal; it is smooth externally, and deeply notched posteriorly for the optic foramen.

The post-frontal (12) is a moderately long trihedral bone, articulated by its expanded cranial end to the frontal and parietal, and bent down to rest upon the outer and fore angle of the ectopterygoid. It does not reach that bone in the Boa, nor in poisonous Serpents. In both the Boa and Python it receives the anterior sharp angle of the parietal in a notch.

The natural segment which terminates the cranium anteriorly, and is formed by the vomerine, prefrontal and nasal bones, is very distinct in the Ophidians.

The vomer (13) is divided, as in Salamandroid Fishes and Batrachians, but is edentulous: each half is a long, narrow plate, smooth and convex below, concave above, with the inner margin slightly raised: pointed anteriorly, and with two processes and an intervening notch above the base of the pointed end. The prefrontals (14) are connate with the lachrymals (73).

The two bones which intervene between the vomerine and nasal bones are the turbinals: they are bent longitudinally outwards in the form of a semicylinder about the termination of the olfactory nerves.

The spine of the nasal vertebra is divided symmetrically as in the Frog, forming the nasal bones (15): they are elongated, bent plates, with the shorter upper part arching outwards and downwards, completing the olfactory canal above, and with a longer median plate forming a vertical wall, applied closely to its fellow, except in front, where the nasal process of the premaxillary is received in the interspace of the nasals.

The acoustic capsule remains in great part cartilaginous: there is no detached centre of ossification in it: to whatever extent this capsule is ossified, it is by a continuous extension from the alisphenoid. The sclerotic capsule of the eye is chiefly fibrous, with a thin inner layer of cartilage; the olfactory capsule is in a great measure ossified, as above described.

Maxillary arch.—The palatine (20) or first piece of this arch is a strong, oblong bone, having the inner side of its obtuse anterior end applied to the sides of the prefrontals and turbinals, and, near its posterior end, sending a short, thick process upwards and inwards for ligamentous attachment to the lachrymal, and a second similar process outwards as the point of suspension of the maxillary bone: between these processes the palatine is perforated, and behind them it terminates in a point. The chief part of the maxillary bone (21) is continued forwards from its point of suspension, increasing in depth, and terminating obtusely: a shorter process is also, as usual, continued backwards, and terminates in a point. The point of suspension of the maxillary forms a short, narrow, palatine process: the dental branch of the supramaxillary nerve penetrates the upper and fore part of this process, and its chief division escapes by a foramen on the outer and fore part of the maxillary. A space occupied by elastic ligament intervenes between the maxillary and the premaxillary (22), which is single and symmetrical, and firmly wedged into the nasal interspace: the anterior expanded part of this small triangular bone supports two teeth. Thus the bony maxillary arch is interrupted by two ligamentous intervals at the sides of the premaxillary key-bone, in functional relation to the peculiar independent movements of the maxillary and palatine bones required by serpents during the act of engulfing their usually large prey.

Two bones extend backwards as appendages to the maxillary arch; one is the 'pterygoid' (24) from the palatine, the other the ectopterygoid (25) from the maxillary. The pterygoid is continued from the posterior extremity of the palatine to abut against the end of the tympanic pedicle: the under part of the anterior half of the pterygoid is beset with teeth.

The ectopterygoid (25) overlaps the posterior end of the maxillary, and is articulated by its posterior obliquely cut end to the outer surface of the middle expanded part of the pterygoid.

Mandibular arch.—The tympanic bone (28) is a strong, trihedral pedicle, articulated by an oblique upper surface to the end of the mastoid, and expanded transversely below to form the antero-posteriorly convex, transversely concave, condyle for the lower jaw. This consists chiefly of an articular and a dentary, with a small coronoid and splenial piece.

The articular piece ends obtusely, immediately behind the condyle: it is a little contracted in front of it, and gradually expands to its middle part, sends up two short processes, then suddenly contracts and terminates in a point wedged into the posterior and outer notch of the dentary piece. The articular is deeply grooved above, and produced into a ridge below. The coronoid is a short compressed plate; the splenial is a longer, slender plate, applied to the inner side of the articular and dentary, and closing the groove on the inner side of the latter. The outer side of the dentary offers a single perforation near its anterior end, which is united to that of the opposite ramus by elastic ligament.

Purchased.

629. The skeleton of a large constricting Serpent from Africa (*Python regius*, Dum.; *Boa regia*, Shaw*), which measured 15 feet 6 inches in length.

It had the subcaudal scutes single, as in the American Boas, but it agrees with the Pythons of India in its osteological characters. It presents, for example, as in the skeleton of *Python tigris* (No. 602), the distinct superorbital bones, with the narrower frontals of which they appear to be dismemberments; it has also the longer and narrower nasals, the broader ecto-pterygoids, the twisted tympanics, and the lower development of the internal wall of the mandibular coronoid concavity. The prefronto-lachrymals differ from those in the *Python tigris*, as well as from those in the *Boa*, in the absence of the antorbital tubercle.

In this skeleton there are 348 vertebræ: of which 74 anterior vertebræ have hypapophyses, and all these, save the atlas and axis, have ribs; 207 vertebræ bear articulated ribs, but have no hypapophysis; and, of the 67 caudal, 56 have double hypapophyses.

Purchased.

630. The skeleton of the *Boa constrictor*.

It measures 8 feet 4 inches in length, and, after the atlas and dentata, has 243 vertebræ with moveable ribs, 60 of the anterior of which have hypapophyses, which in the rest subside to a low ridge and tubercle; there are 60 caudal vertebræ, of which 44 vertebræ have the hypapophyses for the most part in pairs.

The skull differs from that of the Python in the superior breadth of the frontal bones, in the absence of superorbital bones, in the greater breadth of the nasals as compared with their length, in the more slender and cylindrical form of the ectopterygoids, in the more simple and less twisted form of the tympanics, and in the larger and higher internal border of the coronoid concavity of the mandible. The first caudal vertebra is indicated by a disproportionate shortening of the rib, and by a short process from the middle of the outer surface of the rib. This process is longer and nearer to the head in the next rib; and in the third vertebra the rib seems to bifurcate from its beginning, and has become anchylosed to the diapophysis: beyond the eighth caudal the outer process disappears, but the rib continues anchylosed, and represents a long, transverse, deflected process to within three or four vertebræ of the end of the tail: the zygosphene and zygantrum interlocking with the ordinary zygapophyses are continued to the same extent. The hypapophyses are short, and begin to bifurcate at about

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* "Serpens Pythicus, Africanus, prodigiosus, ab indigenis divino honore cultus."—*Seba*, Thesaurus Rerum Natural. tom. i. tab. 62. fig. 1. In *Python Sebæ* the subcaudal scutes are generally *all* divided into two: by accidental variety some entire ones may be mixed with the others.—D. & B. 404.

the fifteenth caudal vertebra. The last imperforate obtuse bone of the tail is obviously a coalescence of three vertebræ.

Purchased.

631. The skeleton of a non-venomous and apparently constricting Serpent.

It differs from the true Boas in the absence of the superorbital bones. Hypapophyses are developed in 69 anterior vertebræ; they are not present in 157 of the vertebræ bearing ribs: of the remaining 53 caudal vertebræ the eleven anterior ones do not develope hypapophyses; they are present in pairs in most of the rest.

Presented by Sir Everard Home, Bart., F.R.S.

632. A superior maxillary bone of a large constricting Serpent; showing its characteristic elongated form, and the row of numerous, fixed, imperforate teeth which chiefly distinguish the non-venomous from the venomous Serpents.

Hunterian.

Genus *Natrix.*

633. The skeleton of the common harmless Snake (*Coluber natrix*, Linn.; *Natrix fusca,* Cuv.). Hypapophyses exist upon all the vertebræ, of which there are 170 abdominal and 40 caudal in the present skeleton. *Hunterian.*

634. The skeleton of the common harmless Snake (*Natrix fusca*).

The number of vertebræ with articulated ribs is 172; all of these have inferior spines. The number of caudal vertebræ is 52, and the hypapophyses are bifurcate beyond the seventh.

Mus. South.

635. The skeleton of the King Snake or Harlequin Snake (*Coluber Histrio*).

It belongs to the harmless or Colubrine division of the Order. There are 305 vertebræ, of which 58 anterior ones have hypapophyses, and 157, without hypapophyses, support moveable ribs: of the remainder, or caudal vertebræ, 90 have hypapophyses.

Purchased.

636. The skeleton of a non-venomous Colubrine Snake.

The frontals are longer than they are broad, but there are no superorbital bones. Both internal and external plates of the coronoid fossa are nearly equally developed. The ribs are strong, and shorter than usual. The length is 6 feet 3 inches: 46 anterior vertebræ bear hypapophyses, and, with the exception of the atlas and axis, moveable ribs: 155 bear moveable ribs, but no hypapophyses; and of the 97 caudal, 90 have hypapophyses.

Presented by George Bennett, Esq., F.L.S.

637. Two abdominal vertebræ of a Coluber (*Coluber elaphus*).

They are characterized by the great extent to which the part of the diapophysis that underprops the zygapophysis is produced beyond the articular surface: the lower end of the diapophysis is less produced: the hypapophysis, beyond the anterior fourth part of the vertebral column, is reduced to a straight ridge, extending along the middle of the under surface of the centrum, and is not produced posteriorly: a groove separates the ridge on each side from the diapophysis and the posterior ball of the centrum. Both the cup and ball and the articular part of the diapophysis are relatively smaller than in the *Naja*; the neural spine is lower in proportion to its antero-posterior extent.

Presented by Prof. Owen, F.R.S.

Genus *Deirodon.*

638. The skeleton of the rough Tree-Snake (*Deirodon scaber*).

Its length is 18 inches; the number of vertebræ 256; of which 190 support moveable ribs, which are unusually slender. Hypapophyses are developed from thirty-two anterior vertebræ; these are directed backwards in the first ten vertebræ, and incline forwards in the last ten, where they are unusually long, and tipped with a coat of hard dentine; in the recent snake they perforate the œsophagus and serve as teeth. The jaws appear to be edentulous, but are roughened by anchylosed, minute rudiments of teeth. This modification of the dental system, with the singular development of the cervical hypapophyses, relates to the nature of the food of the Deirodon: it lives in trees, and feeds habitually upon the eggs of small birds: the minutely roughened jaws assist in the introduction of the egg into the mouth, and its transference entire into the gullet: had teeth been developed of the ordinary size and shape, and in the jaws, the egg would have been broken, and much of its contents lost, but this does not happen until it meets, in the progress of deglutition, with the anteriorly directed œsophageal teeth; these saw through the shell, the egg is crushed by the contraction of the œsophagus and surrounding muscles, and its contents transferred entire to the stomach.

Presented by Dr. Andrew Smith, F.L.S.

Genus *Eryx.*

639. Two abdominal vertebræ of an African species of *Eryx*.

In these the diapophysis does not extend beyond the articular surface of the anterior zygapophysis, but is exclusively devoted to forming a low, subconvex, articular tubercle, which has a longitudinal depression anteriorly; the posterior margin of the neurapophysis forms an angle above the zygantrum, which angle, though slight, is more marked than in any of the foregoing Ophidians; the hinder end of the hypapophysial ridge is slightly produced; the zygapophyses are less extended outwards than in the Pythons.

Presented by Thomas Keate, Esq.

Genus *Crotalus.*

640. The skeleton of the Rattlesnake (*Crotalus horridus*).

It measures 4 feet 4 inches in length, and includes 194 vertebræ, of which 168 support moveable ribs: the number of tail-vertebræ is 25, but the anchylosed terminal ones which support the rattle are wanting in this skeleton. All the abdominal vertebræ have hypapophyses, equalling in length the neural spines, and a short process extends outwards above the articular surface of the diapophysis and below that of the anterior zygapophysis. The hypapophysis of the basioccipital is single, and appears to terminate the strong ridge developed from the under part of the basisphenoid: the maxillary bones are short, subcubical, deeply excavated externally, and supporting one long, curved, perforated poison-fang which is anchylosed to the bone: behind this are several loose rudiments of successional fangs. The external ridge of the coronoid depression of the under jaw is almost obsolete, the process for the implantation of the temporal muscles being formed exclusively by the internal ridge.

Mus. South.

641. The skull of a Rattlesnake (*Crotalus durissus*), which shows well the typical characters of that part of the skeleton of a poisonous snake.

These characters consist chiefly in the modification of form and attachments of the superior maxillary bone, which is moveably articulated to the palatine, ectopterygoid and lachrymal bones; but chiefly supported by the latter, which presents the form of a short, strong, three-sided pedicle, extending from the anterior external angle of the frontal to the anterior and upper part of the maxillary. The articular surface of the maxillary is slightly concave, of an oval shape: the surface articulating with the ectopterygoid on the posterior and upper part of the maxillary is smaller and convex. The maxillary bone is pushed forward and rotated upon the lachrymal joint by the advance of the ectopterygoids, which are associated with the movements of the tympanic pedicle of the lower jaw by means of the true pterygoid bones. The premaxillary bone is edentulous. A single, long, perforated poison-fang is anchylosed to the right maxillary, and two similar fangs to the left maxillary, in the present specimen. The palatine bones have four or five, and the pterygoids from eight to ten, small, imperforate, pointed and recurved teeth. The frontal bones are broader than they are long: there are no superorbitals. A strong ridge is developed from the under surface of the basisphenoid, and a long and strong recurved spine from that of the basioccipital; these give insertion to the powerful 'longicolli' muscles, by which the downward stroke of the head is performed in the infliction of the wound by the poison-fangs.

Presented by Prof. Owen, F.R.S.

642. A chain of vertebræ of the Rattlesnake (*Crotalus horridus*), wanting the ribs.

The hypapophysis, which is developed from the anterior vertebræ only in most Serpents, is here present on all the abdominal vertebræ. A short process extends downwards and forwards from the under part of each diapophysis, and a smaller process or tubercle projects from the under part of each anterior zygapophysis. The other characters of the vertebræ conform to those in serpents generally.

Hunterian.

643. Two anterior and two posterior abdominal vertebræ of a Rattlesnake (*Crotalus horridus*).

These show the long hypapophysis, which is hollow, as is shown in the fractured specimen: but a single vertebra of the *Crotalus* might be distinguished from an anterior trunk-vertebra of a *Boa* or *Python* by the following characters: the diapophysis developes a small, circumscribed, articular tubercle from its upper convexity, and a short process from its under part, extending downwards and forwards below the level of the centrum; the anterior zygapophysis seems to be supported by a similar process from the upper end of the diapophysis, the point of which projects a little beyond the end of the zygapophysis; the zygapophyses are less produced outwards; the zygantra are more distinct excavations.

Hunterian.

Genus *Naja.*

644. A considerable proportion of the separate bones of the skeleton of a Hooded Snake (*Naja tripudians*).

The hypapophysis is continued, though of small size, from the posterior part of the lower ridge of the vertebra throughout the abdominal region, as in the Viper. A minute process is continued forwards from the under part of the diapophysis, the upper part of which is impressed by a small pit anteriorly.

In the portion of the skull preserved may be noticed the absence of the superorbital bones, the broad and sloping superoccipital region separated by a strong arched transverse ridge from the temporal fossa, and the two hypapophyses from the basioccipital, between which the single hypapophysis of the basisphenoid is situated.

Presented by Frederic D. Bennett, Esq., F.L.S.

645. Four abdominal vertebræ and a pair of ribs of a Hooded Snake (*Naja tripudians*).

The diapophysis presents the same well-marked tubercle upon its upper part, as in the Rattlesnake, but its lower end is much less produced; the bone underpropping the zygapophysis projects proportionally further beyond the articular surface: the neural spine is much lower, and beyond the anterior third of the trunk the hypapophysis subsides into a ridge, with its point produced backwards beneath the articular ball of the centrum; the zygantra are distinct cavities.

Presented by Prof. Owen, F.R.S.

Genus *Vipera*.

646. The skeleton of the Viper (*Vipera berus*, Linn.).

It measures twenty inches in length, and has 187 vertebræ, of which 154 support moveable ribs, from all of which the hypapophysis is developed, though of smaller size in the posterior than in the anterior half of the trunk. The number of caudal vertebræ, or those with anchylosed ribs, bifurcate in the anterior ones, is 33: the hypapophyses begin to bifurcate in the last three abdominal vertebræ, the forks separating into distinct processes in the caudal vertebræ.

Mus. South.

Genus *Hydrus* (Water Snakes).

647. Ten abdominal vertebræ of a Sea-serpent (*Hydrus bicolor*).

The height of the neural spine (*ns*) is greater in proportion to its antero-posterior extent than in any of the foregoing Ophidians. The diapophysis sends a point outwards a little beyond the articular surface of the anterior zygapophysis; a very small hypapophysis projects below the articular ball of the centrum, and a low ridge is continued forwards from it; the posterior border of the neurapophysis forms no angle, but is moderately convex, as in all the foregoing Ophidians, excepting the *Eryx*.

Presented by Prof. Owen, F.R.S.

648. Ten posterior abdominal vertebræ of a Sea-serpent (*Hydrus bicolor*).

Presented by Prof. Owen, F.R.S.

649. The poison-fangs of a Sea-serpent (*Hydrus bicolor*). These are the original specimens described in the 'Philosophical Transactions,' 1818, by Thomas Smith, Esq., in a Memoir on the Poison-Fangs of Serpents.

Presented by the Author.

Species indeterm.

650. The skin and skull of a large poisonous Serpent from New Holland: a bristle is passed through the poison-canal of the left fang. Three successional fangs may be seen in different stages of growth behind the principal ones, which have become anchylosed to their jaw. *Hunterian.*

651. The skull and anterior vertebræ of a poisonous Serpent (*Naja*), which had been deprived of its poison-fangs. This appears to have been effected by cutting away the fangs, together with that part of the short maxillary bone which contained their matrices. This was one of the specimens exhibited by the Jugglers or Snake-charmers in India. *Presented by Dr. Wallich, F.R.S.*

652. The lower jaw and pterygoid bones of a Serpent.

Neither the outer nor the inner plates of the coronoid fossa are developed into a coronoid process. Each mandible consists of an articular, dentary and splenial piece, the latter divided into two, opposite the junction of the two former pieces.

Hunterian.

Genus *Anguis* (Slow-worms).

653. The skeleton of the Slow-worm (*Anguis fragilis*).

It is fifteen inches in length and includes 111 vertebræ, of which 61 support free ribs, which commence apparently at the fourth vertebra from the head. The transverse processes of the caudal vertebræ are formed by short anchylosed pleurapophyses, which are bifurcate in the second and third of those vertebræ; in a few others they are notched and grooved at their extremities and are much thicker than the succeeding ones, in which they are simple, short, and extend directly outwards. The hypapophyses, instead of remaining distinct as in the true *Ophidia*, unite at their extremities and complete a hæmal arch.

Mus. South.

Genus *Amphisbœna*.

654. The skeleton of the white Amphisbœna (*Amphisbœna alba*).

It includes 134 vertebræ, and some are wanting from the end of the tail: 114 vertebræ, after the atlas and axis, support moveable ribs, which are very short in the last; hypapophyses are developed singly from the five anterior vertebræ, and in pairs from the last abdominal vertebra, and from the caudal vertebræ where they coalesce at their apices to form a neural arch. The chief characteristic of the vertebræ of the *Amphisbœna* is the absence of the neural spine: the neurapophyses meet and coalesce at an angular ridge on the three or four first vertebræ and in the caudal vertebræ, but form a low smooth arch above in the intervening ones: the premaxillary is single, and the upper jaw is fixed: the tympanic is short, compared with that of true Serpents, and extends almost horizontally forwards, in a line with the lower jaw which it supports. The smooth satureless cranium supports an occipital and sagittal crest.

Purchased.

The osteology of the typical Ophidian reptiles differs from that of the Batrachians, in the more elongated ribs; in the distinct basi- and super-occipitals; in the superoccipital forming part of the ear-chamber; in the basioccipital combining with the exoccipital to form a single articular condyle for the atlas; in the ossification of the membranous space between the elongated parietals and the sphenoid; in the constant coalescence of the parietals with one another; in the constant confluence of the orbito-sphenoids with the frontals, and in the meeting of the orbitosphenoids below the prosencephalon, upon the upper surface of the presphenoid; in the presence of distinct postfrontals, and the attachment thereto of the ectopterygoids, whereby they form an anterior point of suspension of the lower jaw, through the medium of the pterygoid and tympanic bones; in the connation of the prefrontals and lachrymals. The trunk may be very long and consist of numerous vertebræ, and all trace of locomotive extremities may be wanting in the *Batrachia*, e. g. in the *Cæciliæ*, as in the typical *Ophidia*.

Order LACERTILIA.

Family *Scincoïdea*.

Genus *Cyclodus*.

655. The vertebræ of the trunk, with the bones of the extremities, of the black Scink of Australia (*Cyclodus niger*).

The inferior spine or hypapophysis of the atlas is triangular; its base supports laterally the neural arch of the atlas, and posteriorly the proper centrum of the atlas or 'odontoid process,' whilst anteriorly it forms the lower third of the cup for the occipital condyle; its apex is prolonged downwards into a broad compressed spine. The base of the neural arch forms anteriorly the sides of the articular cup, and, above this, the neural canal, the sides of which are notched anteriorly: each neurapophysis sends off posteriorly two short processes, the lower one being the diapophysis, the upper one the zygapophysis; the apex of the arch forms a low ridge.

The axis is a much larger, especially a deeper, vertebra, the neural spine being as long as the hæmal one: the sutures which exist in the Monitors between the centrum and odontoid process, and between this and the spine sent down from that process, are obliterated in the *Cyclodus*, as in the *Iguana*; but the limits of the odontoid are indicated by the fissure between its hypapophysis and that sent down from the body of the axis in the *Cyclodus*. The fore part of the odontoid forms, as in the other scaled reptiles, the back part of the cup for the occipital condyle: a rudimental diapophysis projects from the side of the odontoid. The neural arch of the axis sends off a larger diapophysis and a posterior zygapophysis on each side, and terminates above in the strong and long compressed spine. The neural and hæmal spines of the third cervical are as long as, but less broad from before backwards than, those of the axis; the centrum presents anteriorly a cup answering in form to the ball of the axis, and terminates in a similar ball posteriorly. The diapophyses are longer than those of the preceding, or even than those of the succeeding vertebræ: the prezygapophyses are fully developed and look upwards, the postzygapophyses look downwards: both extend outwards and form the four rounded angles of the platform sustaining the neural spine. The hæmal spine is a much-developed 'hypapophysis.'

Neither the first, the second, nor the third vertebræ support pleurapophyses. The fourth differs from the third in having a somewhat smaller hypapophysis; but more markedly in the shorter and thicker diapophyses, which support short, broad pleurapophyses, with expanded and compressed extremities. The pleurapophyses of the fifth and sixth vertebræ have a similar form, with a slightly increased length: the expanded end of the sixth is more produced downwards.

In the seventh vertebra the answerable lower angle of the pleurapophysis is much elongated, and forms its continuation: the upper angle is reduced to a representative of the tubercle of the rib. The tubercle almost disappears in the eighth vertebra, whose pleurapophyses become simple, long, slender, with a sigmoid curve, but yet have no communication with sternal ribs or sternum. The proximal ends of all the pleurapophyses have four equidistant, sharp, longitudinal ridges; those of the ninth vertebra are joined by short and slender semi-ossified hæmapophyses to the outer angles of a broad rhomboid sternum. Both pleur- and hæm-apophyses of the tenth to the thirteenth vertebræ progressively increase in length; the hæmapophyses of the last two of these vertebræ joining together before they unite with the posterior angle of the sternum, the united parts representing a xiphoid prolongation of that bone. The hæmapophyses of the fourteenth and some succeeding vertebræ complete the hæmal arch by uniting together, without the intervention of a hæmal spine or sternal bone.

Hunterian.

656. The skull of the black Scink (*Cyclodus niger*).

The frontal and parietal bones are thick and expanded; the parietal is bifurcated behind, and articulated with the mastoids and paroccipitals. The postfrontals are separated from the malars by the squamosals, which extend between the malars and the mastoids to form the strong lateral bony arch resting anteriorly upon the malar and the maxillary, and posteriorly on the parietal and tympanic. Concomitantly with this strong osseous roof of the cranium, there is a singular arrest of development of bone in the fibro-membranous neurapophysial walls of the cranium; two lateral processes extend downwards into these walls from the parietal and forwards from the exoccipitals; but the sole trace of alisphenoids is seen in the columnar bones, called 'columellæ' by Cuvier, which extend from the interspaces of the processes above mentioned, to rest upon the upper groove of the pterygoids. The orbito-sphenoids are represented by still more slender bony styles, which circumscribe the outlets for the optic nerves and form the anterior boundary of the prosencephalic division of the cranium. The lachrymal bones are large and divided on each side, as in most Lizards. The premaxillaries are confluent, and their nasal process separates the external nostrils from each other. There are ten teeth or alveolar depressions in the premaxillary, which are minute and pointed: the maxillary teeth are large and with hemispheric crowns, whence the name of the genus. Each pterygoid presents a rough surface towards the palate, but does not support teeth. There is a small ossicle between the pterygoid processes of the sphenoid and the true pterygoid bones. The columelliform stapes is extremely long and slender.

Hunterian.

657. The vertebræ of the trunk and part of those of the tail of a small species of Cyclodus (*Cyclodus scincoïdes*; *Lacerta scincoïdes*, Shaw).

The pleurapophyses appear to commence at the fourth vertebra, and, with those of the fifth and sixth vertebræ, are short, broad and flat; the latter expanding at their free extremities. The ribs of the seventh and eighth vertebræ are long and slender, but false or floating; those of the ninth vertebra are articulated to a sternum by slender semiossified hæmapophyses. The costal arches of the four succeeding vertebræ are similarly complete, and articulated with the sternum or its xiphoid appendage; the hæmapophyses of the fourteenth vertebra unite with each other, but not with the sternum. After the thirty-second vertebra the ribs rapidly decrease in size to the sacrum; this consists, as usual in Lizards, of two vertebræ characterized by short, thick, anchylosed ribs, which are confluent with each other at their free extremities. The centrums of the two sacral vertebræ have coalesced, but the hinder one presents a ball to the first caudal vertebra. Each centrum presents two vascular perforations on its under surface, and the articular ball is in the state of an epiphysis in most. The axis and three following vertebræ have hypapophyses. The neural spines soon subside to mere ridges. The clavicles are broad, and perforated at their lower half. The episternum has the form of a cross: the broad arch formed by the anchylosed scapula and coracoid presents two deep anterior notches, and a small, transverse perforation. The ilium, ischium and pubis have coalesced on each side. The caudal hæmapophyses commence at the inferior interspace of the third and fourth vertebræ.

Hunterian.

658. The skull of a small Scincoid Lizard of Australia (*Cyclodus scincoïdes*).

The anterior teeth are small and obtusely conical; the hinder ones have hemispherical crowns. The dermal ossifications which form the scutes upon the integument of the body are connate with the upper surface of the parietals and frontals, and render that surface irregular and rugged.

Hunterian.

659. The facial part of the skull and the lower jaw of a larger species of Australian Scink (*Cyclodus gigas*).

The vomerine bones are much longer than in the preceding specimen: the palatines are completely separated, and abut against the back part of the alveolar process of the maxillary and the ectopterygoids. The right ramus of the lower jaw is divided into three parts, to show the mode of union of the dentary, coronoid, and splenial pieces, and that of the coronoid, articular, angular, and surangular.

Hunterian.

660. One ramus of the lower jaw of the *Cyclodus gigas*, partially disarticulated; the dentary, angular and splenial pieces being separated from the articular and

coronoid piece. The numbers indicate the names of the bones according to the Table of SYNONYMS. *Hunterian.*

661. A superior maxillary bone and one ramus of the lower jaw of the *Cyclodus*. This and the specimens Nos. 656 and 680, show extremes of modification in the form of the teeth, with the same mode of attachment and development of those parts.

Family *Geckotiæ*.

Genus *Rhynchocephalus*.

662. The five first vertebræ of the trunk of a Lacertian (*Rhynchocephalus*).

The atlas consists chiefly of the hypapophysis and neurapophyses; the former is in the form of a transverse arched bar, concave upwards, with the anterior border cut obliquely to receive the under part of the occipital condyle; the posterior border is convex vertically, and adapted to the transverse trochlear groove in the fore part of the odontoid process; the neurapophyses have a small articular surface at the fore part of their base for the occipital condyle, and a second at their inner and back part for their proper centrum, the odontoid process. They are expanded superiorly, develope a small posterior zygapophysis, exterior to which is a tubercle; and they come in contact, but do not coalesce, above the neural canal.

The odontoid process has coalesced with the body of the axis, which it equals in height and exceeds in breadth: it is convex from side to side, concave vertically at its lower half, having, as it were, a channel scooped out from side to side: this kind of joint will allow of great extent and freedom of motion of the atlas with the head from side to side; whilst the vertical movements would be restricted. The neurapophyses of the axis have coalesced with the centrum below, and with each other above, where they develope a strong ridge or spine, which is most produced in the antero-posterior direction. An autogenous hypapophysis is wedged into the inferior interspace between the centrum of the axis and the third vertebra. The centrum and neurapophyses of the third vertebra have coalesced: a short diapophysis projects from the line of union. The anterior and posterior zygapophyses form the angles of the broad base of the neural spine: this spine is of moderate length, thick and trihedral. There is a small wedge-shaped hypapophysis beneath the interspace of the third and fourth vertebræ. The fourth vertebra has a short pleurapophysis on each side, with a bifurcate proximal end articulated by a broad tubercle to the diapophysis and by a slender neck and head to a rudimental parapophysis, but this is very feebly marked off from the diapophysis. In the fifth vertebra the parapophysis and diapophysis form together an oblique ridge, chiefly extended vertically, and to which the expanded head of the pleurapophysis articulates by a single surface. There is a wedge-shaped hypapophysis at the interspace of the fourth and fifth vertebræ: both anterior and posterior surfaces of the centrum are excavated by a deep conical cavity.

Presented by Prof. Owen, F.R.S.

663. The skull of the same Lacertian (*Rhynchocephalus*).

The occipital condyle is unusually elongated transversely, and presents the form of a crescentic, convex bar, bent upwards. The basisphenoid sends down two short processes to abut against the pterygoids. The parietal bone is perforated by a small median fontanelle close to the sagittal suture: its upper surface presents two strong curved and approximated temporal crests, divided by a median, angular, longitudinal furrow: the crests are continued outwards upon the posterior bifurcated part of the parietal to be continuous with that forming the upper border of the mastoid: the frontal is divided by a median suture. The posterior frontal supports a strong, obtuse ridge forming the back part of the frame of the orbit, and unites below with the malar and behind with the mastoid. The premaxillary bones are divided by a median suture, and their dentigerous border projects below the level of that of the maxillary bones. The vomer is likewise divided by a median suture. The palatal apertures of the nostrils are bounded behind by the vomer and palatal plate of the maxillary: this plate is of unusual breadth, as compared with the Lizards generally, and presents the unusual peculiarity of a dentigerous ridge parallel with the posterior half of the alveolar border. It is situated close to the inner side of this border, leaving only space sufficient for the reception of the teeth of the under jaw. The teeth are completely confluent with the summits of the proper and accessory alveolar ridges. The palatine bones are united together along the anterior halves. The rami of the lower jaw are not anchylosed at the symphysis. The alveolar border is serrated by a single row of anchylosed teeth. The coronoid piece is triangular, rises into a point, and presents a smooth articular surface on its inner side, adapted to the anterior lateral projection of the pterygoid.

Presented by Prof. Owen, F.R.S.

Family *Chamæleonia.*

Genus *Chamæleo.*

664. The skeleton of a Chameleon (*Chamæleo vulgaris*).

The teeth are short, and so confluent with the jaws that these appear to have simply a serrated margin. The external nostrils are divided, as in all Lizards, by the premaxillary bone, which sends a nasal process upwards and backwards to join the nasal bones. There is a vacuity in the bony walls of the upper surface of the skull, between the median bar so formed and the prefrontals: a long, compressed, serrated crest arches upwards and backwards from the superoccipital and parietal bones, and joins the processes of bone continued from the mastoids. The vertebræ are 64 in number, of which 16 support moveable ribs, commencing at the fourth. The first two pairs of ribs are free or floating; the pair attached to the sixth vertebra is first articulated to the sternum by semiossified cartilages; the three succeeding pairs also join the sternum. In the following pairs the long and slender cartilages meet at an acute angle directed forwards, and unite together at their extremities. There are two vertebræ without ribs, or 'lumbar vertebræ': in the three following the ribs are short, thick, and anchylosed to the vertebræ; they give attachment to the iliac bones and form a sacrum. The tail is long and prehensile, but all the vertebræ are not preserved in this skeleton. The scapular arch consists of long, slender, rib-like scapulæ overlapping the first pair of ribs, and of broad, semiossified coracoids which articulate with a rhomboidal semiossified manubrium sterni. The pelvic arch is completed by two pubic bones anteriorly, which are distinct from the two more slender ischia. The bones of the extremities are long and slender: the digits are especially arranged for grasping; three internal ones are opposed to two external in the fore-foot, and three external are opposed to two internal digits in the hind-foot.

Purchased.

665. The skeleton of the bifurcate or two-horned Chameleon (*Chamæleo bifurcatus*).

The name is derived from the two long and strong compressed and rough processes of bone, continued forwards, slightly diverging, from the anterior part of the skull, formed by the prefrontal, nasal and maxillary bones. The number of vertebræ which support moveable ribs is 15. Two vertebræ without ribs represent the lumbar series, and the three following combine to support the pelvic arch, and in that respect may be regarded as sacral. The spinous processes are remarkable for their length and strength in this species. The zygapophyses are also continued upwards and outwards like transverse processes; the true diapophyses are short and simple convex tubercles, as in other Lizards, and exclusively support the ribs.

Presented by Dr. Leach, F.L.S.

Family *Iguania*.

Genus *Iguana*.

666. The skeleton of an Iguana (*Iguana tuberculata*).

The teeth are anchylosed to the inner side of the outer wall or rampart of an open alveolar groove; their crowns are expanded, compressed, pointed, with finely serrated margins. There are 25 teeth in the upper jaw, and the length of this range is 1 inch $\frac{4}{8}$ths. Twenty-one vertebræ support free ribs, which commence at the fifth. The first four pairs are simple and floating, progressively increasing in length. The pleurapophyses of the ninth vertebra are first joined to the sternum by slender semiossified hæmapophyses. The three succeeding pairs are similarly joined to the sternum. The next three pairs are united by a common cartilage to the end of the expanded part of the sternum: the remaining pairs of ribs are again free or floating, and progressively diminish to the twenty-fourth vertebra. The pleurapophyses of the twenty-fifth and twenty-sixth vertebræ are much thickened and anchylosed: the extremity of the twenty-fifth is grooved or notched; these two vertebræ support the pelvic arch and form the sacrum. The anchylosed pleurapophyses in the anterior caudal vertebræ are simple, straight, depressed, and represent long transverse processes, but they progressively diminish in length and disappear at the forty-sixth vertebra. The hæmapophyses begin to be developed at the second caudal vertebra; they coalesce at the extremities and form a hæmal spine, but they remain free from the centrum, and are articulated both to the vertebra to which they properly belong and to the succeeding vertebra. The spinous processes are strong, compressed, very gradually increase in length to the base of the tail, and after the eighth caudal vertebra begin as gradually to diminish, and finally disappear at the forty-first caudal vertebra. In most of the caudal vertebræ there may be observed a transverse line, as if the anterior third part of the centrum had remained in the state of an epiphysis: it is at this line that the vertebra breaks when a portion of the tail is voluntarily detached. The epiphysial cartilage becomes the nidus or centre of development of the cartilaginous or fibro-cartilaginous axis of the reproduced tail. To the ordinary scapular arch, consisting of scapula and coracoid, there are here added clavicles and a long T-shaped episternum.

Hunterian.

667. The skeleton of an Iguana.

The fontanelle or foramen in the middle of the coronal suture is well shown in this specimen. There are twenty-nine teeth in each upper jaw, and the length of this range is $1\frac{1}{4}$ inch. Twenty vertebræ, beginning at the fifth cervical, bear moveable ribs, the fifth to the eleventh of which are articulated to the sternum. There are 2 sacral vertebræ and 68 caudal vertebræ.

Presented by Samuel Stutchbury, Esq.

It was by their comparison with this skeleton, that the nature of the fossil teeth, which had been found by Dr. Mantell in the Wealden strata of Sussex, and to which Mr. Conybeare afterwards suggested the application of the name of *Iguanodon*, was determined. Dr. Mantell, in his original communication to the Royal Society on the subject, writes:—"Among the specimens lately collected, some, however, were so perfect, that I resolved to avail myself of the obliging offer of Mr. Clift (to whose kindness and liberality I hold myself particularly indebted) to assist me in comparing the fossil teeth with those of the recent Lacertæ in the Museum of the Royal College of Surgeons. The result of this examination proved highly satisfactory, for in an Iguana which Mr. Stutchbury had prepared to present to the College, we discovered teeth possessing the form and structure of the fossil specimens."—Philosophical Transactions, 1825, p. 180. It is due, however, to Cuvier to state, that he had previously suggested to Dr. Mantell that the fossil teeth from the Wealden which afterwards bore the name of *Iguanodon* probably belonged to a herbivorous reptile.

668. An abdominal vertebra of an Iguana.

The centrum has the same general form as in the *Varanus*; but its under surface has a longitudinal depression on each side. The articular diapophysis is smaller, the neural spine higher; but the chief distinction is seen in the presence of two small accessory zygapophyses at the fore part of the base of the spine, on an eminence, answering to the zygosphene in Serpents, and two depressions at the back part of its base, or zygantra, for receiving the accessory zygapophyses of the following vertebræ. The vertebræ of the Iguana thus present what has been regarded as the character of those of Serpents, and the difference is one of degree rather than of peculiar structure; the zygosphenal surfaces are relatively smaller, and the zygantra are less deep. The much smaller proportions of the tubercular diapophyses for the ribs is another character by which the vertebra of the Iguana may be distinguished from that of the Serpent. The depressions on the under part and sides of the body of the vertebræ in the Iguana which give rise to the three low ridges diverging from the posterior ball, one to the cup and one to each diapophysis, is another feature of resemblance to the vertebræ of Serpents which is present in the vertebræ of the Iguana and not in those of the Varanus.

Presented by Prof. Owen, F.R.S.

669. The six anterior vertebræ of an Iguana (*Iguana tuberculata*).

The autogenous hypapophysis of the atlas is broad, like a wedge with the base divided into four parts, the apex forming a sharp longitudinal ridge produced backwards: the anterior, upper or basal facet forms the lower part of the cup for the occipital condyle; the posterior facet joins the proper centrum of the atlas or odontoid process: the two lateral facets support the neurapophyses of the atlas: the lower half of the neurapophyses forms anteriorly the sides of the cup for the condyle, and posteriorly each sends out a short diapophysis which supports a cartilaginous tubercle or rudimental parapophysis. Above this, each neurapophysis arches over the neural canal in the form of a broad and thin plate which meets its fellow without coalescing or developing a neural spine, but sends out from its back part a zygapophysis surrounded by a tubercle. The odontoid process resembles the hypapophysis of the atlas in shape, except that its apex forms a slender spine instead of a ridge, and its base rises higher, to form the back part of the cup for the occipital condyle. The proper body of the axis has coalesced with the neural arch; it developes on each side of its fore part a broad, short diapophysis, overlapped by that of the atlas; its hypapophysis is a triangular epiphysis wedged into the under part of the interspace between the axis and third vertebra. The under part of the axis is sharply keeled: the neural arch sends off two prezygapophyses looking upwards, and two postzygapophyses looking downwards, and forms above a long and strong sharp spinous ridge, continued forwards over the atlas and backwards over the third cervical vertebra. The diapophyses of this vertebra support a minute cartilaginous tubercle, and a ridge is continued backwards from each, which bounds the concavity on the under and lateral part of the centrum divided by the median carina. The hypapophysis has the same shape, independence, and relative position as that of the axis. Besides the ordinary zygapophyses, there are two smaller and superior ones developed from the fore-part of the base of the neural spine, which is comparatively slender and trihedral: the postzygapophyses have a nearly vertical facet upon their inner sides, lodged, as in the axis, in an excavation beneath the back part of the base of the neural spine.

The fourth cervical resembles the third, but its hypapophysis is smaller. In the fifth cervical it is further diminished, though still distinct, and wedged into the lower angle between this and the next vertebra. There is a distinct cartilaginous tubercle attached to the lower part of the diapophysis, and assisting this now enlarged process to support a bony pleurapophysis: this is subcompressed, slightly bent, and tapering to an obtuse apex. The diapophysis is still larger in the sixth vertebra, though not more prominent, the increase being chiefly vertical: beneath it there is a larger autogenous hard cartilaginous tubercle—a rudimental parapophysis. The rib is here twice the length of the preceding one, and articulates with both diapophysis and parapophysis, without any intervening vacuity for artery or nerve.

Presented by Prof. Owen, F.R.S.

670. The skull of a small *Iguana*: it shows the characteristic expanded and notched crowns of the maxillary teeth and the single row of simple conical denticles on each pterygoid bone. *Hunterian.*

671. The frontal, nasal, premaxillary, maxillary, lachrymal, malar, postfrontal and mandibular bones of a large Iguanoid Lizard.

The posterior margin of the frontal is notched by the fronto-parietal fontanelle: both lachrymal and postfrontal are subdivided into two pieces; the lachrymal foramen is between the two pieces, being here formed like a 'conjugational foramen.' The upper portion of the lachrymal is called anterior frontal by Cuvier; but it can represent only the facial part of that bone, for it sends down no neurapophysial plate to join the vomer or palatines, forms no part of the lateral walls of the rhinencephalic cavity, nor any part of the foramen for the transmission of the olfactory nerves.

Hunterian.

672. The lower jaw of an Iguana.

This shows the pleurodont type of dentition, the teeth being placed in a common alveolar depression without any internal wall. The cavities on the inner side of the base of the anchylosed teeth are the effects of the pressure from the germs of the successional teeth developed from the vascular membrane which supplies the place of the internal wall.

Hunterian.

Genus *Draco*.

673. The skeleton of the small flying Lizard (*Draco volans*).

There is merely the rudiment of a spine or ridge from the superoccipital; an arched transverse ridge separates the occipital from the parietal region of the skull. The postfrontal, mastoid and paroccipital project successively from their respective cranial segments, and well manifest their character as the transverse processes of these. There are 20 vertebræ supporting moveable ribs, which commence apparently at the fifth. Those of the eighth vertebra join the sternum, as do those of the ninth and tenth: the pleurapophyses of the eleventh vertebra suddenly acquire extreme length; those of the five following vertebræ are also long and slender; they extend outwards and backwards, and support the parachute formed by the broad lateral fold of the abdominal integuments. The pleurapophyses of the seventeenth vertebra become suddenly shorter, and these elements progressively diminish to the sacrum: this consists of two vertebræ, modified as in other Lizards. There are about 50 caudal vertebræ.

Purchased.

Genus *Grammatophora.*

674. The anterior vertebræ of the trunk, with the scapular arches of a Lizard (*Grammatophora barbata*, Kaup).

The atlas consists of four parts, a hypapophysis, a centrum, and two neurapophyses: a long compressed hæmal spine is developed downwards and backwards from the autogenous hypapophysis. The right neurapophysis is removed to show the proper centrum of the atlas or odontoid process: it is here restricted to an articulation with the hypapophysis of the atlas, and to the formation of a similar long recurved process: a smaller hypapophysis is wedged into the inferior interspace of the axis and third vertebra, between the third and fourth and between the fourth and fifth vertebræ: the pleurapophyses begin to be developed at the fifth vertebra, and are attached by a compressed, expanded, simple head to a broad diapophysis: they are simple, slender styles, progressively elongating to the ninth pair, which is the first to be provided with hæmapophyses articulated to the sternum. The ribs of the tenth and eleventh vertebræ are similarly and separately joined to the sternum: the hæmapophyses of the twelfth and thirteenth vertebræ unite with each other before joining the posterior angle of the sternum.

The scapula and coracoid have coalesced, but traces of the original suture remain: there is a large semiossified suprascapula: the coracoid is deeply notched anteriorly and perforated. The clavicles are long, slender, and slightly bent. The episternum is anchor-shaped, with a broad and thin stem. The sternum has three perforations near its posterior margin.

Presented by Prof. Owen, F.R.S.

675. The hyoid apparatus, with the dried tongue and trachea of the *Grammatophora barbata.*

The basihyal is prolonged into a slender pointed urohyal. The ceratohyals are articulated with the posterior angles of the basihyal; are short and directed forwards: to their extremities are attached the long and curved epihyals: the similarly-shaped but stronger thyrohyals articulate with both the basi- and cerato-hyals: the rings of the trachea are slender and complete.

Presented by Prof. Owen, F.R.S.

Genus *Istiurus.*

676. The eleven anterior vertebræ of the trunk, with the scapulo-coracoid arch of the deep-tailed Lizard (*Istiurus amboinensis*).

The atlas resembles that of the *Grammatophora*, but its hypapophysis is less produced and pointed below: the true centrum or odontoid has coalesced with that of the axis. The hypapophyses of the four following vertebræ are compressed and produced both forwards and backwards. They are independent elements, and are articulated to the interspace between their own vertebræ and the one in advance. The pleurapophyses commence at the fifth vertebra in the form of short, slightly-curved styles: they progressively increase in length to the ninth vertebra, where they are united by hæmapophyses to the sternum. The tenth and eleventh vertebræ have their ribs similarly and independently united with the sternum. The sternum is imperforate. The clavicles are broader than in the *Grammatophora*, and have a sharp posterior margin. The episternum presents a rhomboidal dilatation anteriorly: the scapula and coracoid have coalesced: the coracoid presents the usual deep anterior notch and foramen. The scapula has two large and deep anterior notches, the upper one converted into a long oval foramen by a continuation of the semiossified suprascapula to the extremity of the long process dividing the two notches.

Hunterian.

677. Four caudal vertebræ of the *Istiurus amboinensis.*

These show the development of the neural spines into long and slender rib-like pieces. The hæmapophyses are produced into comparatively short spines: they are firmly articulated to the interspaces between their own vertebra and the one behind. Short and straight anchylosed pleurapophyses represent the transverse processes in this region of the tail.

Hunterian.

Family *Varanidæ.*

Genus *Varanus.*

678. The skeleton of the large Monitor (*Varanus niloticus*).

The number of vertebræ between the skull and sacrum is 29, in the sacrum 2, in the tail 80, =111. Both the hypapophysis and the centrum (odontoid) of the atlas send down spinous processes, which continue to be developed from the under part of the centrum in the seven succeeding vertebræ. The pleurapophyses begin to be developed from the sixth cervical vertebra: they are very short, and are appended to a short, thick, bilobed, transverse process, which appears to combine both parapophysis and diapophysis. They rapidly increase in length, and in the tenth vertebra are joined by the medium of semiossified hæmapophyses to the sternum: this is, also, the case with the eleventh and twelfth ribs: in the following vertebræ the hæmapophyses are reduced to short appendages attached to the end of the pleurapophyses. After the eighteenth pair the ribs suddenly shorten, and end at the twenty-eighth vertebra as they began at the sixth, as short, straight appendages to the diapophyses: the twenty-ninth vertebra has no ossified ribs, and is a lumbar vertebra. All the pleurapophyses have simple expanded articular extremities. The suprascapula is a broad semiossified plate: the scapula is short and broad, and appears to have coalesced with the coracoid. This bone is much expanded, and has two deep notches anteriorly, and a perforation near the humeral articulation. The ossified sternum is a long narrow piece of bone; the semiossified part is a broad rhomboidal plate. The innermost toe of the fore-foot has two phalanges, the second three phalanges, the third has four, the fourth five, and the outer one has three phalanges. The elongated iliac bone abuts against the transverse processes of the two sacral vertebræ, the first on the right side and the second on the left side being applied on a plane higher than the opposite processes: that of the first caudal vertebra also abuts against the ilium on the left side. The ilium sends off a tuberosity in front of the sacro-iliac syndesmosis, and it joins the pubis and ischium by a broad suture. The trochanter arises from the inner and back part of the proximal end of the shaft of the femur. There are two ossified patellæ in the tendon of the great extensor of the leg. Both tibia and fibula articulate below with the upper surface of the transversely extended bone, representing the astragalus and calcaneum coalesced. The phalanges of the hind toes are arranged in the same numerical order as in the fore-foot, viz. 2, 3, 4, 5, 3.

The second caudal vertebra presents a pair of hypapophyses near its hinder end, indicating the attachment of a hæmal arch. This arch is preserved in the succeeding vertebræ, articulated to similar hypapophyses.

In the skull the basioccipital sends down a pair of short, large, obtuse hypapophyses: those of the basisphenoid are larger and abut against the pterygoids: these bones are applied to the back part of the tympanic, and the slender 'columella' rests upon the middle of their upper surface.

The parietal is perforated near its anterior border. The postfrontal has a descending postorbital process. The prefrontal supports an antorbital dermal bone: the small perforated lachrymal is a distinct bone. The nasal and premaxillary are both single or undivided bones. The premaxillary supports eight small conical teeth: each maxillary has nine teeth progressively increasing in size and obtuseness to the penultimate one: the left dentary has ten teeth; the right has twelve teeth, resembling those above.

Purchased.

679. An abdominal vertebra of a Monitor Lizard (*Varanus variegatus*).

The centrum is subdepressed, triangular, the posterior articular ball forming the rounded apex: the position of this and of the anterior cup is extremely oblique. The diapophysis is a simple convex tubercle between the articular cup of the centrum and the anterior zygapophysis. The articular surface of the latter is directed upwards and inwards, that of the posterior zygapophysis downwards and outwards: the neural spine has considerable antero-posterior extent, but is low and truncate. The fore part of its base is a simple ridge, and the back part is without articular depressions.

Hunterian.

680. A portion of the upper jaw of a *Varanus*, showing the long, compressed, pointed, trenchant and recurved crowns of the anchylosed teeth. *Hunterian.*

681. The lower jaw of a Monitor (*Varanus variegatus*), showing the characters of the pleurodont type of dentition; the adhesion, namely, of the teeth by their basis to an alveolar wall. The numbers on the bones indicate their names according to the Table of SYNONYMS. *Hunterian.*

Order CROCODILIA.

Genus *Gavialis*.

682. The skull of the Gavial, or more properly 'Gahrial' (*Gavialis gangeticus*).

The characters of this genus of *Crocodilia* are manifested not only by the long and slender snout, but by the even line of the alveoli, and by the smaller, more numerous and equal-sized teeth, the crowns of which are slightly compressed from before backwards, and present a sharp external and internal ridge: the first and third teeth are the largest in the upper jaw, the first and fourth in the lower jaw. Both these teeth are received into notches in the border of the other jaw, and are visible when the mouth is shut. The temporal apertures, bounded by the united mastoids and postfrontals externally, are relatively larger than in the Crocodiles or Alligators: the nasal bones terminate before they have attained half the length of the upper jaw, and the external nostril is entirely surrounded by the premaxillary bones, which are longer than usual, and terminate in a point posteriorly. There is no trace of vomer upon the palate; each pterygoid expands into a large oval bulla at its external and anterior part; the plane of the posterior nasal aperture is horizontal.

More than half the length of the lower jaw is formed by the symphysis. The alveoli in the premaxillary are 5—5, in the maxillary 24—24, in the dentary 25—25.

Hunterian.

683. The atlas and axis of the Gavial (*Gavialis gangeticus*).

The hypapophysis, which represents the body of the atlas, is subquadrate, with the angles truncated: the neurapophyses articulate with the two upper angles, and the pleurapophyses with the two lower ones: the pleurapophyses are long, slender, and with a single proximal articulation answering to the head of the rib. The anterior surface of the hypapophysis is obliquely excavated to form the lower half of the cup for the occipital condyle: the back part articulates with the true centrum of the atlas (odontoid). The neurapophyses, which complete with the hypapophysis and the end of the centrum the articular cavity for the occipital condyle, are distinct above as well as below. The neural spine is not retained in this specimen, but is an independent depressed plate, the atlas consisting of seven permanently distinct parts or elements in all Crocodilians. The true centrum of the atlas articulates with the whole of the fore part of the centrum and with the bases of the two neurapophyses of the axis, and developes on each side two transverse processes, to which the bifurcate head of each pleurapophysis of the axis articulates. The neurapophyses have coalesced above, and develope a ridge or spine from the whole of their antero-posterior extent. Two zygapophyses, with the articular surfaces turned upwards, articulate with the neurapophyses of the atlas. The two posterior zygapophyses of the axis look obliquely downwards and outwards: two short hypapophyses project from the under part of the body of the axis.

This and the following specimens, to No. 701 inclusive,
were presented by Prof. Owen, F.R.S.

684. The sixth cervical vertebra of a Gavial (*Gavialis gangeticus*).

The confluence of the neurapophyses with each other and the neural spine above, and the non-development of a distinct hypapophysis, reduce the number of permanently separate elements to four,—the centrum, neural arch, and pleurapophyses. The latter are principally developed, as in other Crocodilia, in the antero-posterior direction: the head articulates by suture to the parapophysis, the tubercle by a smaller plane surface with the diapophysis, which is here developed from the base of the neurapophysis: the centrum developes a single hypapophysis, which is here an exogenous process, not, as in most Lacertians, an autogenous element.

685. An anterior dorsal vertebra of the Gavial (*Gavialis gangeticus*).

The centrum is still characterized by the hypapophysis: the pleurapophyses are elongated, slender and curved: the articulation of the head is transferred to a notch upon the largely-developed diapophysis, the tubercle still articulating to the extremity of that process. There is no parapophysis.

686. A lumbar vertebra of the Gavial (*Gavialis gangeticus*).

It is characterized, as in other Crocodilia, by the absence of the hypapophysis, by the anchylosis of the pleurapophyses, and by the detached hæmapophyses.

687. The two sacral vertebræ of the Gavial (*Gavialis gangeticus*).

These show the continuous sutural attachment of the head of the short and thick pleurapophyses, one of which is detached from the posterior vertebra. The sutural surface is divided into two parts, the lower one joining a prominent part of the side of the centrum, answering to the parapophysis, and the upper one to an expansion of the base of the neurapophysis, which represents the diapophysis. The coadapted surfaces of the centrum are flat: the opposite surfaces are concave in each.

688. An anterior caudal vertebra of the Gavial (*Gavialis gangeticus*).

By the coalescence of the neurapophyses with each other and the neural spine, and of the hæmapophyses in like manner with each other and the hæmal spine, this vertebra is reduced to five distinct pieces: the proximal end of the pleurapophyses is expanded and articulated by suture with the centrum and base of the neurapophysis.

689. A posterior caudal vertebra of the Gavial (*Gavialis gangeticus*).

This is characterized by the absence of the pleurapophyses and by the anchylosis of the neural arch with the centrum. The hæmapophyses continue distinct from the centrum.

690. The two iliac and the two ischial bones of a Gavial.

691. The right humerus of a Gavial: its head is transversely compressed: its shaft bent in two directions, with a deltoid crest developed from its upper and fore part: the lower end is also transversely extended and divided anteriorly into two condyles.

692. The right radius of a Gavial: its head is oval: its shaft cylindrical: its lower end oblong and subcompressed.

693. The right ulna of a Gavial: it is thicker and longer than the radius: has no olecranon: it articulates with the outer condyle of the humerus by an oval facet.

694. Two carpal bones of a Gavial: *s* is the scapholunar, and *u* is the unciforme.

695. The left humerus in horizontal section, showing the thickness of the compact tissue at the middle of the shaft forming the walls of the medullary cavity. The medullary artery enters above the middle on the inner side of the shaft, and the canal slopes downwards.

696. The right femur of a Gavial: its head is compressed from before backwards: its shaft with a slight double curvature in directions contrary to those of the humerus: the trochanter is represented by an obtuse pyramidal prominence from the inner side of the upper fourth of the shaft: the lower end is extended transversely and divided behind into two condyles.

697. The right tibia of a Gavial: its upper head is large and triangular: its lower end is compressed and convex.

698. The right fibula of a Gavial: this is slender and cylindrical: its head is much compressed: its lower end enlarged and subtriangular.

699. Two of the tarsal bones of a Gavial: *a* is the astragalus and *c* the calcaneum.

700. The left femur of the same Gavial, in longitudinal section.

701. The left tibia of the same Gavial, in longitudinal section.

702. The skull of the *Gavialis gangeticus*, with the dried integuments; showing the peculiar valve which defends and closes the external nostril. Number of alveoli in the premaxillary, 5—5; in the maxillary, 24—24; in the dentary, 25—25. *Presented by Nathaniel Wallich, M.D., F.R.S.*

703. The skull, wanting the lower jaw, of the *Gavialis gangeticus*. Number of alveoli in the premaxillary, 5—5; in the maxillary, 24—24. *Hunterian.*

704. The skull of the *Gavialis gangeticus*.

Presented by Nathaniel Wallich, M.D., F.R.S

705. The skull, with the cranium mutilated and the integuments dried, of a smaller specimen of the *Gavialis gangeticus*. There is a palpebral ossicle at the superior and anterior border of the orbit. Number of alveoli in the premaxillary, 5—5; in the maxillary, 23—23; in the dentary, 26—26.

Presented by Sir T. S. Raffles, P.Z.S.

706. The skull of a *Gavialis gangeticus*, of exactly the same size as the preceding specimen, vertically and longitudinally bisected.

It shows the size and form of the cranial cavity, and the prominence formed by the oto-cranial plates of the alisphenoid, exoccipital and superoccipital bones. These have been partially removed in the right half of the section. In the left half is shown the junction of the two canals from the tympanic cavity with each other and with the common median eustachian outlet. There is a very feeble rudiment of the expansion of the pterygoid bone in these small Gavials; but this may be a character of immaturity, not of specific distinction.

Presented by E. Evarest, Esq.

707. The skull of a small Gavial (*Gavialis gangeticus*). Number of alveoli in the premaxillary, 5—5; in the maxillary, 24—24; in the lower jaw, 26—26.

Presented by Sir Everard Home, Bart., F.R.S.

708. Five teeth of the Gavial (*Gavialis gangeticus*), in different stages of growth. The specimen with the crown and base fully formed presents a deep notch in the latter, as if a piece had been cleanly cut out; but which is the effect of the progressive absorption excited by the pressure of the successional tooth. The enamelled crown is long, slender, subcompressed, with two strong and sharp opposite ridges, the intervening tracts being pretty regularly divided by more feeble longitudinal ridges. It appears from the inscription on this tooth that it came into Mr. Hunter's possession in the year 1784. The largest tooth has had the crown fractured and the successional tooth has penetrated its cavity. All the specimens are widely excavated at their base. *Hunterian.*

709. A stuffed specimen of a young Gavial (*Gavialis gangeticus*). The number of alveoli in the premaxillary is 4—4; in maxillary, 25—25; in dentary, 25—25.

The arrangement of the dermal ossicles forming the dermal skeleton is well shown in this specimen: in the middle of the flexible integument between the cranium and the series of dorsal scutes are two large, oval, conical ossicles in the same transverse line, and a small epidermal scute external to these on each side. The first transverse row of the dorsal series of scutes consists of two large triangular pieces, the second row of two square pieces, the third row of two principal square pieces and two small lateral ones; the fourth and succeeding series have two large median and two small lateral pieces on each side: this series of six scutes begins a little in advance of the setting on of the fore-limbs.

Presented by Nathaniel Wallich, M.D., F.R.S.

Genus *Crocodilus*.

710. A dried specimen of a young Crocodile (*Crocodilus cataphractus*).

This is the original specimen described and in part figured by Cuvier in the 'Ossemens Fossiles,' p. 58. pl. v. fig. 1 & 2, under the name of 'Crocodile à nuque cuirassée.' It was presented to the College by Sir William Blizard, but without an indication of the locality from which it had been originally derived, a circumstance which Cuvier regrets. A living specimen of this species was exhibited in the Menagerie of the Zoological Society of London in the year 1834, which was stated to have been brought from Fernando Po, Africa. There is, however, a very close resemblance, in the elongated slender proportions of the skull and the slightly festooned borders of the jaws, between this species and the *Crocodilus Schlegelii* from Borneo. Number of alveoli in the premaxillary, 4—4; in the maxillary, 13—13; in the dentary, 15—15.

Presented by Sir Wm. Blizard, F.R.S.

711. The skeleton of a young Sharp-nosed Crocodile (*Crocodilus acutus*). The number of alveoli in the premaxillary is 5—5; in the maxillary, 14—14; in the dentary, 15—15.

The rib of the axis is expanded and sub-bifurcate at its proximal end, but is slightly advanced in position, and articulates with two transverse processes, a parapophysis and diapophysis of the odontoid. The ribs of the five succeeding vertebræ are short and developed forwards and backwards, overlapping each other. The ribs of the eighth and ninth vertebræ are long, slender and pointed, but do not articulate with the sternum. This character is presented by the seven succeeding ribs, the semiossified hæmapophyses of which are divided into two parts. The cartilaginous appendage of the eighth rib joins that of the preceding one. The ribs of the eighteenth and nineteenth vertebræ are again free or floating. The rudiments of the ribs of the twentieth vertebra have not been preserved, but the surface at the end of the long diapophysis indicates that they existed. The diapophyses of the next four vertebræ seem not to have had pleurapophyses, and represent lumbar vertebræ. There are two sacral vertebræ, characterized like those in the Gavial. Diapophyses are developed from the fourteen anterior caudal vertebræ: the hæmapophyses commence at the interspace between the second and third vertebræ.

Mus. Heaviside.

712. The skull of the Sharp-nosed Crocodile (*Crocodilus acutus*), in three transverse sections.

One is taken through the prefrontal and lachrymal bones, immediately in front of the orbits, and shows the junction of the descending or neurapophysial plates of the prefrontals with the upper vomerine or coalesced portion of the pterygoids. The second transverse section is taken between the thirteenth and fourteenth tooth, through the nasal, maxillary, vomerine, and palatine bones. It shows the commencement of the posterior respiratory canals formed by the external lamella of the vomer, which arches outwards to join the external ascending plate of the palatines, and which is continued backwards by the vomerine tubular portions of the pterygoids. In the anterior part of the section the vomerine bones may be seen extending forwards to join the nasal processes of the maxillaries. The maxillary and palatine sinuses are exposed by the anterior section: the maxillary sinuses are separated from the nasal cavities by a thin, vertical, bony plate. They communicate by an oval aperture at their back part with the posterior part of the nasal cavities. A palpebral ossicle is displayed at the superior and anterior part of the orbit. Number of alveoli in the premaxillary 5—5, in the maxillary 14—14.

Presented by Prof. Owen, F.R.S.

713. The skull of the *Crocodilus acutus*. Number of alveoli in the premaxillary, 4—4; in the maxillary, 14—14; in the dentary, 15—15. *Hunterian.*

714. The skull of the *Crocodilus acutus*. Number of alveoli in the premaxillary, 4—5; in the maxillary, 14—14; in the dentary, 15—15. *Hunterian.*

715. The skull of the *Crocodilus acutus*. Number of alveoli in the premaxillary, 5—5; in the maxillary, 14—14; in the dentary, 15—15. *Hunterian.*

716. The skull of the *Crocodilus acutus*, wanting the lower jaw. Number of alveoli in the premaxillary, 5—5; in the maxillary, 14—14. *Mus. Brit.*

717. The mutilated and distorted skull of a young Nilotic Crocodile (*Crocodilus vulgaris*).

The extremity of the upper jaw is raised above the plane of the upper surface of the skull, producing a marked concavity between the orbits and the external nostril. The under jaw is correspondingly curved, except at its extremity. The base of the cranium has been removed, and both tympanic cavities are laid open; the size, shape and relative position of the small petrosal being well shown on the left side. Number of alveoli in the premaxillary, 5—5; in the maxillary, 14—14; in the dentary, 15—15.

Hunterian.

718. The skull of a young Crocodile, apparently of the Nilotic species (*Crocodilus vulgaris*).

The palatine suture between the premaxillary and maxillary bones passes obliquely backwards a little way at its commencement and then extends transversely across; but the premaxillary bones are longer than in the second Gangetic species. There is a small palpebral ossicle above the anterior angle of the eyelids. Number of alveoli in the premaxillary, 5—5; in the maxillary, 13—13.

Hunterian.

719. The skeleton of the Gangetic Crocodile (*Crocodilus biporcatus*).

In this skeleton may be noticed the chief osteological characters by which the order *Crocodilia* is distinguished from the order *Lacertilia*. First, the confluence of the external bony nostrils into a single median, subcircular foramen: the implantation of the teeth in distinct sockets: the fixation of the tympanic by being wedged between the mastoid and squamosal, a modification which gives the requisite firmness of support to the strong and massive under-jaw. The ordinal characters are further manifested in the vertebral column of the trunk. Pleurapophyses commence at the atlas, and in the succeeding vertebræ are articulated to two points of their respective vertebræ, viz. by a head and tubercle to a dia- and par-apophysis. From the third to the seventh cervical the pleurapophyses are short and peculiarly developed in the direction of the axis of the trunk both forwards and backwards, overlapping each other; the pleurapophyses of the eighth vertebra are long and slender, extend outwards, and terminate in a point; those of the ninth vertebra join the sternum by partially ossified hæmapophyses: the same structure is presented by the six following ribs: in the next four vertebræ the cartilages join each other, and are united to the sternum through the medium of the cartilage of the fifteenth pleurapophysis; in the twenty-first vertebra the pleurapophyses are reduced to small styliform rudiments appended to the extremity of the diapophysis.

From the third to the ninth vertebra inclusive the head of the rib articulates to the lower transverse process or parapophysis, and the tubercle to the upper transverse process or diapophysis: in the thirteenth vertebra the head of the rib ascends and articulates to the base of the diapophysis, the tubercle still adhering to the apex: in the fourteenth vertebra the head of the pleurapophysis applies itself to a notch in the fore-part of the diapophysis, and in the twentieth vertebra the head finally disappears. The twenty-first to the twenty-fourth vertebræ inclusive show no rudiments of ossified pleurapophyses, but the hæmapophysial parts of the ribs are present as long and slender cartilages in the abdominal parietes. If we begin to count the dorsal series of vertebræ from that in which the rib is complete, or consists of both pleurapophysis and hæmapophysis joining the sternum, and include in the dorsal series the succeeding vertebræ which have freely articulating pleurapophyses, there are then twelve 'dorsal' vertebræ. The eight vertebræ anterior to these may be called 'cervical,' and the four posterior to them 'lumbar.' The sacral vertebræ are two in number, and characterized, as in the Lizards, by their short and thick pleurapophyses; the sutures uniting which to the diapophyses are still obvious in this skeleton: the second sacral vertebra differs in the *Crocodilia* from that in the *Lacertilia* by presenting a concavity or cup to the first caudal instead of a ball; the second caudal vertebra recovering the ordinary position of the cup and ball. The hæmapophyses are articulated to interspaces of the caudal vertebræ, but chiefly to the centrum of that to which they properly belong, viz. the anterior one: they are confluent at their lower extremities, which are produced into a hæmal spine. The transverse processes, formed by the anchylosed depressed pleurapophyses, are developed from the fourteen anterior caudal vertebræ. The remainder of this series bear compressed, high, slender neural spines, which progressively decrease in length to the end of the tail.

The hyoid arch consists of a broad cartilaginous and partially ossified basihyal, and two simple, slender, bent, bony ceratohyals.

The scapular arch consists of a simple scapula and coracoid, both formed by compressed, narrow, moderately long plates of bone, thickest where they are united together to form the glenoid cavity for the humerus. The ilium is a very short but thick bone: the inverted arch formed by the pubes is quite distinct from that formed by the ischia: all the three bones combine as usual to form an articular cavity for the femur.

The character of the genus *Crocodilus* is manifested in this specimen by the reception of the fourth tooth, or canine, of the lower jaw in a notch of the lateral margin of the upper jaw, so that it is exposed when the mouth is shut. The specific character is given by the two unusually developed and distinct bony ridges extended from the anterior parts of the orbits and converging as they advance forwards. The number of alveoli in the premaxillary is 4—4; in the maxillary, 14—14; in the dentary, 15—15.

Mus. Brit.

720. The skull of the *Crocodilus biporcatus.*

Ossification has extended over the left temporal fossa, from the mastoid and postfrontal to the parietal, covering it with a bony roof like that in the Turtles (*Chelone*). The outer walls of the sockets of some of the teeth have been removed in the upper jaw, which exposes the great depth and curvature of those sockets, and the recess at the inner side of the base of each, in which was lodged the matrix of the successional teeth. The number of the alveoli is,—in the premaxillary, 4—4; in the maxillary, 14—14; in the dentary, 15—15.

721. The skull of the *Crocodilus biporcatus.*

Besides the two ordinary perforations of the premaxillary bone receiving the two anterior mandibular teeth, the second and third pairs have also excited progressive absorption of the same bones, and have partly perforated them. The number of the alveoli is,—in the premaxillary, 4—4; in the maxillary, 14—14; in the dentary, 15—15.

Presented by Sir Everard Home, Bart., F.R.S.

722. The skull of the *Crocodilus biporcatus.* It shows the same number of the teeth.

Presented by Dr. Nathaniel Wallich, F.R.S.

723. The skull of the *Crocodilus biporcatus.* It shows the same number of the teeth.

Hunterian.

724. The skull of the *Crocodilus biporcatus.* The constituent bones are numbered according to the Table of Synonyms. The number of alveoli is,—in the premaxillary, 5—5; in the maxillary, 15—15; in the dentary, 14—14.

Presented by Dr. Henderson.

725. The skull of *Crocodilus biporcatus.* The number of alveoli is,—in the premaxillary, 4—4; in the maxillary, 14—14; in the dentary, 15—15. *Hunterian.*

726. The skull of a Crocodile, which resembles in the proportions of the length and breadth of the maxillary and premaxillary bones the preceding specimen. The premaxillo-palatine suture has the same undulating transverse direction, but bends more forward and nearer the nasal aperture at its middle part; this however is probably only an individual peculiarity. The ecto-pterygoid has the

same proportional extent behind the last alveolus of the upper jaw. The eyelids and opercular flaps of the ear, and the tegumentary valvular nostrils, with other portions of the integument, are left upon the exterior of the skull. There are no palpebral ossicles. The number of alveoli is,—in the premaxillary, 5—5; in the maxillary, 14—14; in the dentary, 15—15. *Mus. Brit.*

727. The skull, wanting the lower jaw, of the *Crocodilus biporcatus*. The back part of the skull is broken away, and a portion of the descending process of the basioccipital has been removed by the saw, to show the common descending canal of the median system of eustachian tubes, and one of the lateral eustachian canals, with the sinus of communication between the lateral and the basioccipital branch of the median canal *. The number of alveoli is,—in the premaxillary, 4—4; in the maxillary, 14—14.

Presented by Prof. Owen, F.R.S.

728. A mutilated cranium of the *Crocodilus biporcatus,* in vertical and longitudinal section. The small petrosal may be noticed at the bottom of the T-shaped suture, uniting the alisphenoid with the ex- and super-occipitals. The common canal of the median system of eustachian tubes is laid open to its bifurcation into the basioccipital and basisphenoidal branches, and the subdivision of each of these into a pair of canals diverging laterally to the tympanic cavities is shown. The tympanic cavity is exposed in the left half of the section by the removal of the basi- and ex-occipitals. The number of alveoli is,—in the premaxillary, 4—4; in the maxillary, 14—14. *Presented by Prof. Owen, F.R.S.*

729. The six pieces of which the composite ramus of the lower jaw of a Crocodile is composed. Each is indicated by its characteristic number, and has also its name marked on it. *Presented by Prof. Owen, F.R.S.*

730. The right ramus of the mandible of the *Crocodilus biporcatus,* in four transverse sections, showing the mode in which the pieces are articulated together and their texture.

* This specimen is figured in Pl. 41. fig. 7 of the donor's 'Memoir on the Communications between the Cavity of the Tympanum and the Palate in the Crocodilia,' Phil. Trans. 1850, p. 521.

The anterior section is across the dentary piece at the extremity of the splenial. The second section is across both dentary and splenial, at the extremity of the angular piece. The third section crosses the dentary, the splenial, the angular, and the anterior extremity of the surangular piece, and shows the wide cavity surrounded by these pieces: each piece bears its characteristic number, according to the Table of SYNONYMS.

Presented by Prof. Owen, F.R.S.

731. The centrum and neurapophyses of the atlas of a Crocodile. The neural spine is wanting.

The centrum is wedge-shaped, with the base downwards and the anterior surface excavated to form the lower half of the cup for the condyle of the occiput: the posterior surface is nearly flat, with the lateral margins expanded and bent forwards to give attachment to the pleurapophyses: each neurapophysis presents an articular surface at the fore part of its base for the occipital condyle, and at the back part for the odontoid epiphysis of the axis: the odontoid process projects into the space between these parts of the neurapophyses and the centrum. Above these parts the neurapophyses circumscribe the neural canal; they meet and articulate with each other, but do not coalesce above. Each developes a small zygapophysis posteriorly, the articular surface of which looks downwards.

Hunterian.

732. A second cervical vertebra of a Crocodile, with the central part of the body of the atlas, forming the 'odontoid process' of anthropotomy, attached by synchondrosis to the fore part of the body.

The upper part of the odontoid presents a broad subcircular neural surface between two neurapophysial surfaces, each of which forms two oppositely sloping facets; the anterior one for the neurapophysis of the atlas, the posterior one for that of the axis: these surfaces are divided by a notch from a lower diapophysial protuberance of the odontoid, which supports the pleurapophysis of the second vertebra. The proper body of the second vertebra has an inferior tubercle. The neural arch has two small anterior zygapophyses, looking upwards and outwards; two larger posterior ones, with an opposite aspect; and a compressed confluent neural spine.

Hunterian.

733. The third cervical vertebra of the same Crocodile. *Hunterian.*

734. The sixth cervical vertebra of a Crocodile.

The centrum presents an anterior concavity and a posterior convexity, as in most of the other vertebræ: it has two oblong parapophyses laterally, and a short and strong hypapophysis developed from the anterior half of its under part. The neurapophyses are permanently articulated by sutural surfaces to the centrum, but coalesce above with each other and with the neural spine. They each develope a moderately long and slender diapophysis, two prezygapophyses, looking obliquely inwards and upwards, and two postzygapophyses with opposite aspects. The spine is long, trihedral, with a rough surface at the fore- and back-part of its base, for the attachment of elastic ligaments. The pleurapophyses are bifurcate, short, and developed chiefly in the anterior and posterior directions.

Hunterian.

735. A posterior dorsal vertebra of a Crocodile.

The centrum is characterized by the absence of processes; the neural arch by the great length of the diapophyses, which are notched at the end and present two surfaces, one for the head, the other for the tubercle of the rib, which is here characterized by its length, slenderness, and its articulation at its thickened distal end with a semi-ossified hæmapophysis.

Hunterian.

736. A lumbar vertebra of a Crocodile.

The centrum is broader in proportion to its length than in the dorsal. The diapophyses have no articular surfaces for ribs. The zygapophyses are more nearly horizontal than in the dorsal and cervical series.

Hunterian.

737. A vertical longitudinal section of a lumbar vertebra of a Crocodile.

It shows the compact bone upon the upper and under surface, and forming the anterior concavity of the centrum.

Hunterian.

738. Six pairs of the hæmapophyses from the abdominal walls of a Crocodile.

From their long and slender form they have obtained the name of abdominal ribs; each is divided into two parts, being ossified from two distinct centres.

Hunterian.

739. The anterior sacral vertebra of a Crocodile.

The short and thick pleurapophyses are trihedral, expanded obliquely, truncate, and irregularly notched at their extremities: they articulate with both the centrum and neurapophysis by a broad sutural surface, the limits of which are not yet obliterated. The anterior articular cup of the centrum is expanded transversely by portions of the pleurapophyses: the posterior surface of the centrum is rough and nearly flat.

Hunterian.

740. An anterior caudal vertebra of a Crocodile.

Here the neural arch has become anchylosed to the centrum, and the short ribs to both those parts. The centrum is characterized by the two articular tubercles (hypapophyses) at its under and posterior part for the articulation of the hæmapophyses which have coalesced at their extremities and developed a long compressed spine.

Hunterian.

741. A posterior caudal vertebra of a Crocodile.

It is characterized by the absence of transverse processes. The centrum is more compressed; the articular cup and ball form a small proportion only of the terminal surfaces.

Hunterian.

742. The right scapula and coracoid of a Crocodile. The coracoid is perforated near its proximal end. *Hunterian.*

743. The right humerus of the same Crocodile. *Hunterian.*

744. The left humerus of the same Crocodile. *Hunterian.*

745. The left humerus of a Crocodile (*Crocodilus biporcatus*), in longitudinal section. *Hunterian.*

746. The right humerus, radius, ulna, scapho-lunar, cuneiform, pisiform, unciform and metacarpal bones, with sundry phalanges, of a young *Crocodilus biporcatus.* *Presented by Prof. Owen, F.R.S.*

747. The left humerus, radius, ulna, scapho-lunar, cuneiform, pisiform, unciform and metacarpal bones, with sundry phalanges, of the same *Crocodilus biporcatus.*
Presented by Prof. Owen, F.R.S.

748. The right femur, tibia, fibula, astragalus, calcaneum, ecto-cuneiform, cuboid and metatarsal bones, with sundry phalanges, of the same *Crocodilus biporcatus.*
Presented by Prof. Owen, F.R.S.

749. The left femur, tibia, fibula, astragalus, calcaneum, ecto-cuneiform, cuboid and metatarsal bones, with sundry phalanges, of the same *Crocodilus biporcatus.*
Presented by Prof. Owen, F.R.S.

750. The cranium of a Crocodile (*Crocodilus rhombifer*), which measures 10 inches in length, 7 inches from the anterior part of the orbit to the end of the muzzle, and $4\frac{3}{4}$ inches in a straight line across the sockets of the fifth maxillary tooth.

The facial part, and especially the maxillary bones, are consequently shorter than in the *Crocodilus biporcatus*; but a more definite difference is presented in the form of the palatine suture between the maxillary and premaxillary bones: this extends in the present specimen irregularly, but transversely, from behind the small foramen on the inner side of the marginal notch receiving the canine of the lower jaw; whilst in the *Cr. biporcatus* the same suture inclines from this point obliquely backwards, before it bends inwards to meet the opposite half of the suture at the median line. The palatal processes of the premaxillary bones are consequently relatively longer in the *Cr. biporcatus*, and the anterior palatal aperture of the bony nostril is more nearly in the centre of the palatine plate of the premaxillaries in the *Cr. rhombifer*. The posterior palatal aperture of the nostrils is not so completely marginal in its position, and its plane is more horizontal in the present specimen. The right lateral eustachian canal has been laid open as far as the tympanum, and a portion of wire is passed through the median eustachian canal, to show the communication of its lateral basioccipital branch with the lateral eustachian canal. The left carotid canal is laid open and a bristle is passed through it into the tympanic cavity, and into the canal continued to the sella turcica in the cranial cavity. The number of alveoli is—in the premaxillary, 5—4; in the maxillary, 14—14; in the dentary, 15—15. The specimen is from Bengal.

Presented by Dr. Nathaniel Wallich, F.R.S.

751. The skull of a larger individual of the *Crocodilus rhombifer*.

Like the preceding specimen, it differs from *Cr. biporcatus* in the greater breadth of the maxillary and premaxillary portion of the skull. The palatine suture of the premaxillary bones is likewise transverse. The posterior palatine vacuities are broader in proportion to their length, and the palatine bones are narrower. There is a smaller proportion of the ectopterygoid behind the last alveolus. The teeth are larger in proportion to the length of the skull. The antorbital ridges are not continued so far forwards. The number of the alveoli is —in the premaxillary, 5—5; in the maxillary, 14—14; in the dentary, 14—15.

Presented by B. C. Henderson, Esq., F.R.S.

752. The skull of a Crocodile from Bengal, wanting the lower jaw, of a species (*Crocodilus palustris*?) which is frequently found inhabiting the larger ponds. It differs from the *Cr. biporcatus* of the Ganges in having shorter maxillary and premaxillary bones in proportion to its length, in having much less developed prefrontal ridges; the palatal suture between the maxillary and premaxillary bones is transverse, not curved. The anterior extremities of the palatine bones are narrower and more pointed. The number of the alveoli is,—premaxillary, 5—5; maxillary, 14—14.

753. A longitudinal section of the left ramus and teeth of the lower jaw of a young Crocodile, showing the pulp-cavities of the teeth in place and the germs of their successors.

As the teeth of the *Crocodilia* are shed and renewed many times in the course of life, but always in the vertical direction, or in that according to which the human deciduous teeth are directly replaced, the number of the teeth is the same in the young Crocodile when it quits the egg as when it has attained its full growth: it does not appear, at least, that there are any teeth added to the series from behind forwards without displacing previous teeth, or which can be compared with the true molars in Mammalia.

Hunterian.

754. Two of the larger-sized teeth, with the germ of a successional tooth, of a Crocodile (*Crocodilus biporcatus*).

The conical enameled crown is less acute than in the Gavial, and its transverse section is circular; but it presents two opposite trenchant ridges. In the older and more worn of these two teeth the walls of the long hollow fang have not been attacked by the absorbent process, which would indicate that the succession of the teeth was less frequent and rapid than in the Gavial.

Hunterian.

755. A tooth of a younger Crocodile, with the crown transversely bisected and the base deeply notched by the absorbent action. *Hunterian.*

756. The tooth of a Crocodile, with part of the enamel removed from the crown, showing its thickness. *Presented by Sir Everard Home, Bart., F.R.S.*

757. Two of the posterior teeth of a Crocodile, in which the crown is shorter in proportion to the base, and is more compressed, than in the anterior teeth.

Hunterian.

758. Four nuchal scutes of the epidermal covering of the *Crocodilus biporcatus.*

Mus. Brit.

759. A similar specimen from a larger individual of the *Crocodilus biporcatus.*

Mus. Brit.

760. A skeleton of a young Alligator (*Alligator lucius*).

The character of the genus is marked by the reception of the crown of the fourth tooth, or canine, of the under jaw in a deep fossa at the outer part of the palatine suture, between the maxillary and premaxillary bones, by which these teeth are concealed when the mouth is shut. Both maxillary and premaxillary portions of the skull are unusually broad in proportion to their length, but this is a character of the species rather than the genus. The nasal bones send their attenuated extremities forwards to the premaxillaries so as to divide the anterior external nostrils into two cavities. Cuvier figures the same peculiarity in the *Alligator lucius* represented in pl. 1. fig. 8 of the 'Ossemens Fossiles.' The vacuity in the back part of the ramus of the jaw, between the angular, surangular, and dentary pieces, is relatively longer than in the true Crocodiles. The number of alveoli in the premaxillary is 5—5; in the maxillary, 14—14; in the dentary, 18—18.

The bifurcation of the rib of the axis is deeper than in the *Crocodilus acutus*. There are the same number of hatchet-shaped, or anterior floating ribs, and of true ribs, as in the *Cr. acutus*. The rudimental pleurapophyses are preserved upon the 20th vertebra. There are four lumbar, two sacral, and thirty-nine caudal vertebræ; the sixteen anterior of which support transverse processes, which are anchylosed pleurapophyses, traces of the suture being still visible in some of the anterior ones.

Mus. South.

761. The skull of a young *Alligator lucius*.

The number of alveoli is—in the premaxillary, 5—5; in the maxillary, 15—15; in the dentary, 19—19. The seven posterior sockets are confluent, and form a partially divided common groove. There is no trace of vomer upon the palate of this or of the preceding specimen.

Hunterian.

762. The skull of a young *Alligator lucius*, in vertical longitudinal section: it shows the large proportional size of the cranial cavity at this period. The point of the nasals joins the premaxillaries and divides the external nasal aperture.

Prepared from a specimen presented by the Zoological Society of London.

763. The disarticulated bones of the skull of a young *Alligator lucius*, minus the hyoid and scapular arches, the right alisphenoid, and the divided anterior portions of the vomer. The individual bones are numbered upon coloured labels indicative of their natural arrangement and names, according to the Table of SYNONYMS. *Hunterian.*

764. The skull of the black Alligator (*Alligator niger*).

The number of alveoli is—in the premaxillary, 5—5; in the maxillary, 13—13; in the dentary, 18—18. The vomer is divided at the median line, and the anterior expanded part of each moiety appears upon the bony palate, between the premaxillary and maxillary bones; the palatine suture between the same bones bending down to the hinder border of the palatal anterior aperture of the nostrils. The fossæ for the reception of the crowns of the inferior canines are well developed at the outer end of this suture: the palatine bones are unusually expanded anteriorly: the posterior nasal apertures are horizontal, as in the *Alligator lucius*. The specimen was brought from Guiana.

Purchased.

765. The right ramus of the lower jaw of an Alligator, from which the posterior part of the inner alveolar wall has been removed, showing the five posterior teeth lodged in a common alveolar groove, the germs of the successional teeth, and the effects of their pressure upon the bases of those in place. Here likewise may be observed the short obtuse crowns of the posterior teeth in the Alligator, and the constriction or cervix which separates the crown from the fang. *Purchased.*

766. The left ramus of the lower jaw of an Alligator, from which a section of the outer alveolar wall has been removed, exposing three complete sockets with the germinal recess at the inner part of their base, where the matrix of the successional teeth was lodged: it also exposes four teeth *in situ*, on removing which the germs of their successors may be seen occupying the germinal recesses. The absorbent process excited by that of the posterior tooth has produced a circular excavation on the inner side of its base. *Purchased.*

767. The fourth tooth of the lower jaw, or canine, of an Alligator (*Alligator niger*).

The crown is short and conical, with two opposite ridges nearer the concave side; the intermediate tracts of enamel present numerous feeble longitudinal striæ and a minutely reticular surface: an almost circular piece has been removed by progressive absorption from the inner side of the base.

Purchased.

768. Several teeth of an Alligator (*Alligator niger*), in different stages of growth and decay.

One shows the apex of a successional tooth projecting through the pulp-cavity, which has been exposed by the breaking away of the crown: in another the almost perfectly formed tooth is surrounded by the remains of its predecessor, reduced to a mere irregular shell of dentine.

Purchased.

Order CHELONIA.

Family *Marina*. Turtles.

Genus *Chelone*.

769. The skeleton of the green Turtle (*Chelone mydas*).

In the marine species of the Chelonian Order, of which this may be regarded as the type, the ossification of the carapace and plastron is less extensive, and the whole skeleton is lighter, than in those species that live on dry land. The head is proportionally larger,—a character common to aquatic animals; and, being incapable of retraction within the carapace, ossification extends in the direction of the fascia covering the temporal muscles, and forms a second bony covering of the cranial cavity: this accessory defence is not due to the intercalation of any new bones, but to exogenous growths from the frontals (11), postfrontals (12), parietals (7) and mastoids (8).

The carapace is composed of a series of median and symmetrical pieces, and of two series of unsymmetrical pieces on each side. The median pieces have been regarded as lateral expansions of the summits of the neural spines *; the medio-lateral pieces as similar developments of the ribs †; and the marginal pieces as the homologues of the sternal ribs ‡. But the development of the carapace shows that ossification begins independently in a fibro-cartilaginous matrix of the corium in the first and some of the last median plates, and extends from the summits of the neural spines into only eight of the intervening plates: ossification also extends into the contiguous lateral plates, in some *Chelonia*, not from the corresponding part of the subjacent ribs, but from points alternately nearer and farther from their heads, showing that such extension of ossification into the corium is not a development of the tubercle of the rib, as has been supposed. Ossification commences independently in the corium in all the marginal plates which never coalesce with the bones uniting the sternum with the vertebral ribs, and which are often more numerous, and sometimes less numerous than those ribs, and in a few species are wanting. Whence it is to be inferred that the expanded bones of the carapace, which supported and are impressed by the thick epidermal scutes called 'tortoise shell,' are dermal ossifications, homologous with those which support the nuchal and dorsal epidermal scutes in the Crocodile §. Most of the pieces of the carapace being directly continuous or connate with the obvious elements of the vertebræ, which have been supposed exclusively to form them by their unusual expansion, the median ones have been called 'neural plates,' and the medio-lateral pieces 'costal plates': but the exter-

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* Cuvier, Leçons d'Anatomie Comparée, i. (1799) p. 212. † *Ibid.* p. 211.

‡ Geoffroy, Annales du Muséum, t. xiv. (1809) p. 7.

§ Carus, Lehrbuch der Vergleich. Anatomie, Bd. i. p. 164. Peters, Observationes ad Anatomiam Cheloniorum. Owen, Philos. Trans. 1849, p. 151.

nal lateral pieces have retained the name of 'marginal plates.' The first or anterior of the median plates ('nuchal plate') is remarkable for its great breadth in the Turtles, and usually sends down a ridge from the middle line of its under surface, which articulates more or less directly with the summit of the neural arch of the first dorsal vertebra; this may be seen in the carapace of the *Trionyx*, No. 931: the second neural plate is much narrower, and is connate with the summit of the neural spine of the second dorsal vertebra: the seven succeeding neural plates have the same relations with the succeeding neural spines: the rest are independent dermal bones, but the ninth is separated from the tenth by the last pair of costal plates. The costal plates of the carapace are superadditions to eight pairs of the pleurapophyses or vertebral portions of the second to the ninth ribs inclusive. The slender or proper portions of these ribs project freely for some distance beyond the connate dermal portions, along the under surface of which the rib may be traced, of its ordinary breadth, to near the head, which liberates itself from the costal plate to articulate to the interspace of the two contiguous vertebræ, to the posterior of which such rib properly belongs.

The plastron consists in the genus *Chelone*, as in the rest of the Order, of nine pieces,—one median and symmetrical, and the rest in pairs. With regard to the homology of these bones, three explanations may be given: one in conformity with the structure of the thoracic-abdominal cage in the Crocodile; the other based upon the analogy of that part in the Bird; and the third agreeably with the phænomena of development. According to the first, the median piece of the plastron, called 'ento-sternal,' answers to the sternum of the Crocodile, or 'sternum proper,' and the four pairs of plastron-pieces answer to the 'hæmapophyses' forming the so-called sternal and abdominal ribs of the Crocodile. Most Comparative Anatomists have, however, adopted the views of Geoffroy St. Hilaire, who was guided in his determination of the pieces of the plastron by the analogy of the skeleton of the Bird; according to which all the parts of the plastron are referred to a complex and greatly developed sternum, and the marginal plates are viewed as sternal ribs (hæmapophyses). The third ground of determination refers the parts of the plastron, like those of the carapace, to a combination of parts of the endoskeleton with those of the exoskeleton.

In the present skeleton the marginal plates are twenty-two in number, or twenty-four if the first (nuchal) and last (pygal) vertebral plates be included. Omitting these in the enumeration, two marginal pieces intervene on each side at the angles between the first median plate and the point of the first costal plate formed by the end of the second dorsal rib, which point enters a depression in the third marginal piece; the fourth, fifth, sixth, seventh, eighth and ninth marginal plates are similarly articulated by gomphosis to the six succeeding ribs; the tenth marginal plate has no corresponding rib; the eleventh is articulated with the point of the ninth dorsal rib supporting the eighth costal plate.

The want of concordance with the vertebral ribs, or 'pleurapophyses,' arising from the increased number of the marginal pieces, favours the idea of their being dermal ossifications, such peripheral elements being more subject to vegetative division and multiplication than the hæmapophyses: the absence of the marginal pieces in the *Trionyx* gives additional support to the same view. The parial pieces of the plastron are the 'hæmapophyses' connate with expanded dermal ossifications, and have received the following special names: 'episternal,' 'hyosternal,' 'hyposternal' and 'xiphisternal,' as they succeed each other from before backwards.

The scapular and pelvic arches, and the bones of the extremities, are described and figured in the 'Ossemens Fossiles' of Cuvier.

Hunterian.

770. The carapace of the green Turtle (*Chelone mydas*).

The first and last three 'neural' plates are not attached to any vertebral elements. The pleurapophyses of the first dorsal vertebra are short, expanded at their extremities, and articulated there with the second pair of ribs, which are connate with the first pair of the costal plates of the carapace, beyond which the rib extends in its ordinary slender form. The head of the rib articulates by an extensive sutural surface to the sides of the contiguous extremities of its own centrum, and that of the vertebra in advance. The ninth pair of ribs resume their connection exclusively with their proper centrum; they are connate with the last pair of costal plates of the carapace. The tenth dorsal vertebra has a pair of short and straight pleurapophyses, which articulate by slightly expanded extremities to those of the preceding vertebra. The pleurapophyses of the three following vertebræ articulate together at their extremities, against which the iliac bones abut; these may be regarded, therefore, as sacral vertebræ. The first three caudal vertebræ are likewise here preserved; together with the marginal pieces of the carapace, and the dermal scutes which cover the exterior of the carapace.

Mus. Brit.

771. The carapace of a large Turtle (*Chelone*), constructed as in the preceding specimen. The bodies of the fifth to the eighth dorsal vertebræ are wanting, or mutilated. *Hunterian.*

772. The osseous parts of the plastron of a Turtle (*Chelone mydas*). The special names given to the nine portions by Geoffroy St. Hilaire are written on them. In General Homology the lateral or parial pieces are expanded hæmapophyses, and the median piece a hæmal spine. *Hunterian.*

773. The skeleton of a small Turtle (*Chelone mydas*). *Mus. Langstaff.*

774. The skull of a green Turtle (*Chelone mydas*).

The expanded overarching part of the frontal and parietal bones is cut through and articulated on one side, so that it may be removed to show the true parietes of the cranial cavity which it conceals, and to which it affords additional protection. This modification seems to relate to the proportional size of the head in this and other species of marine Turtles being such as to prevent its retraction within the carapace. The numbers on the different bones correspond with those in the Table of Synonyms.

Presented by Prof. Owen, F.R.S.

775. The skull of a green Turtle (*Chelone mydas*), in transverse vertical section; showing the relative size and shape of the cranial, otocranial, tympanic and temporal cavities, and the osseous roof vaulting over the latter formed by the parietal and squamosal bones. The columelliform stapes is preserved *in situ* on the right side. *Presented by Prof. Owen, F.R.S.*

776. The right moiety of the cranium of a small Turtle (*Chelone mydas*).

A portion of the transverse parietal plate has been removed, forming an artificial opening into the temporal fossa, answering to the natural one in the skull of the Crocodile. A portion of the squamosal has likewise been removed, forming an artificial opening answering to the natural one between the squamosal, jugal and postfrontal in the Crocodile. On the inner side of the cranium the course of the carotid canal has been exposed between the pterygoid and basisphenoid. The otocrane, or cavity of the internal ear, is also exposed, showing the inner surfaces of the exoccipital, paroccipital, superoccipital, alisphenoid and tympanic bones, which concur in its formation.

Presented by Prof. Owen, F.R.S.

777. The separated bones of the head of a marine Turtle. They are numbered according to the Table of SYNONYMS. *Presented by Prof. Owen, F.R.S.*

The following specimens to No. 894 inclusive, of a disarticulated skeleton of the same species of Turtle, prepared from a specimen presented by Mr. Cuff, are designed to facilitate the study of the peculiarities of its singularly modified parts.

778. The skull of a Turtle (*Chelone mydas*), in horizontal and longitudinal section.

779. The atlas of the same *Chelone*.

780. The odontoid of the same *Chelone*.

781. The second cervical vertebra of the same *Chelone*.

782. The third cervical vertebra of the same *Chelone*.

783. The fourth cervical vertebra of the same *Chelone*.

784. The fifth cervical vertebra of the same *Chelone*.

785. The sixth cervical vertebra of the same *Chelone*

786. The seventh cervical vertebra of the same *Chelone*.

787. The eighth cervical vertebra of the same *Chelone*.

788. The nuchal, or first neural plate of the carapace of the same *Chelone*.

789. The second neural plate of the carapace of the same *Chelone*.

790. The third neural plate of the carapace of the same *Chelone*, confluent with the neural spine of the second dorsal vertebra.

791. The fourth neural plate of the carapace of the same *Chelone*, confluent with the neural spine of the third dorsal vertebra.

792. The fifth neural plate of the carapace of the same *Chelone*, confluent with the neurapophyses of the fourth dorsal vertebra.

793. The sixth neural plate of the carapace of the same *Chelone*, confluent with the neurapophyses of the fifth dorsal vertebra.

794. The seventh neural plate of the carapace of the same *Chelone*, confluent with the neurapophyses of the sixth dorsal vertebra.

795. The eighth neural plate of the carapace of the same *Chelone*, confluent with the neurapophyses of the seventh dorsal vertebra.

796. The ninth neural plate of the carapace of the same *Chelone*, confluent with the neurapophyses of the eighth dorsal vertebra.

797. The tenth neural plate of the carapace of the same *Chelone*, which touches but is not confluent with the neural spine of the ninth dorsal vertebra.

798. The eleventh neural plate of the carapace of the same *Chelone*.

799. The twelfth neural plate of the carapace of the same *Chelone*, which overlies the neural spines of the sacral vertebræ.

800. The thirteenth neural plate of the carapace of the same *Chelone*.

801. The fourteenth neural plate, which may also be regarded as a median marginal plate, of the same *Chelone*: it is called the 'pygal' plate.

802. The centrum of the first dorsal vertebra of the same *Chelone*.

803. The neurapophyses of the first dorsal vertebra of the same *Chelone*.

804. The centrum of the second dorsal vertebra of the same *Chelone*.

805. The centrum of the third dorsal vertebra of the same *Chelone*.

806. The centrum of the fourth dorsal vertebra of the same *Chelone*.

807. The centrum of the fifth dorsal vertebra of the same *Chelone*.

808. The centrum of the sixth dorsal vertebra of the same *Chelone*.

809. The centrum of the seventh dorsal vertebra of the same *Chelone*.

810. The centrum of the eighth dorsal vertebra of the same *Chelone*.

811. The centrum of the ninth dorsal vertebra of the same *Chelone*.

812. The neurapophyses of the ninth dorsal vertebra of the same *Chelone*: they have imperfect articular surfaces looking outwards on the posterior zygapophyses.

813. The centrum of the tenth dorsal vertebra of the same *Chelone*.

814. The neurapophyses of the tenth dorsal vertebra of the same *Chelone*: they bear anteriorly small zygapophyses looking inwards, and well-developed ones looking outwards posteriorly.

815. The centrum of the first sacral vertebra of the same *Chelone*.

816. The neurapophyses of the first sacral vertebra of the same *Chelone*.

817. The centrum of the second sacral vertebra of the same *Chelone*.

818. The neurapophyses of the second sacral vertebra of the same *Chelone*.

819. A chain of nineteen caudal vertebræ of the same *Chelone*.

820. The right pleurapophysis of the first dorsal vertebra of the same *Chelone*.

821. The left pleurapophysis of the first dorsal vertebra of the same *Chelone*.

822. The first costal plate of the right side of the carapace, connate with the pleurapophysis of the second dorsal vertebra, of the same *Chelone*.

823. The corresponding parts of the left side of the same *Chelone*.

824. The second costal plate of the right side of the carapace, connate with the pleurapophysis of the third dorsal vertebra, of the same *Chelone*.

825. The corresponding parts of the left side of the same *Chelone*.

826. The third costal plate of the right side of the carapace, connate with the pleurapophysis of the fourth dorsal vertebra, of the same *Chelone*.

827. The corresponding parts of the left side of the same *Chelone*.

828. The fourth costal plate of the right side of the carapace, connate with the pleurapophysis of the fifth dorsal vertebra, of the same *Chelone*.

829. The corresponding parts of the left side of the same *Chelone*.

830. The fifth costal plate of the right side of the carapace, connate with the pleurapophysis of the sixth dorsal vertebra, of the same *Chelone*.

831. The corresponding parts of the left side of the same *Chelone*.

832. The sixth costal plate of the right side of the carapace, connate with the pleurapophysis of the seventh dorsal vertebra, of the same *Chelone*.

833. The corresponding parts of the left side of the same *Chelone*.

834. The seventh costal plate of the right side of the carapace, connate with the pleurapophysis of the eighth dorsal vertebra, of the same *Chelone*.

835. The corresponding parts of the left side of the same *Chelone*.

836. The eighth costal plate of the right side of the carapace, connate with the pleurapophysis of the ninth dorsal vertebra, of the same *Chelone*.

837. The corresponding parts of the left side of the same *Chelone*.

838. The right pleurapophysis of the tenth dorsal vertebra of the same *Chelone*.

839. The left pleurapophysis of the tenth dorsal, which might be regarded as a 'lumbar' vertebra, of the same *Chelone*.

840. The right pleurapophysis of the first sacral vertebra of the same *Chelone*.

841. The left pleurapophysis of the first sacral vertebra of the same *Chelone*.

842. The right pleurapophysis of the second sacral vertebra of the same *Chelone*.

843. The left pleurapophysis of the second sacral vertebra of the same *Chelone*.

844. The first right marginal piece of the carapace of the same *Chelone*.

845. The first left marginal piece of the same *Chelone*.

846. The second right marginal piece of the carapace of the same *Chelone*.

847. The second left marginal piece of the carapace of the same *Chelone*.

848. The third right marginal piece of the carapace of the same *Chelone*.

849. The third left marginal piece of the carapace of the same *Chelone*.

850. The fourth right marginal piece of the carapace of the same *Chelone*.

851. The fourth left marginal piece of the carapace of the same *Chelone*.

852. The fifth right marginal piece of the carapace of the same *Chelone*.

853. The fifth left marginal piece of the carapace of the same *Chelone*.

854. The sixth right marginal piece of the carapace of the same *Chelone*.

855. The sixth left marginal piece of the carapace of the same *Chelone*.

856. The seventh right marginal piece of the carapace of the same *Chelone*.

857. The seventh left marginal piece of the carapace of the same *Chelone*.

858. The eighth right marginal piece of the carapace of the same *Chelone*.

859. The eighth left marginal piece of the carapace of the same *Chelone*.

860. The ninth right marginal piece of the carapace of the same *Chelone*.

861. The ninth left marginal piece of the carapace of the same *Chelone*.

862. The tenth right marginal piece of the carapace of the same *Chelone*.

863. The tenth left marginal piece of the carapace of the same *Chelone*.

864. The eleventh right marginal piece of the carapace of the same *Chelone*.

865. The eleventh left marginal piece of the carapace of the same *Chelone*.

866. The right episternal piece of the plastron of the same *Chelone*.

867. The left episternal piece of the plastron of the same *Chelone*.

868. The entosternal piece of the plastron of the same *Chelone*.

869. The right hyosternal piece of the plastron of the same *Chelone*.

870. The left hyosternal piece of the plastron of the same *Chelone*.

871. The right hyposternal piece of the plastron of the same *Chelone*.

872. The left hyposternal piece of the plastron of the same *Chelone*.

873. The right xiphisternal piece of the plastron of the same *Chelone*.

874. The left xiphisternal piece of the plastron of the same *Chelone*.

875. The right scapula and clavicular process of the same *Chelone*.

876. The right coracoid of the same *Chelone*.

877. The left scapula and clavicular process of the same *Chelone*.

878. The left coracoid of the same *Chelone*.

879. The right humerus of the same *Chelone*.

880. The left humerus of the same *Chelone*.

881. The right radius of the same *Chelone*.

882. The right ulna of the same *Chelone*.

883. The left radius of the same *Chelone*.

884. The left ulna of the same *Chelone*.

885. The carpal series of bones of the same *Chelone*.

886. The metacarpal and some of the phalangeal bones of the same *Chelone*.

887. The two ilia, the two ischia, and the two pubes of the same *Chelone*.

888. The right femur of the same *Chelone*.

889. The left femur of the same *Chelone.*

890. The right tibia of the same *Chelone.*

891. The left tibia of the same *Chelone.*

892. The right fibula of the same *Chelone.*

893. The tarsal series of bones of the same *Chelone.*

894. The metatarsal and some of the phalangeal bones of the same *Chelone.*

895. The skull of a green Turtle (*Chelone mydas*): the weight of the entire animal was 603 pounds. *Presented by Mr. Cuff.*

896. The skull of a green Turtle (*Chelone mydas*). *Hunterian.*

897. The skull of a green Turtle (*Chelone mydas*). *Hunterian.*

898. The skull of a small green Turtle (*Chelone mydas*), with the lower jaw and its horny sheath. *Presented by Henry Cline, Esq.*

899. The skull of a green Turtle (*Chelone mydas*), wanting the lower jaw. *Hunterian.*

900. The skull of a green Turtle (*Chelone mydas*), wanting the lower jaw. *Hunterian.*

901. The second dorsal pleurapophysis and connate costal plate of the right side of the carapace of a large Turtle (*Chelone*).

The head of the rib is supported upon a short, thick, but compressed free portion, resembling a neck; the projecting part above this, which seems to answer to the tubercle, is the base of the connate 'costal plate,' which was articulated by a sutural border with the first, second and third neural plates of the same carapace. The rest of the costal plate presents a subtriangular form, and shows on its inner surface, near the neck, the rough depression to which the rib of the first dorsal vertebra articulated; a smooth tract, indicating the ordinary slender form or proper part of the second rib, may be traced along the inner surface to the outer angle of the costal plate, where the rib becomes free, and extends two inches beyond the expanded plate.

Presented by M. B. Lefebvre, Esq.

902. One of the pleurapophyses, with the connate costal plate, of the same large Turtle (*Chelone*). The slender terminal part of the rib has been broken away.

Presented by M. B. Lefebvre, Esq.

903. One of the pleurapophyses, and the connate costal plate, of a smaller Turtle (*Chelone*), with the terminal slender part of the rib entire. *Hunterian.*

904. The right moiety of the scapular arch of a large Turtle (*Chelone*). *Hunterian.*

905. The left moiety of the scapular arch of the same Turtle. The numbers indicate the scapular, acromial, and coracoid portions of the arch, according to the Table of SYNONYMS. *Hunterian.*

906. The right ulna of a Turtle (*Chelone*). *Hunterian.*

907. The pelvic arch of a large green Turtle (*Chelone mydas*).

Owing to the non-extension of ossification in the median line from the pubis to the ischium, the two foramina ovalia are blended together into one large heart-shaped vacuity. In the cartilage which fills the anterior part of the symphysis of the pubis there are several irregular specks of ossification. There is also a small independent ossification in the symphysis of the ischia.

Presented by Mr. Cuff.

908. The pelvis of the green Turtle (*Chelone mydas*). In this and the preceding specimen the numbers indicate the constituent parts according to the Table of SYNONYMS. *Presented by Mr. Cuff.*

909. The pelvis of a small green Turtle (*Chelone mydas*). *Presented by Mr. Cuff.*

910. The skull of a Turtle (*Chelone*), with the lower jaw.

It is somewhat narrower in proportion to its length, and tapers more gradually forwards than in the *Chelone mydas*; from which it differs more decidedly in the complete insulation of the frontals (11), by the junction of the prefrontals (14) and postfrontals (12) above the orbits: the prefrontals are bent down more abruptly to the external nostril; the mastoids unite with a larger proportion of the parietals. It differs from the Loggerhead (*Chelone caretta*), by the greater breadth as well as the greater curvature of the prefrontals, and by the greater length of the parietals. The excavation beneath the basioccipital and basisphenoid is less deep than in *Chelone mydas*. The tympanic excavation of the mastoid is less deep than in *Chelone caretta*.

Hunterian.

911. The skull of a Hawk's-bill Turtle (*Chelone imbricata*, Schweigger *), in longitudinal section, and partially disarticulated.

It resembles the *Chelone mydas* in the extension of the frontal to the superorbital border, but a larger proportion of the squamosal articulates with the postfrontal. The tympanic excavation of the mastoid is deeper, and the digastric excavation of the same bone is wider and shallower. The numbers on the bones indicate their names according to the Table of SYNONYMS.

Hunterian.

912. The skull of a large Loggerhead Turtle (*Testudo caretta*, Linn.; *Testudo marina Caouanna*, Ray; *La caouane*, Cuv.; *Chelone Caouana*, Schweigger). The numbers indicate the names of the individual bones according to the Table of SYNONYMS.

The extreme length of this skull is 13¼ inches; the extreme breadth, 10½ inches.

Purchased.

913. The skull of a large Loggerhead Turtle (*Chelone Caouana*), with the spine of the superoccipital broken away, and the horny covering remaining on the upper mandible.

The extreme length of this skull is 14½ inches; the extreme breadth, 10¾ inches. The entire animal weighed upwards of 1600 pounds.

Mus. Leverianum.

914. The skull of the Loggerhead Turtle (*Chelone Caouana*). It is a little mutilated behind: the horny covering of the mandibular part of the lower jaw is preserved. *Hunterian.*

* Not the same species as that termed '*Chélonée Caret*,' of which the skull is figured by Cuvier, in the 'Ossemens Fossiles,' 4to, tom. v. part 2. pl. 11. figs. 1–4.

915. The skull of a young Loggerhead Turtle (*Chelone Caouana*), with the lower jaw.

The frontal (11) is excluded from the orbital border by the junction of the prefrontal (14) with the postfrontal (12): the tympanic excavation of the mastoid (8) is deeper, and the mastoid joins a larger proportion of the parietal (7) than in the *Chelone mydas*.

Mus. Brit.

916. One of the ribs, with the connate costal plate, of a Loggerhead Turtle (*Chelone Caouana*). *Presented by C. H. Hawkins, Esq.*

917. The crust of the skull of a green Turtle (*Chelone mydas*), with the dried integuments and some of the epidermal scutes. It shows the small size of the exterior nostrils.

918. The dried remains of a variety of the green Turtle (*Chelone virgata*, Cuv.).

919. The shell of a variety of the green Turtle (*Chelone virgata*, Cuv.). *Hunterian.*

920. The shell of the Imbricated, or Hawk's-bill Turtle (*Chelone imbricata*, Schweigger).

Fig.—Schæpff, Test. tab. xviii.
Hab.—The Asiatic and American Seas; also the Mediterranean.

Mus. Brit.

921. The shell of the Imbricated, or Hawk's-bill Turtle (*Chelone imbricata*). It is from this species that the most valuable 'tortoise-shell' of commerce is derived. *Mus. Leverianum.*

Family *Fluviatilia*.

Genus *Trionyx* (Mud Tortoises).

922. The skull, with the horny covering of the alveolar borders of the jaws, of a large Mud Tortoise (*Trionyx*).

It is long, depressed, triangular, the muzzle forming the obtuse apex, and the base remarkable for its four large backward prolongations. The inferior of these is the shortest, and terminates in the occipital condyle; the superior is the longest, and is formed by the extremely developed compressed superoccipital spine: the two lateral processes are developed from the paroccipitals and mastoids. The premaxillary is single, very small, and represented by its alveolar border only; the maxillaries meet above it. The prefrontals have coalesced with both lachrymals and nasals: the latter terminate in points overhanging the external nostril. The alveolar borders of both upper and lower jaws show a regular series of vascular pits or foramina, indicative of the primitive separate matrices, like those of teeth, which laid the foundation in the young animal of the continuous horny coverings of the jaws.

The specimen from which this and the following parts of the skeleton have been prepared was presented by Capt. Sir Everard Home, Bart., R.N., F.R.S.

923. The atlas, or first vertebra of the neck, of the same *Trionyx*.

The hypapophysis presents four articular surfaces: one, anterior, concave, for the lower part of the occipital tubercle; one, posterior, flat and subcircular, for the proper centrum (odontoid); and two, lateral and superior, for the neurapophyses: these are joined together above the neural arch by suture: the anterior articular surfaces are cut obliquely from their fore part, and are adapted to the sides of the occipital tubercle formed by the exoccipital elements. Two corresponding oblique surfaces behind these articulate with the centrum: the posterior zygapophyses are very long, and are directed backwards, with the articular surfaces looking downwards and inwards. The centrum, or 'odontoid,' presents a subcubical form, with a small subcircular surface on its lower and fore part for articulating with the hypapophysis; above this, a transversely expanded portion, with a convex surface adapted to the bases of the neurapophyses, and completing the cup for the occipital condyle; and at the back part an excavation to articulate with the anterior convexity of the succeeding centrum.

924. The second cervical vertebra of the same *Trionyx*.

It presents a convex anterior surface for articulation with the true body of the atlas, which, in higher animals, is united thereto as the 'odontoid' process.

925. The third cervical vertebra of the same *Trionyx*.

It is much elongated; the suture between the centrum and neural arch remains; the centrum is convex anteriorly, concave behind, the lower part of which concavity is formed by an epiphysis, analogous to the 'wedge-bone,' or hypapophysis, of the Ichthyosaurus.

926. The fourth cervical vertebra of the same *Trionyx*.

It resembles the preceding; but the ridges extending upon the posterior zygapophyses are stronger, and the transverse processes more developed.

927. The fifth cervical vertebra of the same *Trionyx*.

The articular surfaces of the zygapophyses here begin to be concave in one direction, convex in the other, so as to produce an interlocking joint.

928. The sixth cervical vertebra of the same *Trionyx*.

This is distinguished by two concave surfaces, placed side by side on the posterior part of the centrum.

929. The seventh cervical vertebra of the same *Trionyx*.

This has two convexities on the fore part of the centrum, as well as two concavities at the back part.

930. The eighth cervical vertebra of the same *Trionyx*.

This has two convexities on the fore part of the centrum, but the back part has dwindled into a thin, rough, obtusely-pointed edge, which is joined in the recent animal by elastic ligament to a corresponding rough depressed border, terminating anteriorly the centrum of the first dorsal vertebra. The junction between the last cervical and first dorsal is chiefly effected by the zygapophysial joints, a broad, deep, oblique concavity in the last cervical being adapted to a corresponding but more extensive convexity on the first dorsal. The rapid retraction of the head and neck is chiefly performed by the movements between these two vertebræ.

931. The carapace, with the first dorsal vertebra and the single lumbar vertebra, of the same *Trionyx*.

The carapace is composed, as in the genus *Chelone* (see No. 769), of a combination of eight dorsal vertebræ with the neural and costal dermal plates, but the marginal plates are absent. The pleurapophyses of the first dorsal vertebra are short, curved, and expanded at their outer extremities, which articulate with the under surface of the first costal plate. The first neural or 'nuchal' plate is much developed transversely, with a median inferior ridge articulated by ligament to the conjoined summits of the neurapophyses of the first dorsal vertebra, and united by a posterior sutural margin to the fore part of the second costal plates, and to the second neural plate. The neural arches of the seven succeeding vertebræ are displaced forwards so as to rest equally upon their own centrums and the next in advance: their spines are connate with the neural plates. The neurapophyses of the ninth dorsal vertebra have nearly resumed their normal connexions, but the spine is obliterated by the median union of the costal plates connate with the ribs of the eighth dorsal vertebra. The vertebra succeeding the ninth dorsal, or the last of the carapace, has no ribs, and represents a lumbar vertebra. The next two vertebræ have short and thick pleurapophyses joined together at their distal extremities, and forming on each side a broad surface for the attachment of the iliac bones.

932. The sacrum of the same *Trionyx*.

This is composed of the two vertebræ which succeed the lumbar one. The sutures joining the neurapophyses to the centrums, and the ribs to the neurapophyses, remain. The anterior surface of the centrum is concave, the posterior one convex, in each of these vertebræ.

933. The caudal vertebræ of the same *Trionyx*.

They are twenty in number: the short pleurapophyses are anchylosed, forming apparently long transverse processes, which gradually subside in the last six vertebræ: the zygapophyses are developed as far as the sixteenth; the bodies are all concave before and convex behind.

934. The two episternals of the same *Trionyx*.

935. The right hyosternal and hyposternal of the same *Trionyx*.

936. The left hyosternal and hyposternal of the same *Trionyx*.

937. The two xiphisternals of the same *Trionyx*.

938. The entosternal of the same *Trionyx*.

939. The right scapula, acromion, and coracoid of the same *Trionyx*.

940. The left scapula, acromion, and coracoid of the same *Trionyx*.

The acromion is an exogenous process of the scapula, which, as in other Chelonians, it almost equals in length. The suture between the scapula and coracoid remains: the coracoid has a ridge along one surface, and being the most expanded bone of the three, much resembles in shape the scapula of a ruminant quadruped.

941. The pelvic arch of the same *Trionyx*.

The sutures between the ilium, ischium and pubis are persistent. The ischium and pubis join each other only at the acetabula and not at the median symphysis, as in the Land Tortoises. The foramina thyroidea are accordingly blended together to form one large, central, oval vacuity.

942. The right humerus of the same *Trionyx*.

943. The left humerus of the same *Trionyx*.

The bone is perforated from before backwards at the outer angle of the distal extremity, the perforation being closed by the partially confluent epiphysis forming the articular surface for the radius and ulna.

944. The right radius and ulna of the same *Trionyx*.

945. The left radius and ulna of the same *Trionyx*.

946. The right femur of the same *Trionyx*.

947. The left femur of the same *Trionyx*.

948. The right tibia and fibula of the same *Trionyx*.

949. The left tibia and fibula of the same *Trionyx*.

950. The carpals, metacarpals and phalanges of the right fore-foot of the same *Trionyx*.

951. The carpals, metacarpals and phalanges of the left fore-foot of the same *Trionyx*.

952. The tarsals, metatarsals and phalanges of the right hind-foot of the same *Trionyx*.

953. The tarsals, metatarsals and phalanges of the left hind-foot of the same *Trionyx*.

954. The skull of an Australian Mud Tortoise (*Trionyx* (*Gymnopus*) *Bibroni*).

It differs from the skull of the species (No. 922) allied to the Nilotic Mud Tortoise, and from that of the Gangetic species figured by Cuvier *, in the total absence of the premaxillary bone, which is very small in both those species. The external nostril in the Australian species is circumscribed below by the converging extremities of the maxillary bones which meet there, as in No. 922; but in No. 954 they similarly circumscribe the fore part of the anterior palatal aperture. The Australian *Trionyx* also differs in the larger proportional size of the prefrontals, and the greater breadth and depression of the facial part of the skull.

Presented by Capt. Sir Everard Home, Bart., R.N., F.R.S.

955. The atlas and dentata of the same *Trionyx*.

956. The third to the eighth cervical vertebræ inclusive, of the same *Trionyx*.

* Ossemens Fossiles, v. part 2. pl. 11. figs. 5—8.

957. The carapace of the same *Trionyx*.

It consists of the centrums, neural arches, expanded spines and pleurapophyses of the nine succeeding vertebræ, which are immoveably connected together, and are reckoned as dorsal vertebræ. The first of these is remarkable for the large size and subspirally curved form of the anterior zygapophyses: the pleurapophyses are short and slender, articulated by one end to the sides of the expanded anterior part of the centrum of the first dorsal vertebra, and by the other end to the costal plate connate with the rib of the second dorsal vertebra. The nuchal plate is remarkably expanded in the transverse direction, and forms the anterior border and first piece of the carapace, the major part of which is composed of the expanded costal plates connate with the pleurapophyses of the second to the ninth dorsal vertebræ inclusive: the eighth pair of costal plates are articulated to each other by a suture at the median line, behind the neural plate. The neurapophyses of the vertebræ of the carapace are moved forwards, so as to be articulated partly to the centrum in advance of their own. The pleurapophyses have undergone a similar displacement, and their depressed expanded heads are articulated by suture with the sides of the contiguous ends of the two centrums. The centrums are remarkably broad and depressed in most of these vertebræ.

958. The plastron of the same *Trionyx*.

It is chiefly remarkable for the peculiar chevron-shape of the entosternum, for the extreme breadth of the hyo- and hypo-sternals, and for the expansion of the xiphisternals.

959. The caudal vertebræ of the same *Trionyx*.

Genus *Chelys*.

960. The skeleton of the Matamata, or Fimbriated Tortoise (*Chelys fimbriata*, Schweigger).

The cranium and complex hyoidean apparatus of this species are figured and described in the 'Ossemens Fossiles' of Cuvier, tom. v. part 2. 1824, pl. 11. figs. 21–25, and pl. 12. fig. 41. The small wedge-shaped bone, hypapophosis, representing the so-called body of the atlas, has been lost in the articulation of this specimen: the odontoid, which Cuvier rightly describes as the body of the atlas, is here unusually developed, and supports by a sutural articulation the major part of the atlantal neurapophyses: the suture by which these are united together above the neural canal is still retained. The neurapophyses send out laterally short compressed diapophyses, and posteriorly, long subtrihedral zygapophyses.

The second vertebra is much elongated, sharply carinate below, with larger diapophyses, and with anterior as well as posterior zygapophyses; the third and fourth vertebræ resemble the second, the centrum being convex in front and concave behind: the fifth vertebra is convex, both before and behind: the sixth vertebra is concave before and presents two convexities behind: the seventh vertebra has a corresponding double concavity in front, and a deep vertical groove behind; it has also a moderately well-developed spinous process: the eighth vertebra has the centrum convex at both ends and much compressed in the middle. The posterior zygapophyses of the eighth cervical vertebra form a wedge-shaped process, which enters a cleft formed by the anterior zygapophyses of the first dorsal.

The first dorsal vertebra has short thick depressed ribs, united as usual by suture to the costal plates connate with the succeeding ribs; these are articulated by suture partly to their own centrum, and partly to that of the first dorsal vertebra. The expanded costal plates of the second pair of ribs present deep oblong cavities for the reception of the anterior inflected angles of the hyosternals, to which they are firmly joined by strong suture. The neural arch of the second dorsal is also advanced so as to rest partly upon the centrum of the first; the expanded median dermal plate of the carapace, which is confluent with the compressed neural spine of the second dorsal vertebra, also rests, but without coalescing, upon the neural spine of the first dorsal vertebra. The centrums of the seven succeeding dorsal vertebræ are as remarkably expanded laterally and depressed as those of the neck are compressed. The fourth pair of costal plates, connate with the ribs of the fifth dorsal vertebra, articulate with the hyposternals by oblong excavated sutural surfaces, like those on the second costal plates. Two rough subtriangular surfaces are slightly excavated in the expanded plates connate with the ribs of the eighth and ninth dorsal vertebræ, to which the expanded summits of the iliac bones are firmly united. Short pleurapophyses from the two succeeding vertebræ abut against the inner sides of these excavations, and indicate the segment analogous to a sacrum. Three vertebræ succeed these, and terminate the series in this skeleton.

The parts of the plastron, the scapular and pelvic arches, and the bones of the extremities, are described in the volume of the 'Ossemens Fossiles' above cited.

Presented by Sir Everard Home, Bart., F.R.S.

Genus *Hydraspis.*

961. The skeleton of the long-necked freshwater Tortoise of Australia (*Hydraspis longicollis*, Bell; *Chelodina*, Fitzinger), with a portion of one side of the carapace removed.

The head is much depressed; the mastoids are excavated by large tympanic cells, and prolonged backwards; the frontal is produced forwards as far as the anterior nostril, where it terminates in a point between the two nasals, which are here distinct from the prefrontals. The margins of the upper and lower jaws are trenchant: the hypapophysis of the atlas has the form of a diminutive wedge-bone, forming as usual the lower part of the articular cup for the occipital condyle: the rest of the body of the atlas, or 'odontoid,' has coalesced with its proper neural arch, which developes two transverse and two long posterior oblique processes, as in the *Chelys*. The second, third and fourth cervical vertebræ have the fore part of the centrum convex, the hind part concave: the fifth centrum is biconvex: the sixth is concave in front and convex behind: the seventh is biconcave: the eighth is biconvex. The posterior zygapophyses in this vertebra are blended together, and form a single semicylindrical articular convexity looking downwards: in the antecedent cervicals the posterior zygapophyses are supported on a semicircular horizontal plate overlapping the intervertebral space: the bodies of all the cervical vertebræ are much compressed and carinate inferiorly, and this is particularly the case with the last. The short pleurapophyses of the first dorsal vertebra ascend obliquely outwards and backwards to aid in propping up the carapace. The long scapulæ abut against these, in which respect the vertebra may be compared with a sacrum: the other vertebræ of the carapace offer the usual modifications and combinations with the neural and costal plates. The neural canal sinks into the substance of the centrum of the second to the ninth dorsal vertebræ, and merely grooves the inferior interspace of the neurapophyses; the expanded trihedral summits of the iliac bones abut against broad sutural surfaces on the under part of the last costal plates, and are barely touched by the rudimental ribs of the two sacral vertebræ. The iliac bones articulate by the whole of their under surface to the xiphisternals, and the pubis is anchylosed to the same by the thick process given off from its outer surface. The scapular arch articulates with the carapace by the scapula, and to the plastron by its acromial process, but the coracoid is free and expanded for the attachment of the muscles, which rotate the arch horizontally upon its two attached points. The elasticity of the scapula and acromion, and the angle at which they are placed, permit a slight approximation of the borders of the anterior outlet of the osseous box.

In the fore-foot the scaphoid is represented only by its median portion; the lunare articulates with both radius and ulna; the cuneiforme is small, the pisiforme is wanting; the fifth digit is rudimental; the other four are armed with long and strong claws; the thumb has two phalanges, each of the others three. In the hind-foot the astragalus and scaphoid form a single large bone; but there is a distinct rudiment of a calcaneum: the bones of the second tarsal row progressively increase in size from the tibial to the fibular side: the two bones representing the cuboid are distinct, the outermost is broad and flat, and supports the rudiment of the fifth toe: this is clawless, but has two phalanges: the other digits have long and strong claws, the hallux having two phalanges, the rest three, as in the fore-foot.

Hunterian.

Genus *Emys.*

962. The skeleton of a freshwater Tortoise (*Emys*).

The carapace is less convex than in the genus *Testudo*, but is equally well ossified, and the second and fifth of the costal plates articulate directly with the hyo- and hypo-sternals, completing the hæmal arches there without the interposition of the marginal pieces. The second to the fifth costal pieces of the right side have been disarticulated, so as to expose the interior of the carapace.

Mus. South.

963. Disarticulated portions of the carapace of a small freshwater Tortoise (*Emys*).

Some of the parts are wanting; the short pleurapophyses of the first vertebra of the carapace, for example: the costal plates connate with succeeding pleurapophyses, forming the lateral parts of the carapace, are preserved, and are numbered from 1 to 8 consecutively. The centrum of the sixth vertebra of the carapace has been removed, showing the proportions of its own advanced neural arch, and of the succeeding one which it supported. The ninth neural arch has resumed its normal position, and is wholly supported by its own centrum. The major part of the marginal pieces of the carapace are also preserved.

Hunterian.

964. The shell, with the skull, scapular arch and pelvis, of the Painted Tortoise (*Emys picta*).

Fig.—Shaw, Zool. iii. pl. 10; Schæpff, Test. tab. 4.
Hab.—The swamps of North America.

Mus. Leverianum.

965. The shell of the Painted Tortoise (*Emys picta*). *Mus. Brit.*

966. The shell of the Painted Tortoise (*Emys picta*). *Mus. Leverianum.*

967. The carapace, plastron, skull, scapular arch and pelvis of the Painted Tortoise (*Emys picta*). The horny scutes have been removed. *Mus. Brit.*

968. The shell of the Painted Tortoise (*Emys picta*). *Hunterian.*

969. The shell, longitudinally bisected, with the dried integuments of the extremities, of the Painted Tortoise (*Emys picta*). *Mus. Brit.*

970. The shell of a young specimen of the Painted Tortoise (*Emys picta*). The carapace has a fuller oval form than in the adult: the nuchal scute is relatively larger, and the first three vertebral scutes are quadrate. *Mus. Brit.*

971. The shell of a younger specimen of the Painted Tortoise (*Emys picta*). The first three vertebral scutes are broader in proportion to their length than in the preceding. There is an unossified space in the centre of the plastron, and another behind this. *Mus. Brit.*

972. The carapace and plastron of the Concentric Terrapene (*Emys concentrica*).

Hunterian.

973. The shell of the Concentric Terrapene (*Emys concentrica*): a variety, having the concentric zones double.

Fig.—Shaw, Zool. iii. pl. 9, from this specimen; Schæpff, Test. tab. 15.
Hab.—North America: also the island of Jamaica.

Mus. Leverianum.

974. The shell of a Concentric Terrapene (*Emys concentrica*). *Mus. Leverianum.*

975. The shell of a Concentric Terrapene (*Emys concentrica*): the variety with the concentric lines strongly marked. *Mus. Leverianum.*

976. The shell of a Concentric Terrapene (*Emys concentrica*): the variety with the concentric lines strongly marked. *Mus. Brit.*

977. The shell of the Serrated Terrapene (*Emys serrata*, Schweigger).

Fig.—Schæpff, Test. tab. 3. figs. 4 & 5.
Hab.—South America.

Mus. Leverianum.

978. The shell of the Serrated Terrapene (*Emys serrata*). *Mus. Leverianum.*

979. The shell of the Serrated Terrapene (*Emys serrata*), with the horny scutes removed. *Mus. Brit.*

980. A dried specimen of a young Serrated Terrapene (*Emys serrata*); showing the non-extension of the costal plates to the inserted extremities of the ribs.

Mus. Leverianum.

981. The shell of the European Terrapene (*Emys caspica*, Schweigger; *Emys lutaria*, Merrem).

Fig.—Shaw, Zool. iii. pl. 6. figs. 1, 3.
Hab.—Southern parts of Europe and the borders of the Caspian Sea.

Mus. Brit.

982. The shell of the European Terrapene (*Emys caspica*). *Mus. Brit.*

983. The shell of the Furrowed Terrapene (*Emys decussata*, Bell). *Mus. Brit.*

984. The shell of a young Furrowed Terrapene (*Emys decussata*); showing the non-extension of the costal plates to the inserted ends of the ribs. *Mus. Leverian.*

985. The shell of Spengler's Tricarinate Terrapene (*Emys Spengleri*, Schweigger; *Testudo Spengleri*, Gmel.; *Test. serrata*, Shaw).

Fig.—Shaw, Zoology, vol. iii. pl. 9. fig. 2, from this specimen, which is there described as a new species.

Hab.—Africa, Mauritius.

Mus. Leverianum.

986. The shell of Spengler's Terrapene (*Emys Spengleri*). *Hunterian.*

987. The shell of the Spotted Terrapene (*Emys punctata*; *Testudo punctata*, Schæpff; *Test. guttata*, Shaw).

Fig.—Schæpff, Test. tab. 5.

Hab.—The rivers and lakes of North America.

Mus. Brit.

988. The shell of a Spotted Terrapene (*Emys punctata*). *Mus. Leverianum.*

989. The scapular and pelvic arches of the Spotted Terrapene. *Mus. Leverianum.*

990. The shell of the Wrinkled Terrapene (*Emys rugosa*; *Testudo rugosa*, Shaw).

Fig.—Shaw, Zool. iii. pl. 4, from this specimen.

Hab.—South America.

Mus. Leverianum.

991. The shell of the Specious Terrapene (*Emys speciosa*, Gray, Synops. Reptil.).

Hab.—South America.

Mus. Brit.

Genus *Cinosternon*.

992. The skeleton of the Pennsylvanian Box Terrapene (*Cinosternon scorpioides*). The epidermal scutes are preserved upon the carapace and plastron, the anterior and posterior flaps of which are moveable. *Hunterian.*

993. The shell of the Pennsylvanian Box Terrapene (*Cinosternon scorpioides*).

In a 'Monograph of the Tortoises having a moveable sternum,' by Thomas Bell, Esq., in the second volume of the Zoological Journal, p. 302, amongst the species of the genus *Kinosternon*, Spix, this is described as follows:—

"Species I. *Shavianum*. K. testâ elongato-ovatâ, tricarinatâ; scutis omnibus imbricatis, marginalibus 23; sterno posticè bifido. Testudo Pennsylvanica, var. Shaw, Gen. Zool. iii. part i. p. 61. pl. 15. Habitat —— ?

"Of this elegant species I have seen but a single specimen, now in my collection, which, as I obtained it from a dealer who had long possessed it, may, not improbably, be the identical one figured by Shaw, and stated by him to have been in the Leverian Museum.

"The general colour of the upper shell is a very deep blackish brown; the sternum and under part of the margin yellowish."

The original specimen alluded to by Mr. Bell, and figured by Dr. Shaw, was purchased by the College at the sale of the Leverian Museum, in the year 1806.

Mus. Leverianum.

Genus *Cistudo*.

994. The shell of the speckled Box Tortoise (*Cistudo Europæa*; *Testudo lutaria*, Ray; *Testudo europæa*, Bojanus).

Fig.—Shaw, Zool. iii. pl. 5; Schæpff, Test. tab. 1.

Hab.—The temperate and southern parts of Europe.

Its anatomy is beautifully described and figured by Bojanus, in his 'Anatome Testudinis Europææ,' fol.

Mus. Leverianum.

995. The shell of the speckled Box Tortoise (*Cistudo Europæa*), with some of the scutes removed from the carapace. *Mus. Brit.*

996. The shell of the speckled Box Tortoise (*Cistudo Europæa*). *Hunterian.*

997. The carapace of the speckled Box Tortoise (*Cistudo Europæa*), with the first four vertebral and last pair of costal scutes removed. *Mus. Brit.*

998. A skeleton of the American Box Tortoise (*Cistudo clausa*; *Testudo Carolina* et *Test. clausa*, Linn.).

The neural arch of the atlas is almost wholly supported by its proper centrum, which is not fixed to the second cervical vertebra. The fourth cervical vertebra is biconvex. The tenth and eleventh vertebræ, counting from the first dorsal, form the sacrum; but the iliac bones are chiefly supported by the expanded pleurapophyses of the second sacral vertebra. The tympanic cavities extend into the mastoid bones, which are thus converted into 'bullæ osseæ.'

Presented by William Home Clift, Esq.

999. The shell, skull and pelvis of the American Box Tortoise (*Cistudo clausa*), with the plastron separated from the carapace, showing its moveable joint, and the second and third vertebral and first costal scutes removed from the carapace. *Mus. Brit.*

1000. The carapace, with the hinder part of the plastron, the cervical vertebræ, scapular and pelvic arches, and the bones of the extremities, of the American Box Tortoise (*Cistudo clausa*).

In the carpus the two parts of the scaphoid have coalesced, and there is a distinct pisiforme, together with the lunare and cuneiforme, in the proximal row. The distal row consists of five bones, the unciforme being divided as usual in the *Chelonia*. The pollex and the two outer digits have each two phalanges; the index and medius have each three phalanges; the last phalanx supports a claw on each digit. In the hind-foot the rudimental calcaneum has coalesced with the astragalo-scaphoides. The digits decrease in strength from the first to the fifth, and in length from the second to the fifth. The hallux has two phalanges; the next three digits have each three phalanges; there is barely a rudiment of a second clawless phalanx upon the fifth digit.

Hunterian.

1001. The shell of the American Box Tortoise (*Cistudo clausa*), showing the close adaptation of the plastron to the carapace when the door-like flap of the fore part of the plastron is drawn up. *Hunterian.*

1002. The carapace of the American Box Tortoise (*Cistudo clausa*).

Fig.—Schæpff, Test. tab. 7; Grew, tab. 3. fig. 2.
Hab.—North America.

Mus. Brit.

1003. The carapace of the American Box Tortoise (*Cistudo clausa*). *Mus. Brit.*

1004. The carapace of the American Box Tortoise (*Cistudo clausa*), with all the scutes, save the last vertebral one, removed. *Hunterian.*

1005. The carapace of the American Box Tortoise (*Cistudo clausa*), with the horny scutes removed. The marginal plates but slightly indicate the inversion of the border of the carapace. *Mus. Brit.*

1006. The carapace of the American Box Tortoise (*Cistudo clausa*), with some of the marginal scutes removed; showing the coextension of the marginal plates in this variety, where the degree of eversion is slight. *Mus. Leverianum.*

1007. The shell of a young American Box Tortoise—the Clouded variety (*Cistudo clausa*; *Terrapene nebulosa*? Bell, Zool. Journ. ii.). *Mus. Brit.*

1008. The carapace of a young American Box Tortoise (*Cistudo clausa*). It shows the immature character of the non-eversion of the margin: the keel is well-developed. *Mus. Leverianum.*

1009. The shell and skull of a young American Box Tortoise (*Cistudo clausa*), with the scutes removed. *Mus. Brit.*

1010. The shell of the Leverian Box Tortoise (*Cistudo Amboinensis*, var. *Leveriana*). The anterior flap of the plastron is articulated to show its mobility on the rest of the plastron. *Mus. Leverianum.*

Family *Terrestria*.

Genus *Testudo* (Tortoises proper).

1011. The skeleton of the great Land Tortoise of the Gallapagos Islands (*Testudo elephantopus*).

A section of the carapace and plastron has been removed from the right side to expose the dorsal and sacral vertebræ and the disposition of the scapular and pelvic arches. The first eight vertebræ are free, moveable, and ribless; the fourth of these 'cervical' vertebræ has a much-elongated centrum, which is convex at both ends; the eighth is short and broad, with the anterior surface of the body divided into two transversely elongated convexities, and the posterior part of the body forming a single convex surface divided into two lateral facets; the under part of the centrum is carinate. The neural arch, which is anchylosed to this centrum, has two anterior zygapophyses looking upwards and two posterior ones looking downwards: the spine is short, broad, obtuse, and overarched by the broad expanded nuchal plate. The first dorsal vertebra is, also, short and broad, with two short and thick pleurapophyses, articulated by one end to the expanded anterior part of the centrum, and united by suture at the other end to the succeeding pair of ribs. The head of each rib of the second pair is supported upon a strong trihedral neck, and articulated to the interspace of the first and second dorsal vertebræ: it becomes connate, at the part corresponding to the tubercle, with the first broad costal plate, which articulates by suture to the lateral margin of the first neural plate, and to portions of the nuchal and third neural plates: the connate rib, which is almost lost in the substance of the costal plate, is continued with it to the anterior and outer part of the carapace, where it resumes its subcylindrical form, and articulates with the second and third marginal pieces of the carapace. The neural arch of the second dorsal vertebra is shifted forwards to the interspace between its own centrum and that of the first dorsal vertebra: a similar disposition of the neural arch and spine and of the ribs prevails in the third to the ninth dorsal vertebræ inclusive. The corresponding seven neural plates are connate with the spines of those vertebræ, and form the major part of the median pieces of the carapace: the corresponding costal plates, anchylosed to the ribs, form the medio-lateral pieces: the ninth, tenth, and pygal plates, with the marginal plates of the carapace, do not coalesce with any parts of the endo-skeleton. The bony floor of the great abdominal box, or 'plastron,' is formed by the hæmapophyses and sternum connate with dermal osseous plates; forming, as in the preceding Orders of *Chelonia*, nine pieces, one median and symmetrical, answering to the proper sternum, but called 'entosternal'; and eight in pairs: of these the two anterior are termed 'episternals,' the next two expanded pieces 'hyosternals,' the succeeding pair 'hyposternals,' and the next contracted pair 'xiphisternals.' The iliac bones abut against the pleurapophyses of the ninth, tenth and eleventh vertebræ, counting from the first dorsal vertebra. Beyond these the vertebræ, twenty-six in number, are free, with short, straight and thick pleurapophyses, articulated to the sides of the anterior expanded portions of the centrums. They diminish to mere tubercles in the twenty-first caudal vertebra, and disappear in the last three, which are anchylosed together. The neural arches of the caudal vertebræ are flat above and without spines. The strong columnar scapula is attached by ligament to the first costal plate, and descends almost vertically to the shoulder-joint, of which it forms, in common with the coracoid, the glenoid cavity. A strong subcylindrical process or continuation of the scapula representing the acromion bends inwards to meet its fellow at the middle line. The coracoid continues distinct from the scapula, expands, and becomes flattened at its median extremity, which does not meet its fellow or articulate with the sternum. The iliac bones are vertical and columnar, like the scapula, but are shorter and more compressed: they articulate, but do not coalesce, with the pubis and ischium. The acetabulum is formed by contiguous parts of all the three bones. The pubis arches inwards and expands to join its fellow at the median symphysis and the ischium posteriorly: it sends outwards and downwards a long thick obtuse process from its anterior margin. The ischia, in like manner, expand where they unite together to prolong the symphysis backwards. The foramen ovale seu thyroideum is nearly circular on each side.

In this specimen a portion of the carapace has been fractured and depressed: it has been repaired by a growth of bone from the fractured margins, which have extended over the horny covering of the depressed portion.

The skeleton was articulated from a specimen

Presented by Mr. Cross, of the Surrey Zoological Gardens.

1012. The fore part of the osseous thoracic-abdominal box of a large Tortoise (*Testudo elephantopus*).

It shows the modifications of the ordinary elements of a vertebra and their coalescence with dermal bony plates, to which this singular structure is due. The upper piece or key of the arch is formed by a horizontal plate of bone, developed in the integument, and connate with the summit of the neural spine. The pleurapophyses of the same vertebra are similarly connate with expanded and flattened costal plate, which is articulated by suture to the sides of the neural plate. The distal or inferior extremity of the pleurapophysis is articulated by suture to the hæmapophysis, or sternal rib, which expands as it descends into a broad quadrate plate articulated by suture partly to the hæmal spine, or 'entosternum,' partly to its fellow. The modified elements of the neural and hæmal arches here preserved belong to the first vertebra of the carapace, or second 'dorsal' vertebra. The centrum has been removed, showing the articular surfaces of the neurapophyses and pleurapophyses, divided each into anterior and posterior facets, the latter being those which alone articulated with their proper centrum. The short pleurapophyses of the first dorsal vertebra are retained, united by their sutures to those of the second vertebra. The anterior median and anterior marginal pieces of the carapace which articulate with the anterior borders of the costal plates of the first vertebra of the carapace, and the two anterior pieces of the plastron called 'episternals,' are also preserved in this specimen.

Presented by Prof. Owen, F.R.S.

1013. A posterior segment of the same thoracic-abdominal box of the *Testudo elephantopus*.

It shows the union of the left pleurapophysis of the sixth vertebra of the carapace with its expanded hæmapophysis, which articulates with its fellow of the opposite side without the intervention of a hæmal spine: these expanded elements are termed 'hyposternals,' and the plastron is terminated behind by two smaller pieces of the same series of elements called 'xiphisternals.' With this preparation are also preserved the costal plates connate with the left pleurapophyses of the third, fourth and fifth vertebræ of the carapace, showing the slender elongated free portion of the rib, which supports the head, and the alternate increase of breadth in the proximal and distal portions of the costal plates. Three of the dermal bones called 'marginal pieces' of the carapace are also preserved on the left side.

Presented by Prof. Owen, F.R.S.

1014. The posterior extremity of the same carapace.

It consists of the neural arches of the seventh and eighth vertebræ of the carapace, with the corresponding connate neural plates, and the three median dermal pieces which succeed and are serially homologous with those plates. Three of the marginal pieces on each side complete this end of the carapace. With these parts are preserved the neural arch and pleurapophyses of the first sacral vertebra. The neural spine of this vertebra articulates by a single surface with the back part of the spine in advance, and by a corresponding posterior surface with that which follows: its summit articulates with the ninth neural plate of the carapace. The pleurapophyses of this vertebra are short, compressed, and expanded at their distal ends, which are confluent with the antecedent pleurapophyses and present a broad rough irregular surface for the attachment of the ilium. The neural spine of the last vertebra of the carapace is not directly continued into the ninth median or neural plate, but terminates superiorly in two articular facets, one joining that plate and the other the plate in advance.

Presented by Prof. Owen, F.R.S.

1015. A neural spine, with the connate expanded horizontal bony plate, and the left pleurapophysis, connate with the costal plate of the carapace, of the same Tortoise: the long compressed neck of the rib is excavated anteriorly. *Presented by Prof. Owen, F.R.S.*

1016. The left humerus of the same Tortoise (*Testudo elephantopus*), longitudinally bisected, to show the absence of a medullary cavity: its place is occupied by a coarse cancellous texture. *Presented by Prof. Owen, F.R.S.*

1017. The left femur of the same Tortoise in longitudinal section, showing a similar structure. *Presented by Prof. Owen, F.R.S.*

1018. The osseous thoracic-abdominal box or shell of a young Elephant Tortoise (*Testudo elephantopus*), from which the horny scutes have been removed.

The median pieces of the carapace are numbered from *s.* 1 to *s.* 12, consecutively, and of these the second to the ninth inclusive are connate with the summits of the spines of the corresponding dorsal vertebræ. The lateral plates of the carapace are numbered from *pl.* 2 to *pl.* 9, consecutively, being connate with the pleurapophysial elements or vertebral ribs of the second to the ninth dorsal vertebræ inclusive. The short ribs of the first dorsal vertebra may be seen in the interior of the box articulated by their expanded distal extremities to the second pair of ribs. The marginal pieces are numbered from *m.* 1 to *m.* 11, consecutively, on each side. The pieces of the plastron have their special names written upon them. The necks or proximal free portions of the expanded ribs are unusually long and slender in Tortoises with lofty carapaces of the present form. The neural spines are extremely thin and deep plates, their antero-posterior extent much exceeding that of the neurapophyses supporting them: the centrums, also, of these vertebræ are much compressed, and consist apparently of their cortical part only, the neural canal with the spinal cord occupying the place of the medullary part in their centre.

The ribs of the first sacral, or tenth vertebra counting from the first dorsal, unite with those of the ninth vertebra to form the expanded disc against which the iliac bones abut.

Presented by Sir Joseph Banks, Bart., P.R.S.

1019. The shell of the Negro Tortoise (*Testudo nigrita,* Dumeril and Bibron).

Presented by Mrs. Robinson.

1020. The shell of a young male Elephant Tortoise (*Testudo elephantopus*; *T. nigra,* Dumeril and Bibron). *Presented by Sir Joseph Banks, Bart., P.R.S.*

1021. The shell of a very large Tortoise (*Testudo elephantopus*).

The animal was a native of the Seychalle Islands, and was being sent to General De Caen, Governor of the Isle of France, in the French corvette 'Gobe Mouche,' which was captured by Captain Corbet, of H.M.S. 'Nereide,' and the animal brought to the Cape of Good Hope. It was sent to England by Admiral Bertie, who commanded at the Cape, and remained in a living state at Petworth, the seat of the Earl of Egremont, from August 1809 until April 1810. Its weight was 207 pounds.

Presented by the Earl of Egremont.

1022. The shell of a male Radiated Tortoise (*Testudo radiata*). *Hunterian.*

1023. The shell of a male Radiated Tortoise (*Testudo radiata,* Shaw).

Fig.—Shaw, Zool. iii. pl. 2; Daud. ii. pl. 26.
Hab.—Madagascar.

Hunterian.

1024. The plastron of a male Radiated Tortoise (*Testudo radiata*). The under surface is concave, and the 'gular' scutes more produced than in the female.

Mus. Leverianum.

1025. The shell of a female Radiated Tortoise (*Testudo radiata*). *Mus. Leverianum.*

1026. The abdominal part of the shell, or plastron, of a female Radiated Tortoise (*Testudo radiata*). *Mus. Leverianum.*

1027. The shell of the Geometrical Tortoise (*Testudo geometrica*, Linn.).

Fig.—Schæpff, Test. tab. 10.
Hab.—Africa, Madagascar.

Mus. Leverianum.

1028. The shell of the Geometrical Tortoise (*Testudo geometrica*), wanting the horny scutes. *Mus. Brit.*

1029. The shell of the Geometrical Tortoise (*Testudo geometrica*). *Mus. Leverianum.*

1030. The carapace of the Geometrical Tortoise (*Testudo geometrica*).
Mus. Leverianum.

1031. The carapace and part of the plastron of the Geometrical Tortoise (*Testudo geometrica*). *Mus. Leverianum.*

1032. The carapace and part of the plastron of the Geometrical Tortoise (*Testudo geometrica*). *Mus. Leverianum.*

1033. The carapace of the Geometrical Tortoise (*Testudo geometrica*).
Mus. Leverianum.

1034. The carapace and part of the plastron of a variety of the Geometrical Tortoise (*Testudo tentoria*, Bell, Zool. Journ. iii. p. 420).

Hab.—Africa.

Mus. Leverianum.

1035. The shell of the European, or Greek Land Tortoise (*Testudo græca*, Linn.).

Fig.—Schæpff, Test. tab. 8, 9.
Hab.—Southern parts of Europe, as Greece, Italy, Sardinia, &c.

Mus. Brit.

1036. The shell of the European Land Tortoise (*Testudo græca*). *Mus. Leverianum.*

1037. The shell and pelvis of the European Land Tortoise (*Testudo græca*). Most of the scutes have been removed from the carapace. *Mus. Brit.*

1038. The shell of the Stellated Tortoise (*Testudo actinodes,* Bell), wanting the horny scutes. *Mus. Brit.*

1039. The shell of the Stellated Tortoise (*Testudo actinodes,* Bell), wanting the horny scutes. *Mus. Brit.*

1040. The shell of the Angulated Tortoise (*Testudo angulata*).

Hab.—South Africa.

Presented by Benjamin Travers, Jun., Esq.

1041. The shell of the Carbonaceous Tortoise (*Testudo carbonaria,* Spix; *Test. Hercules,* Spix).

Fig.—Spix, tab. 14.
Hab.—Brazil and the Antilles.

Mus. Brit.

1042. The shell of the Carbonaceous Tortoise (*Testudo carbonaria*). *Mus. Brit.*

1043. The carapace of the Carbonaceous Tortoise (*Testudo carbonaria*). *Mus. Brit.*

1044. The skeleton, with a mutilated cranium, of a Tabulated Tortoise (*Testudo tabulata*), with most of the epidermal scutes remaining upon the plastron and carapace. The pleurapophyses of two vertebræ, with those of the last dorsal, go to abut against the iliac bones. *Hunterian.*

1045. The shell, from which the horny scutes have been removed, of the Tabulated Tortoise (*Testudo tabulata*). *Hunterian.*

1046. The skull and eight cervical vertebræ of a Tortoise (*Testudo tabulata*?).

The anterior border of the alisphenoid is singularly modified, forming an oblique double-convex trochlear surface, apparently for a synovial joint with the tendon of the temporal muscle, facilitating the play, and adding to the force of that muscle.

Hunterian.

1047. The sacral and caudal vertebræ of the same Tortoise (*Testudo tabulata*?).

The sacral are three in number; their pleurapophyses are unanchylosed, converge, and unite at their distal extremities to form the articular surface for the ilium. Traces of the sutures joining the shorter pleurapophyses to the first and second caudal vertebræ remain, but are obliterated in the rest, which resemble transverse processes. The caudal vertebræ are twenty-six in number, and become remarkably depressed or flattened horizontally towards the end of the tail: the fore part of the centrum is concave, the hind part convex, in each. From the length of the tail the specimen was probably a female.

Hunterian.

1048. The shell, with the skull and bones of the extremities, of the Denticulated Tortoise (*Testudo denticulata*).

Fig.—Shaw, Zool. iii. pl. 13., from this specimen; Schæpff, Test. tab. 28. fig. 1.
Hab.—South America.

Mus. Leverianum.

1049. The shell of a young Denticulated Tortoise (*Testudo denticulata*).

Mus. Leverianum.

1050. The skeleton of a small Tortoise (*Testudo angulata*).

The eight costal pieces of the right side of the carapace have been disarticulated, and so attached that they may be uplifted, to expose the cavity of the carapace and to show the bodies of the vertebræ and the scapular and pelvic arches *in situ*. The hyosternal articulates with the first costal plate, and the hyposternal with the fifth costal plate.

Mus. South.

1051. The skeleton of the trunk and extremities of the *Testudo angulata*. The epidermal scutes are preserved upon the carapace and plastron, but the carapace is mutilated behind. *Mus. Langstaff.*

1052. The shell of Schweigger's Tortoise (*Testudo Schweiggeri*, Gray, Synops. Reptil. Part I. p. 10. sp. 4).

Mus. Leverianum.

1053. The shell of the Areolated Tortoise (*Testudo* (*Homopus*) *areolata*).

Fig.—Schæpff, Test. tab. 12. fig. 2, tab. 12. fig. 1 & 2; Shaw, Zool. iii. pl. 8.
Hab.—Africa.

Mus. Brit.

1054. The shell of the Areolated Tortoise (*Testudo areolata*, Thunb.; *Homopus*, Dum.).

Fig.—Schæpff, Test. tab. 23.
Hab.—Africa, Madagascar.

Mus. Leverianum.

Series of parts illustrating the principal Osteological characters distinguishing the Tortoises, Terrapenes, and Turtles, or the Land, Freshwater, and Marine Chelonia.

1055. The skull of the green Turtle (*Chelone mydas*), without the lower jaw.

The chief characteristics of this form of Chelonian skull, with the purposes which they serve, have been noticed in the descriptions of Nos. 769, 774 and 776.

Hunterian.

1056. The skull, wanting the lower jaw, of the expanded Terrapene (*Emys expansa*; *Podocnemis expansa*, Wagner).

This species differs from other freshwater Tortoises (Terrapenes), and approaches the marine Tortoises (Turtles), by the vaulted bony roof arching over the temporal depressions. This roof is chiefly formed by the parietals, but differs from that in the Turtles in being completed laterally by a larger proportion of the squamosal than of the postfrontal, which does not exceed its relative size in other Terrapenes. The present species further differs from the marine Turtles in the non-ossification of the vomer and the consequent absence of a septum in the posterior nostrils; in the greater breadth of the pterygoids, which send out a compressed rounded process into the temporal depressions: the orbits also are much smaller, and are bounded behind by orbital processes of the postfrontal and malar bones: the mastoids and paroccipitals are more produced backwards, and the entire skull is more depressed than in the Turtles.

Presented by Lieut. Mawe, R.N.

1057. The skull of a Terrapene (*Emys concentrica*).

In this skull, which may be regarded as the type of that of the freshwater Tortoises, the parietal crista is continued into the occipital one without being extended over the temporal fossæ; the fascia covering the muscular masses in these fossæ undergoing no ossification. The bony hoop for the membrana tympani is incomplete behind, and the columelliform stapes passes through a notch instead of a foramen to attain the tympanic membrane. The mastoid is excavated to form a tympanic air-cell.

Hunterian.

1058. The skull of a land Tortoise (*Testudo elephantopus*).

In the true Tortoises the temporal depressions are exposed, as in the Terrapenes: the head is proportionally small and can be withdrawn beneath the protective roof of the carapace. The skull is rounder and less depressed than in the Terrapenes: the frontals enter into the formation of the orbital border. The tympanic hoop is notched behind, but the columelliform stapes passes through a small foramen. The palatine processes of the maxillaries are on a plane much below that of the continuation of the basis cranii formed by the vomer and palatines.

Hunterian.

1059. The left moiety of the vertically bisected cervical vertebræ of a marine Turtle (*Chelone*).

The hypapophysis of the atlas supports a much smaller proportion of the neural arch than the true centrum or 'odontoid' does. In the second and third vertebræ the centrum is convex before, concave behind. The body of the fourth cervical is biconvex; that of the fifth is concave before and flat behind; in the three following the body is convex behind.

Hunterian.

1060. The left moiety of the vertically bisected cervical vertebræ of a Tortoise (*Testudo*).

The second vertebra is convex in front, concave behind; the third is biconvex; the next three are concave in front and convex behind; the seventh is biconcave.

Hunterian.

1061. The right scapula and acromial process of a Turtle (*Chelone*).

1062. The right coracoid of the same Turtle.

1063. The left scapula and acromial process of the same Turtle.

1064. The left coracoid of the same Turtle.

1065. The right scapula and acromial process of a mud Tortoise (*Trionyx*).

1066. The right coracoid of the same *Trionyx*.

1067. The left scapula and acromial process of the same *Trionyx*.

1068. The left coracoid of the same *Trionyx*.

1069. The left scapula and acromial process of a freshwater Tortoise (*Emys*).

1070. The left coracoid of the same species. This is remarkable for the great length and slenderness of the columnar scapula.

1071. The right scapula and acromial process of a large Tortoise (*Testudo niger*).

1072. The right coracoid of the same Tortoise.

1073. The left scapula and acromial process of the same Tortoise.

1074. The left coracoid of the same Tortoise.

The Tortoise (*Testudo*) is characterized by the shortness of the clavicular process in comparison with the length of the scapula, and by the shortness of the coracoid in comparison with its breadth: the *Trionyx* is remarkable for the length of its clavicular process, which almost equals that of the scapula; and the *Chelone* by the length of its coracoid, which exceeds that of the scapula. The coracoid is less expanded in the *Chelone* than in the freshwater or land Tortoises: it is of intermediate breadth in the *Trionyx*, where it is further distinguished by a ridge upon its upper surface.

1075. The pelvis of a small Turtle (*Chelone mydas*).

1076. The pelvis of a *Trionyx* (*Trionyx australis*).

1077. The pelvis of an *Emys*.

1078. The pelvis of a Tortoise (*Testudo elephantopus*).

The pubic bones are more expanded at their outer and hinder angles in the *Chelone*, and especially in the *Trionyx*, than in the *Testudo*, and the 'foramina ovalia' are not divided by the extension of bone between the pubis and ischium, in the *Chelone* and *Trionyx*, as they are in the *Emys* and *Testudo*.

1079. The scapula, coracoid and bones of the left anterior extremity of a Tortoise (*Testudo tabulata*).

The ordinary position of that extremity is a state of extreme pronation, with the olecranon thrown forwards and outwards, and the radial side of the hand, or thumb, directed to the ground. The humerus is strongly bent in a sigmoid form, with the anconal surface convex and directed upwards and outwards: the two tuberosities at the proximal end are much developed and bent towards the palmar aspect, bounding a deep and wide groove: that which answers to the external tuberosity is the smallest, and by the rotation of the humerus it becomes the most internal in position. The proximal row of the carpus consists of three bones, a large scaphoides, a small lunare, wedged into the interspace of the radius and ulna, and a large cuneiforme. The second row consists of five distinct bones, corresponding with the five digits; those supporting the fourth and fifth answering to the os unciforme, the remaining three to the trapezium, trapezoides and magnum. Each of the digits has one metacarpal and two phalanges, except the fifth, which has but one phalanx. A sesamoid bone is placed beneath the metacarpo-phalangeal joint of the three middle digits.

Hunterian.

1080. The bones of the right anterior extremity of the same Tortoise.

The capsule of the shoulder-joint includes a considerable proportion of the fore and back part of the neck of the humerus; it is reflected close upon the neck of the bone at its sides.

Hunterian.

1081. The bones of the left hinder extremity of the same Tortoise.

The patella is ligamentous: the synovial joint between it and the femur is distinct from the proper capsule of the knee-joint. The proximal row of the tarsus consists of two bones, astragalus and calcaneum, which appear to have become confluent in this specimen. The distal row consists of five bones, four of which support the four normal toes, and the fifth a rudiment of the metatarsal of the fifth toe: the fourth and fifth of the second row of tarsals answer to the os cuboides of higher animals; the other three bones to the three ossa cuneiformia. The astragalar part of the single proximal bone would seem to include the scaphoid as well as the calcaneum.

Hunterian.

1082. The bones of the right hinder extremity of the same Tortoise. *Hunterian.*

1083. The left scapula, coracoid and anterior extremity of a small freshwater Tortoise (*Emys*).

The proximal row of the carpus consists of four bones, of which the lunare is wedged between the radius and ulna, and the homologue of the scaphoid is divided: the pisiforme is absent: the unciforme is divided, forming, with the trapezium, trapezoides and magnum, five bones of the second series. The first and fifth digits have each a metacarpal bone and two phalanges, the second phalanx supporting a claw; the first and second, and probably also the third digits, have each had three phalanges.

Hunterian.

1084. The right scapula, coracoid, and anterior member of the same *Emys*, wanting several phalanges. *Hunterian.*

1085. The left leg and hind foot of the same *Emys*. *Hunterian.*

1086. The right leg and hind foot of the same *Emys*.

The hallux has two phalanges with a claw; the next three digits have each three phalanges with a claw; the fifth has two small and slender phalanges, and is clawless. The astragalus and scaphoid form a single bone, but there is a distinct rudiment of a calcaneum: the bones of the second tarsal row progressively increase in size from the tibial to the fibular side; the two representing the cuboid are distinct, the outermost is broad and flat, and supports the rudiment of the fifth toe.

Hunterian.

1087. The bones of the left anterior extremity of the green Turtle (*Chelone mydas*).

The shaft of the humerus is compressed laterally instead of from before backwards, as in the Tortoise. The ulna is much shorter and the olecranon less developed than in the Tortoise. The proportions of the scaphoides and lunare are reversed, the lunare being the largest bone and the scaphoid divided into two, of which the part that articulates with the trapezoides and magnum is here ossified: the cuneiforme is a flattened bone of large dimensions, and here also the pisiforme is well developed. The five bones of the distal row are distinct, as in the Tortoise: that which answers to the os magnum is the smallest. In old Turtles it is sometimes anchylosed with the fourth and fifth of the distal series, forming a single bone, answering to both magnum and unciforme in the human wrist.

Hunterian.

1088. The bones of the right fore extremity of the same Turtle.

In both these specimens the second phalanx of the pollex supports a claw: the three middle digits have each three phalanges, the last being flattened and without a claw; the fifth digit has only two phalanges.

Hunterian.

1089. The bones of the left hind foot of the same Turtle.

The proximal row of the carpus consists of two bones, the larger one answering to the astragalus and scaphoides, the smaller one to the calcaneum; the second row includes five bones; the three corresponding to the cuneiform bones are very small, the two which answer to the cuboides are very large; that which supports the fifth digit stands out like a broad depressed metatarsal. The three middle toes have each three phalanges; the first and fifth have only two, and the first supports a claw.

Hunterian.

1090. The bones of the right hind foot of the same Turtle. *Hunterian.*

1091. The bones of the fore-arm and paddle of a large Turtle (*Chelone mydas*).

In this specimen both portions of the bone answering to the scaphoid in the Tortoise are ossified, and the three outer bones of the distal row answering to the magnum and unciforme are partially confluent with one another: the large compressed pisiforme articulates in a small proportion with the cuneiforme, but chiefly with the outer border of the unciforme.

Hunterian.

1092. The bones of the right hind leg and paddle of the same large *Chelone*.

Hunterian.

1093. The bones of the left anterior extremity of a Mud Tortoise (*Trionyx Bibronii*).

They are preserved with their natural connections. The carpal bones are in three rows, the middle row being incomplete and formed by a divided 'scaphoides'; the proximal row is formed by a large 'lunare' wedged between the radius and ulna, a larger cuneiforme, and a pisiforme; the distal row is formed by five bones, as in other *Chelonia*. It is interesting to observe that the scaphoides, which articulates with the trapezium, trapezoides and magnum, holds the same relative position in the carpus as the scaphoides does in the tarsus of Mammalia. The pollex has two phalanges, the last with a claw; the three middle digits have each three phalanges, but only the index and medius have claws; the fifth digit has two phalanges and has no claw.

1094. The bones of the left posterior extremity of the same *Trionyx*, similarly prepared.

The proximal row consists of a single bone, answering to the astragalus, calcaneum and cuboides; the distal row consists of five bones, of which the three cuneiformia are very small, and the first concealed between the proximal tarsal bone and the first metatarsal. The two divisions of the cuboides are very large, and the outermost dilated and angular.

Prepared from the specimen presented by Capt. Sir Everard Home, R.N., F.R.S.

1095. The left radius, ulna, carpal, metacarpal and phalangeal bones of the *Testudo græca*. *Hunterian.*

1096. The left tibia, fibula, tarsal, metatarsal and phalangeal bones of the same *Testudo græca*. *Hunterian.*

Preparations illustrating the development of the carapace and plastron of the Chelonia.

1097. The carapace of a young Tortoise (*Testudo*).

The bodies and neural arches of the vertebræ have been removed from the carapace, leaving only the ribs and the incipient expanded plates attached to these and to the neural spines, together with the marginal plates. The neural plates are of a subquadrate form, but of irregular size, and with rounded angles and ill-defined outlines; the tenth plate being insulated between the ninth and the last or pygal plate. On each side of the middle row of neural plates is a series of eight similarly-sized, triangular or rhomboidal plates, each of them marked on their outer surface with a triradiate linear impression formed by the junction of two costal scutella with one vertebral scutellum, or of one vertebral with two costal scutella; excepting the penultimate or seventh plate. Around the border of the carapace are eleven pairs of marginal plates, exclusive of the nuchal and pygal plates. The wide interval between the marginal and the incipient costal plates was occupied by the corium, supported by the eight pairs of ribs of the carapace, by the first pair of short dorsal ribs, by the pair of shorter lumbar ribs, and by the rib-like upper and outer extremities of the hyosternals and hyposternals, which ascend beyond the marginal plates. The extremities of the ribs do not as yet join the marginal plates. The nuchal plate, the ninth and tenth neural plates, the pygal plate, and all the marginal plates are independent osseous developments in the substance of the derm: the other neural plates are connate with the neural spines of the second to the ninth dorsal vertebræ inclusive, and the costal plates are similarly connate with the upper surface of the ribs of the same vertebræ at varying distances from their proximal ends. The first, second, fourth, sixth and eighth ribs of the carapace are continued from beneath the outer angles or apices of the corresponding costal plates, but the third, fifth and seventh ribs of the carapace are continued from beneath the middle of that side of the corresponding triangular costal plate which seems to form its base.

A strong argument for regarding the costal plates as dermal ossifications rather than processes or continuations of the endo-skeletal elements, to which they are attached, may be drawn not only from their place of development, but also from the period of their ossification; and their relative position to the ribs with which they are connate.

The uniformly slender pleurapophyses are ossified nearly throughout their whole length before the ossification of the costal plates, which have usually been regarded as their expanded tubercles, commences: and the beginning of the superadded bone is not at the same point in each rib, as might have been expected if it were the exogenous process called 'tubercle' of the rib. The costal plates are situated alternately nearer to and farther from the head of the rib; and their presence seems to be determined rather by the angle of union of the superincumbent vertebral scutella with the lateral or costal scutella, than by the necessity for additional strength in the articulation of the ribs with the spine. Ossification commences at the point from which the three impressions radiate, and as this point is nearer the median line at the median apex of the costal scutellum than at the lateral apex of the vertebral scutellum, the resulting plates of bone are alternately further from or nearer to the middle line; and the first, third and fifth costal plates have advanced along the proximal end of the rib so as to join the neural plates, whilst the second, fourth and sixth costal plates leave a portion of the proximal end of the rib uncovered and crossing the space between the incipient costal plate and the neural plate. In regarding these incipient ossifications, extending into the substance of the corium and receiving the impressions of the epidermal scutes, as the developed 'tubercle' of the ribs, as Rathke has endeavoured to illustrate in tab. 3. figs. 11 (Tortoise), 12 and 13 (Chick) of his elaborate Monograph *, we are compelled to suppose that each successive rib in the Tortoise has a different position of its tubercle, which is alternately nearer and farther from the head, and that the neck of each successive rib is alternately long and short, which is contrary to all analogy furnished by those cold-blooded or warm-blooded *Vertebrata* that have unquestionably the exogenous process called 'tubercle' developed from the true neck of the rib.

There is an obvious difference in the texture and external surface of the bones which unquestionably belong to the endo-skeletal vertebræ, and of those which, notwithstanding their connection with the neural spines and pleurapophyses, are developed in the fibrous substance of the corium. These nascent 'neural' and 'costal' plates of the carapace have a granular exterior and a coarse spongy texture, whilst the neural arches and pleurapophyses are compact, smooth, and with a polished external surface: the part of the pleurapophysis which passes beneath and is attached to the under surface of the 'costal' plate contrasts strongly with that superimposed dermal ossification.

The marginal plates present the same rough, coarse, granular character as the neural and costal plates: they are in no way connected in their development with the pleurapophyses, which do not yet reach them: their ossification has been governed by the presence of the marginal epidermal scutes, and, as in the case of the costal plates, by the points of junction of contiguous scutes; each marginal ossification is accordingly impressed by the lines indicating the junction of the marginal epidermal scutes with each other and, in the case of the middle ones, with the contiguous scutes of the plastron. The number of the marginal plates accords, moreover, with that of the marginal epidermal scutella, not with that of the ribs.

Mus. Brit.

1098. The plastron of the same immature Tortoise.

It presents the same difference in the texture and surface of the endo-skeletal and exo-

* Ueber die Entwickelung der Schildkröten, 4to.

skeletal parts of the incipient bones as does the carapace: the triangular entosternal bone, the greater part of the episternals and xiphisternals, and a smaller proportion of the hyosternals and hyposternals, are compact bone with a smooth shining free surface: the greater part of the broad hyosternal and hyposternal plates, the entire and even margins of which are encroaching on the central unossified space of the plastron, are subgranular, coarser and more opake than the slender endo-skeletal parts, which still retain much of the primitive rib-like form they present in the fœtal *Chelone*, and are seen applied, as it were, to the inner (upper) surface of those dermal plates. The median extremities of the true endo-skeletal parts have begun to expand, and to shoot out the pointed rays of tooth-like processes which they retain in the *Trionyces* and the marine *Chelonia*. From the flattened and expanded inner and lower end of the hyosternal the main body of the bone arises and curves upwards, outwards and forwards, in the form of a long and slender rib, and applies itself to the inner and fore part of the first elongated pleurapophysis of the carapace, extending as far as the incipient dermo-costal plate. As the inner and lower toothed border of the endo-skeletal part of the hyosternal touches the outer border of the entosternal bone, the hæmal arch of the first segment of the thoracic-abdominal case (second vertebra of the back) is completed independently of the marginal pieces; and, in point of fact, the third and fourth marginal plates are simply applied to the outer side of the hyosternal where it bends upwards to join the first long pleurapophysis or rib of the carapace. The most obvious and natural explanation of this first complete segment of the thoracic-abdominal region of the young Tortoise, according to the typical vertebra, and the composition of the corresponding segment in the nearest allied *Vertebrata*, is—that the centrum, the neural arch, and the pleurapophysis being unquestionably the elements so called, the hyosternals are the 'hæmapophyses' (sternal ribs or costal cartilages), and the entosternum is the 'hæmal spine' or sternum proper. The hyposternals in the young *Testudo* resemble the hyosternals, but are shorter; the slender rib-like portion which curves upwards and outwards applies itself to the back part of the extremity of the fifth rib of the carapace, almost filling the interspace, for one-fourth of its length, between that rib and the next, and thus again forming the hæmal arch of the segment without the intervention or aid of any of the marginal plates, the seventh of these being simply applied to the outside of the hyposternal, where its slender elongated extremity bends upwards to join the vertebral rib: and the only incomplete part of the arch is the unossified median space between the lower expanded and dentated ends of the hyposternals, between which the entosternal, or true sternal piece, does not extend backwards. So that the condition of this fifth segment of the thoracic-abdominal box, in the young Tortoise, repeats that of a posterior dorsal segment of a mammal or crocodile, in which the cartilages of the ribs, or abdominal ribs, do not reach the sternum; and the Ornithorhynchus offers a special resemblance to the Tortoise in the expansion of the semiossified hæmapophyses, or cartilages of its 'false ribs.' The xiphisternals, viewed in like manner as 'hæmapophyses,' repeat the condition of those abdominal ones in the Crocodile and Plesiosaur which do not ascend so high as to join their pleurapophyses or vertebral ribs. The difference between the endo-skeletal and exo-skeletal portions of these elements of the plastron is as plain, and the contrast, indeed, is almost as great, in the young Tortoise as in the adult Trionyx, where the superadded ossification, at the expense of the dermal system, is characterized by the vermicular or punctate character of the exterior surface, a character common to the dermal ossified plates in the *Reptilia*, especially of the closely-allied Crocodilian order.

Mus. Brit.

1099. The carapace and plastron of a young Terrapene (*Emys concentrica*).

The costal plates have begun to be ossified from near the proximal ends of each of the long and slender ribs of the carapace, and from points more nearly parallel with the median line than in the young Tortoise: the third and fifth are nevertheless nearer the neural plates than the first, second and fourth. The nuchal plate is disproportionately large. The inner borders of the hyo- and hypo-sternals send many pointed rays into the middle membranous space, thus temporarily repeating the permanent character of those bones in the Turtle: and the outer borders of the same bones are still united by membrane to the marginal plates, all of which are independently developed in the substance of the corium.

Mus. Brit.

1100. The carapace and hyosternals of a young Terrapene (*Emys serrata*); showing the independent development of the large nuchal and first three marginal plates in the substance of the corium, and the slender rib-like portions of the hyosternals which join the second dorsal pleurapophyses. *Mus. Leverianum.*

Class AVES.

CHIEF CHARACTERISTICS OF THE SKELETON, AND TEXTURE OF THE BONES, OF BIRDS.

1101. The right moiety of the vertically bisected cranium of an Albatros (*Diomedæa exulans*).

It shows the ivory-like whiteness and compactness of the osseous tissue, and the loose open cancellous structure of the bones. Air is admitted into these cancelli partly, as may be seen, from the nasal passages, and partly from the tympanic cavity which receives it from the eustachian tube; from the latter source the proper bones of the cranium receive their air. Some of the characteristic features in the composition of the skull of birds may here be noticed: as, for example, the obliteration of all the ordinary sutures of the cranium, except those which unite the tympanic bone, 28 (auditory process of the temporal), to the mastoid, 8 (mastoid process of the temporal); and that which unites the pterygoid, 23 (pterygoid process of the sphenoid), to the basisphenoid, 5 (basilar process of the sphenoid); which sutures are speedily obliterated in the Human Subject. The premaxillary is confluent with the nasal and with the maxillary; the nasal being confluent with the frontal and the maxillary with the jugal. The jugal and squamosal are also confluent, and form a long zygomatic style in all birds, connected at the hinder extremity by a moveable glenoid joint to the outer and lower part of the tympanic. The pterygoid articulates, in like manner, with the inner and lower part of the tympanic, the movements of which are thus communicated to the upper mandible, so far as the junction of the nasal with the frontal admits of such independent motion.

Presented by Prof. Owen, F.R.S.

1102. The right moiety of the vertically bisected cranium of a Gannet (*Sula Bassana*).

It shows the moveable articulation between the nasal and frontal by which the upper jaw can be raised. Both facial and cranial bones show the same open cancello-reticulate texture for the reception of air as in the Albatros.

Presented by Prof. Owen, F.R.S.

1103. A longitudinal section of a cervical vertebra of an Ostrich (*Struthio Camelus*).

It shows its open cancellous texture, and the orifice which admitted air therein from a contiguous cervical air-cell. In this specimen may be noticed what appears to be a perforated transverse process, but the nature of which is shown in the following specimen.

Hunterian.

1104. Two cervical vertebræ of a young Ostrich (*Struthio Camelus*).

They show the pleurapophyses, or rudimental vertebral ribs, still unanchylosed to the parapophysis below and the diapophysis above. The neural arch coalesces very early with the centrum in all birds. The anterior articular surface of the centrum is convex vertically, concave transversely, and the reverse on the posterior surface; so that they are joined by slightly interlocking trochlear articulations. The anterior zygapophyses look obliquely upwards and inwards, and the posterior ones downwards and outwards: the neural canal is slightly expanded at its outlets.

Presented by Prof. Owen, F.R.S.

1105. A dorsal vertebra, in longitudinal section, of an Ostrich (*Struthio Camelus*).

It shows the loose cancellous texture, and the orifices by which the air is admitted therein. The pleurapophyses have been removed; they do not become anchylosed, as in the neck, but leave articular surfaces upon the centrum and diapophysis.

Hunterian.

1106. The vertebræ of the trunk of a Pelican (*Pelecanus Onocrotalus*), from the middle of which a segment has been removed by vertical section.

The cut surfaces show the light cellulosity of the centrum, neural arch and sternum. The following letters indicate the elements of the modified vertebræ of the thorax: *c.* centrum; *p.* parapophysis; *d.* diapophysis; *n.* neural arch and rudimental spine; *pl.* pleurapophysis; *h.* hæmapophysis; *h. s.* hæmal spine. The tendency of individual elements and bones to coalesce in birds has already been illustrated in the cranium; it is here shown not only by the confluence of the centrum with the neural arch, but by that of several consecutive centrums and arches into a single bone. In like manner the hæmal spines, which continue distinct in many Vertebrata, have here coalesced into a single bone, which articulates on each side with the hæmapophyses of several vertebræ. These coalesced spines are also much developed in breadth, and send down from the middle of their under surface a longitudinal crest or keel. This modification relates to the extension of the surface for the origin of the great muscles of flight, and renders the 'sternum,' as the coalesced series of spines is called, one of the most characteristic parts of the skeleton of the bird. Ossification extends from the neural arches into the tendons of the vertebral muscles, and such bone-tendons, both here and in other parts of the body, as the legs, are also characteristic of birds. The scapula is long and slender, as in the *Chelonia*; but is usually more compressed and sabre-shaped than in the Pelican. The coracoid, as a general rule, is a distinct bone, moveably articulated to the scapula at one end and to the sternum at the other. Its broad sternal end here articulates by a kind of gomphosis with a deep groove on the fore part of the sternum. The clavicle articulates with the coracoid above, but is confluent with its fellow and with the keel of the sternum below. The iliac bones are remarkable for their length, and for the number of the vertebræ, or the great extent of the confluent spinal column, to which they are anchylosed; they reach in the present instance, and in most other birds, from the tail forwards to the vertebræ with moveable ribs: thus the artificial characters of a 'lumbar vertebra' are wanting. The pubis and ischium on each side have coalesced with the ilium to form the lower boundary of the widely-perforated acetabulum. The pubis is long and slender, joins the ischium of its own side near its lower extremity, but does not join its fellow; thus the foramen ovale is defined, but there is no symphysis pubis: the absence of this symphysis facilitates the expulsion of the large ovum with its unyielding calcareous shell. The ischium coalesces posteriorly with the ilium, and converts the ischiadic notch into a foramen. The caudal vertebræ are few in number, with broad transverse processes formed by confluent pleurapophyses, the limits of which may still be traced. A hæmapophysis is articulated to the lower interspace, between the fourth and fifth caudal, and is anchylosed to the sixth.

Presented by Prof. Owen, F.R.S.

1107. The right humerus of an Argala (*Ciconia Argala*).

It is remarkable for its lightness, as compared with its bulk and seeming solidity; it is, in fact, a mere shell of compact osseous tissue. The orifice admitting air to its large cavity is beneath the great tuberosity at the proximal end.

Hunterian.

1108. The left humerus of the same bird, longitudinally bisected.

It shows the thinness of the compact walls and the loose cancellous lacework at the extremities: filamentary processes of bone shoot more or less obliquely across different parts of the cavity, serving to strengthen, like tie-beams, the thin walls, and also, being hollow, to convey minute blood-vessels. The proximal half of the bone is divided longitudinally by a loose cancellous partition: the decussation or anastomoses of the delicate hollow columns give an open reticulate structure to the inner surface of the air-cavity at the two extremities of the bone, which is highly characteristic of the class of birds.

Hunterian.

1109. A coracoid of a Pelican (*Pelecanus Onocrotalus*).

The thin compact parietes are removed from one side, exposing the air-cavity, which is traversed by the slender decussating hollow columnar processes. The economy of the dense material employed in effecting the requisite strength of the bone is well exemplified in this specimen: the apertures admitting the air form an open network near the proximal end of the bone.

Hunterian.

1110. The chief metacarpal, answering to the third or 'medius,' with the slender fourth metacarpal anchylosed thereto at both ends, of a Pelican (*Pelecanus Onocrotalus*).

A section of the thin outer parietes has been removed from one side of the principal metacarpal, showing its large and smooth air-cavity: the columnar spiculæ are very few in number: the pneumatic foramen is circular, and situated beneath the proximal condyle.

Hunterian.

1111. The proximal phalanx of the principal digit, answering to the third or 'medius' of the same pinion.

The pneumatic foramina are numerous, and occasion a reticulate structure at the exterior part of the bone.

Hunterian.

1112. The sternum of a Wild Swan (*Cygnus Bewickii*).

The keel is excavated, not only for the reception of an air-cell, but likewise for a fold of the wind-pipe, which fold expands with age and lies horizontally in the substance of the back part of the sternum: small pneumatic foramina are situated at the anterior and inner surface of the bone, and perforate the articular surfaces for the sternal ribs.

Hunterian.

1113. A longitudinal section of a tibia of an Ostrich (*Struthio Camelus*).

The walls of the shaft are dense and thick, and lined by a layer of looser cancellous texture, which forms the greater part of the substance of the two extremities. No air penetrates this bone. The medullary cavity is large, and much of its surface is smooth; the arteria medullaris perforates the bone near the termination of the fibular ridge; the canal extends obliquely downwards, divides, and its two inner orifices may be seen below the middle of the shaft.

Hunterian.

1114. A longitudinal section of the tarso-metatarsal bone of the same Ostrich (*Struthio Camelus*).

A larger proportion of its proximal extremity is occupied by a cancellous texture, closer than that of the pneumatic bones. The compact walls of the shaft are as thick as usual in the marrow-bones of birds of this size. The inner surface of the medullary cavity is smooth. The exterior short process above the distal condyle indicates the termination of the abortive digit. The large canal perforating the proximal end of the bone from before backwards indicates the primitive division of the two normally developed but now coalesced metatarsals.

Hunterian.

1115. The metatarsus of a young Ostrich (*Struthio Camelus*).

The single bone, or epiphysis, representing, in part, the tarsus, has been removed from the summits of the three metatarsals, which coalesce with it, and with each other, to form the present segment of the leg. The primitive clefts still extend some way down and may be traced to the distal end: the metatarsal which supports the largest claw has the smallest proximal end, that which supports no claw has the largest.

Presented by Prof. Owen, F.R.S.

1116. The tarso-metatarsal bone of a Bustard (*Otis tarda,* Linn.).

The two foramina near the proximal end lead to canals which indicate the primitive distinction of the three constituent metatarsals: a canal near the distal end, traversing the bone from before backwards, is likewise another trace; the three distinct trochlear distal ends most clearly manifesting the composite character of the bone. The calcaneal process is connate with the back part of the tarsal portion of the bone.

Hunterian.

1117. The distal end of the tibia and bones of the right foot of a Penguin (*Aptenodytes patachonica*).

The cut surface of the tibia shows the solidity of the bone characteristic of this strictly aquatic and wingless bird. The groove of the extensor tendons has been converted into a canal by an osseous bridge, developed in part of the annular ligament in this and many other birds. The primitive distinctness of the three short metatarsals is well shown by two wide longitudinal grooves, leading to two antero-posterior perforations, as well as by the distinct distal articular ends. The difference in the number of the phalanges of each of the toes, and its progressive increase from the inner or tibial to the outer side of the foot, is here seen. The toe with three phalanges answers to the second in the pentadactyle foot; the next, with four phalanges, to the third toe, or 'medius'; the one with five phalanges to the fourth toe; the fifth or little-toe is wanting in all birds; a rudiment of the first or hallux exists in the *Aptenodytes,* and is attached to the tibial side of the anchylosed metatarsal of the second toe.

Hunterian.

Order NATATORES.

Family *Pinnipennatæ*. Divers.

Genus *Aptenodytes* (Penguins)*.

1118. The skeleton of the Antarctic Penguin (*Aptenodytes antarctica*).

The number of vertebræ between the skull and sacrum is 21, the last seven of which support moveable ribs, an eighth pair of ribs being attached to the first sacral vertebra, and the rudiment of a ninth pair being connected with each sacral rib. The last six dorsal ribs are attached to the sternum by bony hæmapophyses, and, together with the first pair, have bony appendages articulated to them. The ribs of the first pair are free, without hæmapophyses:

* No species of this genus is known to exist north of the Equator.

it is probable that a shorter pair of free ribs may have been attached to the fourteenth cervical vertebra. The first four cervical vertebræ have a single hypapophysis; the sixth to the tenth have a pair of hypapophyses; the inferior process is again single, from the eleventh to the fourteenth vertebræ inclusive; it bifurcates into a pair of broad diverging plates in the first three dorsal vertebræ, and becomes a single compressed plate in the rest. The unusual development of the hypapophysis relates to the great size and strength of the inferior muscles of the spine, which combine with other muscles of the trunk in the shuffling movement by which the Penguin, like the Seal, makes progress, prone on its belly, along dry land.

The scapulæ are unusually long and broad: the coracoids are of great length and strength, and rest on grooves which occupy the whole anterior border of the sternum. The furculum is strong, curved, with its apex at some distance from the keel to the sternum. The bones of the fin-like wings are compressed, as in the paddles of the Cetacea. The femur is short and thick: the patella unusually large: the fibulæ almost as long as, and distinct from, the tibia: the groove for the extensor tendons is bridged over with bone. There are eight caudal vertebræ, the last of which is long and styliform.

Prepared from a specimen captured in the Antarctic Expedition of Capt. Sir J. C. Ross, R.N., F.R.S., and presented by R. MCormick, Esq., R.N., Surgeon to the Expedition.

1119. The skull, covered by the dried skin, of the Patagonian Penguin (*Aptenodytes patachonica*). *Presented by Sir Wm. Blizard, F.R.S.*

1120. The skull, partially disarticulated, of the Patagonian Penguin (*Aptenodytes patachonica*).

It differs from that of the *Apt. antarctica* in the greater length and slenderness of the bill. The superorbital ridge is similarly impressed by the cavities for the superorbital glands. The paroccipital, mastoid, and postfrontal processes are well-marked. The occipital condyle sinks below the level of the basioccipital. The interorbital septum is incomplete behind, and the cranial parietes there present three wide vacuities. The hæmapophysial part (angular, surangular, and articular elements) of the lower jaw has not coalesced with the hæmacanthal part (dentary element); but this is confluent anteriorly with the corresponding part of the opposite ramus.

Hunterian.

1121. The atlas of the same Penguin (*Aptenodytes patachonica*).

The neurapophyses are separate above, not confluent as in the skeleton of the *Aptenodytes antarctica.* The hypapophysis is less developed than in that species.

Hunterian.

1122. The vertebra dentata of the same Penguin.

The hypapophysis is developed to the same extent as the neural spine: the anterior zygapophyses are very small; the posterior ones are large and support metapophyses.

Hunterian.

1123. A middle cervical vertebra of the same Penguin.

The anterior articular surface of the centrum is convex vertically, concave transversely, and the reverse at the opposite end. There is no neural spine. Diapophyses project from the outside of the anterior zygapophyses, and the posterior ones support metapophyses; the anchylosed pleurapophyses complete the large apertures for the vertebral artery and sympathetic nerve, and the double hypapophyses form the canal for the carotids.

Hunterian.

1124. The first dorsal vertebra of the same Penguin.

The articular surfaces of the centrum resemble those in the neck: the diapophyses are more developed; the neural spine is strong and quadrate; the metapophyses are suppressed; the hypapophyses have the form of a pair of broad diverging plates.

Hunterian.

1125. The third dorsal vertebra of the same Penguin.

In this the anterior surface of the centrum is simply convex, the posterior one concave. The diverging hypapophyses are supported on a compressed vertical plate.

Hunterian.

1126. The fourth dorsal vertebra of the same Penguin.

This differs from the preceding in the reduction of the hypapophysial plates in size.

Hunterian.

1127. The sixth dorsal vertebra of the same Penguin.

In this the hypapophysis is reduced to a simple compressed plate.

Hunterian.

1128. The eighth caudal vertebra of the same Penguin.

The first five of these have thick bifurcate spines; the last five have bifurcate hypapophyses.

Hunterian.

1129. The right scapula of the same Penguin.

Its articular surfaces for both the coracoid and humerus are convex.

Hunterian.

1130. The right coracoid of the same Penguin.

The clavicular process is thick and bent; the humeral process is broad and compressed.

Hunterian.

1131. The bones of the right wing of a Patagonian Penguin (*Aptenodytes patachonica*).

The humerus is smaller than in the skeleton of the *Apt. antarctica*: the antibrachial bones are nearly as long as in that skeleton, but are narrower: the detached olecranon is here preserved: the bones of the manus are quite as long as in the *Apt. antarctica.*

Presented by Sir William Blizard, F.R.S.

1132. The bones of the left wing of the Patagonian Penguin.

A longitudinal section has been made of the humerus showing its solid texture.

Hunterian.

1133. The right femur of the same Penguin. *Hunterian.*

1134. The right tibia of the same Penguin.

The procnemial and ectocnemial processes are united above by a broad epicnemial ridge. The groove for the extensor tendons is bridged over with bone.

Hunterian.

1135. The right fibula of the same Penguin. *Hunterian.*

1136. The lower end of the tibia, with the bones of the left foot, of the Patagonian Penguin.

This is remarkable for the shortness and breadth of the metatarsus, and for the minor degree of coalescence of the three constituent bones than in other birds, the intervals between their shafts, as well as their distal trochleæ, remaining distinct. The phalanges of the toes are arranged according to the usual numerical law in birds,—three in the inner toe, four in the middle, and five in the outer toe.

Hunterian.

1137. The left humerus of a Patagonian Penguin (*Aptenodytes patachonica*), longitudinally bisected, showing the compact tissue occupying the middle of the shaft, and the fine cancellous texture near the extremities. *Hunterian.*

1138. The left ulna of a Patagonian Penguin, longitudinally bisected. *Hunterian.*

1139. The left femur of the Patagonian Penguin (*Aptenodytes patachonica*), longitudinally bisected, showing the absence of a medullary cavity. *Hunterian.*

1140. The left tibia of the same Penguin, longitudinally bisected: the central cancellous texture is more open towards the upper part of the shaft than in the femur. *Hunterian.*

1141. The right metatarsus of a Patagonian Penguin, longitudinally bisected. *Hunterian.*

1142. The skeleton of a Penguin (*Aptenodytes* (*Spheniscus*) *demersa*).

The superorbital glandular depressions are well-marked; the temporal depressions are deeply excavated, and are bounded behind by an outward production of the super- and exoccipital crista, and below by the mastoid. The posterior cervical vertebræ are remarkable for the length of their hypapophysis or inferior compressed spine, and the anterior dorsal vertebræ for the bifurcation of the corresponding process. An unusually large patella, ossified from two centres, is articulated to the procnemial process of the tibia. The three constituent bones of the compound metatarsus are unusually distinct, as in other species of *Aptenodytes*. The number of vertebræ between the skull and sacrum is 20, of which the nine last support moveable ribs. The first two pairs of ribs are free and unattached to the sternum; the seven succeeding pairs are articulated by bony hæmapophyses to the sternum. There are 7 caudal vertebræ beyond the iliac bones, the first four with bifurcate spines, the last a long sabre-shaped bone.

Hunterian.

1143. The left wing of a Penguin (*Aptenodytes demersa*), the integuments of which have been removed on the inner side to display the bones *in situ*. *Hunterian.*

1144. The skeleton of the small Penguin (*Aptenodytes* (*Spheniscus*) *minor*).

It presents all the characteristics adapted to marine existence which are shown on a larger scale in the *Aptenodytes antarctica*. The ridge dividing the temporal from the occipital depression is more developed. There are 21 vertebræ between the skull and the sacrum, the last eight of which bear moveable ribs, and of these the last six are united to the sternum by bony hæmapophyses.

Hunterian.

1145. The skull of the Crested Penguin (*Aptenodytes* (*Eudyptes*) *chrysocome*).
Presented by W. Bullock, Esq.

Genus *Alca*.

1146. The skeleton of the Razor-billed Auk (*Alca torda*).

The exterior surface of the cranium is deeply excavated by the superorbital glandular fossæ and by the temporal and occipital depressions. There are 21 free vertebræ between the skull and sacrum, of which the last nine support moveable ribs, the first two sacral vertebræ having each a similar pair of long and slender ribs, extending to near the end of the tail. All the ribs, save the first two pairs, have bony hæmapophyses, which progressively elongate, and, with the exception of the last pair, directly articulate with the sternum. This unusual extension of osseous hoops about the parietes of the abdomen relates to the power of compressing the abdominal air-cells during submersion in these diving birds. There are 9 caudal vertebræ. The hypapophyses are unusually developed in the dorsal region.
Mus. South.

1147. The skull of the Razor-billed Auk (*Alca torda*), with the horny sheath of the bill preserved. *Mus. Brit.*

1148. The dried head of a Razor-billed Auk (*Alca torda*).
Presented by W. Bullock, Esq.

1149. The dried head of the Little Auk (*Alca alle*). *Presented by W. Bullock, Esq.*

1150. The mutilated skull of the Great Auk (*Alca impennis*), with the dried integuments, and the horny sheath of the bill. *Mus. Brit.*

1151. The skull of the Great Auk (*Alca impennis*).

The superorbital glandular impressions meet along the interorbital space, and the temporal depressions above the parietal region; these depressions are then continued forwards, at a right angle with the parietal part, to the postfrontal processes.
Hunterian.

1152. The right tympanic bone of the Great Auk (*Alca impennis*). *Hunterian.*

1153. Nine dorsal vertebræ, with their pleurapophyses, of the Great Auk (*Alca impennis*). In these the remarkable development and modifications of the hypapophyses, and the bone-tendons developed in the muscles of the back, are shown. *Hunterian.*

1154. The right scapula of the same Auk. It is narrower in proportion to its length than in the Penguin. *Hunterian.*

1155. The right coracoid of the same Auk.

The clavicular process is long, strong, and curved; the scapular process compressed, triangular, and perforated at its base.

Hunterian.

1156. The right femur of the same Auk. *Hunterian.*

1157. The right tibia of the same Auk. The procnemial and ectocnemial processes are united by an oblique epicnemial ridge. *Hunterian.*

1158. The left femur, longitudinally bisected, of the same Auk: it shows a medullary cavity. *Hunterian.*

1159. The left tibia, longitudinally bisected, of the same Auk: it, also, has a medullary cavity. *Hunterian.*

1160. The right metatarsus of the same Auk. *Hunterian.*

Genus *Fratercula.*

1161. The skeleton of the common Puffin (*Fratercula arctica*).

The superorbital ridge is remarkable for the short extent of its attachment to the frontals, and for the development of its angles into the postfrontal and antorbital processes. The superorbital glandular fossa meets the temporal fossa on the upper part of the ridge: the rostral part of the premaxillary commences by an abrupt elevation above the nasal process of the same bone, and the symphysial part of the mandible sinks down in an analogous manner below the level of the rami, both forming the basis of a deep, compressed, sharp-pointed beak, trenchant above and below. The vertebral and sternal ribs progressively elongate as they are placed further back, and join each other at acute angles, as in the genus *Alca* and other diving birds: the hypapophyses of the middle dorsal vertebræ are remarkable for their great length and terminal bifurcation. There are 21 vertebræ between the skull and sacrum, the last seven supporting moveable ribs, of which the first pair is free, and the succeeding six pairs articulated to the sternum by bony hæmapophyses; the eighth pair of ribs is attached to the first sacral vertebra. There are 8 caudal vertebræ.

Mus. South.

1162. The dried head of the Puffin (*Fratercula arctica*).

Presented by W. Bullock, Esq.

1163. The dried head of a young Puffin (*Fratercula arctica*). *Hunterian.*

Family *Colymbidæ*.

Genus *Uria**.

1164. The skeleton of the Guillemot (*Uria Troile*).

There are 21 vertebræ between the skull and sternum, to the last six of which are attached ribs, articulated to the sternum by bony hæmapophyses. Anterior to these there is one pair of ribs, free, and unattached to the sternum: the last or eighth pair of ribs is attached to the sacrum and to the sternum by long hæmapophyses. There are 8 caudal vertebræ.

The dorsal vertebræ are bound together by many ossified tendons of the deep-seated spinal muscles. The ribs are remarkable for the progressive elongation of their hæmapophyses, and the acute angles at which they articulate with the pleurapophyses.

Mus. South.

Genus *Colymbus*.

1165. The skeleton of the Great Diver (*Colymbus glacialis*).

The superorbital glandular fossæ are unusually long, and divided only by a thin ridge above the orbits; the temporal depressions, likewise, are divided by a parietal crista, and by a stronger superoccipital crest from the occipital depressions, which are divided from each other by a sharp median occipital ridge. The mastoid is convex above the tympanic articulation, as if pressed up by it. The common base of the procnemial and ectocnemial ridges extends upwards in the direction of the shaft of the tibia nearly two inches beyond the femoral articulation. There are 21 vertebræ between the skull and sacrum, and the last six support ribs, which are articulated by their hæmapophyses to the sternum. The seventh and eighth pairs of moveable ribs are attached to the sacrum, and are articulated to the sternum by hæmapophyses: the first rib is free and unattached to the sternum. There are 7 caudal vertebræ. Hypapophyses are developed from the last three cervical vertebræ, the seven dorsal vertebræ and the first sacral vertebra; most of them are remarkable for their great length and terminal bifurcation.

Mus. South.

1166. The pelvis and bones of the right leg of the Red-throated Diver (*Colymbus septentrionalis*).

* No Puffins or Guillemots are known to exist south of the Equator.

It is chiefly remarkable for the shortness of the femur as compared with the length of the tibia, which is much increased by the development of the epicnemial process, formed by the convergence and union of the pro- and ecto-cnemial ridges, in the line of the axis of the shaft, half way down which the procnemial ridge is continued. The fibula is of unusual length; the metatarsus is singularly compressed.

Mus. Brookes.

Family *Tolipalmatæ*. Fishers.

Genus *Pelecanus* (Pelicans).

1167. The skeleton of the common Pelican (*Pelecanus onocrotalus*).

There are 19 vertebræ between the skull and sacrum, the last three of which support moveable ribs: of these the first pair is free and floating; the second and third pairs, like the fourth, fifth and sixth pairs of ribs, which are attached to the sacrum, are articulated by bony hæmapophyses to the sternum. All the ribs, save the first and last, have bony appendages, and from the hæmapophyses of the last pair a bony projection passes backwards. There are 7 caudal vertebræ. The anterior dorsal vertebræ support feeble rudiments of hypapophyses.

Mus. South.

1168. The skull of the White Pelican (*Pelecanus onocrotalus*, Linn.).

Presented by Dr. Leach, 1824.

1169. The skull of a large Pelican (*Pelecanus onocrotalus*). From the Himalayan Mountains. *Presented by Lieut.-Colonel Finch*, 1830.

1170. The skull of a Pelican (*Pelecanus onocrotalus*). *Hunterian.*

1171. The skull of a Pelican (*Pelecanus onocrotalus*). *Hunterian.*

1172. The skull of a Pelican (*Pelecanus onocrotalus*). *Hunterian.*

1173. The skull of a Pelican (*Pelecanus onocrotalus*). *Hunterian.*

1174. The mandibular bones of a Pelican (*Pelecanus onocrotalus*).

A portion of the inner wall of the left ramus has been removed to show the wide air-cavity.

Hunterian.

1175. The right coracoid of a Pelican (*Pelecanus onocrotalus*). *Hunterian.*

1176. The right humerus of a Pelican (*Pelecanus onocrotalus*), the wall of which has been partially removed. *Hunterian.*

1177. The left humerus of a Pelican (*Pelecanus onocrotalus*). *Hunterian.*

1178. The right ulna of a Pelican (*Pelecanus onocrotalus*).

A portion has been removed from the greater part of its length to show its wide air-cavity. *Hunterian.*

1179. The left metacarpus of a Pelican (*Pelecanus onocrotalus*). *Hunterian.*

Genus *Phalacrocorax* (Cormorants).

1180. The skeleton of the Cormorant (*Phalacrocorax carbo*).

There are 23 vertebræ between the skull and sacrum, and 7 pairs of ribs. The first rib is free; the next four are attached to the last four dorsal vertebræ, and are articulated by bony hæmapophyses to the sternum; the last two pairs of ribs are attached to the sacrum. There are 7 caudal vertebræ. *Mus. South.*

1181. The skull of the common Cormorant (*Phalacrocorax carbo*). The osseous style appended to the occiput is preserved. *Hunterian.*

1182. The skull of a Cormorant (*Phalacrocorax carbo*), with the occipital osseous style attached. *Mus. Brookes.*

1183. The skull of the Lesser Cormorant, or Shag (*Phalacrocorax graculus*). *Hunterian.*

Genus *Sula* (Gannets).

1184. The skeleton of the Gannet (*Sula bassana*).

There are 22 vertebræ between the skull and sacrum; the last five support ribs, which, save the first pair, are attached by bony hæmapophyses to the sternum; two other pairs of ribs are attached to the sacral vertebræ ; the hæmapophysis of the first articulating with the sternum, while that of the last is attached to the preceding hæmapophysis.

Hunterian.

1185. The skeleton of the Gannet (*Sula bassana*).

The furculum and two phalanges of the left middle toe, and the right femur, show the effects of ossific inflammation. The number of vertebræ between the skull and sacrum is 21, the last four of which support ribs with bony appendages, and attached to the sternum by hæmapophyses ; the last three pairs of ribs are attached to the sacral vertebræ. The difference in the vertebral characters from the foregoing specimen is due merely to a greater degree of confluence of the twenty-second vertebra with the sacrum in the present skeleton. There are 8 caudal vertebræ.

Mus. South.

1186. The skull of the Gannet (*Sula bassana*).

The external nostrils are reduced to extremely minute perforations at the extremity of the grooves, answering to those leading to the external nostrils in the Cormorant.

Presented by Sir Everard Home, Bart., F.R.S.

1187. The dried head of a Gannet (*Sula bassana*). *Hunterian.*

1188. The sternum, furculum, and scapular arch of a Gannet (*Sula bassana*), with five pairs of hæmapophyses, or sternal ribs.

The apex of the furculum has coalesced with that of the keel of the sternum, but the line of original separation may be traced. The episternal process is much developed, and supports the chief part of the keel, which subsides at the middle of the proper sternum. This bone is entire, with two posterior emarginations.

Purchased.

Tribe Longipennatæ (Wanderers).

Family *Procellariidæ*.

Genus *Diomedæa* (Albatroses).

1189. The skeleton of the Great Albatros (*Diomedæa exulans*).

It is remarkable for the great length of the humerus and antibrachial bones. The skull is characterized by the large and deep superorbital fossæ, for the lodgment of a peculiar gland, the duct of which passes through a deep notch at the anterior part of the superorbital ridge. The base of the skull is also peculiar for a large and very deep circular fossa, opening anterior to the articular cavity of the tympanic bone. The number of vertebræ between the skull and the sacrum is 20: the first sacral or anchylosed vertebra supports the last pair of moveable ribs; this rib, like the dorsal ones, has a double articulation, viz. with the centrum and diapophysis of its vertebra. It is also articulated by a bony hæmapophysis, or sternal rib, with the sternum through the medium of the antecedent rib, to the sternal extremity of which it is anchylosed. The sternum is broad, very convex, with a stout keel, entire, and with four small rounded notches upon its posterior margin; at its anterior margin it presents on each side two distinct and remote articular surfaces for the very broad and short coracoids; the anterior of these surfaces consists of a wide groove continued at one end upon a convex surface; the posterior surface is a deep but narrow notch; the furculum is comparatively slender, but forms a wide arch; it is articulated to the flattened apex of the sternal keel. Seven pairs of ribs are completed by bony hæmapophyses, and the first five pairs support anchylosed appendages; these are preceded by a long and slender styliform rib, reaching to, but not articulating with, the sternum. The scapula is long and unusually slender, retaining its normal form as a pleurapophysis. The deltoid ridge of the humerus is compressed and angular; the shaft of the humerus is slightly compressed, and becomes trihedral towards its distal end, a ridge extending to the outer condyle, above which a short, well-marked process stands out. There is a small pneumatic foramen at the base of the deltoid process. The shaft of the ulna presents an oval transverse section and two rows of rough spots, indicating the attachment of the great quill-feathers; it has no pneumatic foramen; the medullary arterial canal runs distad. The shaft of the long and slender radius is trihedral; it is also a marrow-bone. The metacarpus consists as usual of three metacarpal bones, anchylosed together, and to a carpal bone, answering to the os magnum at the proximal end. The largest metacarpal is that of the 'medius' digit; the slender one of equal length is that of the 'annularis' or fourth digit; the metacarpus of the index is a short rudiment. The principal metacarpal is deeply grooved for the passage of an extensor tendon. The bones of the leg are comparatively short: the femur is but a fourth part the length of the humerus and presents a large and distinct pit for the ligamentum teres, on the upper part of the head: the trochanter does not rise so high as this part. The tibia is more than twice the length of the femur; it is chiefly remarkable for the great development of the procnemial and ectocnemial ridges and of their common base. The tendinous canal at the forepart of the distal end is crossed by an osseous bridge. The metatarsus has a four-sided shaft, deeply grooved, but not perforated, at the back part of its proximal end: it is perforated above the interspace between the middle and internal trochlea. There are 6 free caudal vertebræ.

Purchased.

1190. The skull of an Albatros (*Diomedæa exulans*). *Hunterian.*

1191. The skull of an Albatros (*Diomedæa exulans*). *Hunterian.*

1192. The left moiety of the vertically bisected cranium of an Albatros (*Diomedæa exulans*). *Presented by Prof. Owen, F.R.S.*

1193. The mutilated skull of an Albatros (*Diomedæa exulans*).
Presented by Dr. Leach, F.L.S.

1194. The dried head of an Albatros (*Diomedæa exulans*).
Presented by W. Bullock, Esq.

1195. The mandibles of an Albatros (*Diomedæa exulans*), with their bony sheath.
Presented by Sir Wm. Blizard, F.R.S.

1196. The thorax and pelvis of an Albatros (*Diomedæa exulans*).

There are 8 pairs of ribs, the last of which is attached to the sacrum: the first pair is free, or floating; the rest are completed by bony hæmapophyses, which articulate with the sternum, save the last, which terminates before it attains that bone. There are 7 caudal vertebræ.

Hunterian.

1197. The right radius and ulna of an Albatros (*Diomedæa exulans*). *Hunterian.*

1198. The left radius and ulna of the same Albatros. *Hunterian.*

1199. The furculum of an Albatros (*Diomedæa exulans*). *Hunterian.*

1200. The right coracoid of the same Albatros.

1201. The left coracoid of the same Albatros.

1202. The right scapula of the same Albatros.

1203. The left scapula of the same Albatros.

1204. The right humerus of the same Albatros.

1205. The left humerus of the same Albatros.

1206. The right ulna of the same Albatros.

1207. The right radius of the same Albatros.

1208. The left ulna of the same Albatros.

1209. The left radius of the same Albatros.

1210. The right metacarpus of the same Albatros.

1211. The left metacarpus of the same Albatros.

1212. The right femur of the same Albatros.

1213. The left femur of the same Albatros.

1214. The left tibia and fibula of the same Albatros.

1215. A longitudinal section of the right tibia of the same Albatros.

1216. A longitudinal section of the right metatarsus of the same Albatros.

1217. The left metatarsus and phalanges, with the natatory membrane, of an Albatros. *Hunterian.*

1218. The skeleton of an Albatros (*Diomedæa culminata*).

Its osteology corresponds in all essential particulars with that of the larger species, but the nostrils are more advanced, and the upper concavity of the beak is shorter. The number of free vertebræ between the skull and sacrum is 20: of these, the five last have the pleurapophyses articulated to the sternum by bony hæmapophyses. All the ribs completed by hæmapophyses joining the sternum support bony appendages. There are 9 free caudal vertebræ. *Mus. Gould.*

1219. The skeleton of a small species of Albatros (*Diomedæa melanophrys*).

The number of vertebræ between the skull and sacrum is 20, the last seven of which support moveable ribs: the first two pairs are free and floating; the succeeding five pairs are attached by hæmapophyses to the sternum; the last two pairs of ribs are attached to the sacral vertebræ, the last of which is not directly united to the sternum.

Mus. Gould.

Genus *Procellaria* (Petrels).

1220. The skeleton of the Cape Petrel (*Procellaria capensis*).

The number of vertebræ between the skull and the sacrum is 20, of which the last five support ribs articulated by hæmapophyses with the sternum; this bone corresponds in form with that of the Albatros. The furculum is relatively stronger, but forms a narrower and more angular arch.

Mus. Brookes.

1221. The dried head of the Cape Petrel (*Procellaria capensis*).

Presented by W. Bullock, Esq.

1222. The skull of the Giant Petrel (*Procellaria gigantea*). *Hunterian.*

1223. The dried head of the Fulmar or St. Kilda Petrel (*Procellaria glacialis*).

Hunterian.

Genus *Puffinus.*

1224. The skeleton of the Short-tailed Petrel (*Puffinus brevicaudus*).

Hab.—Green Island, Bass's Straits.

The number of free vertebræ between the skull and sacrum is 20, the last eight of which support free ribs, a ninth pair of ribs being attached to the first sacral vertebra. This genus is remarkable for the large size and upward development of the epicnemial process of the tibia; but the procnemial, like the ectonemial ridge, subsides at the commencement of the shaft of the bone. A styliform accessory ossicle is attached to the produced entocondyloid process of the humerus.

Mus. Gould.

Genus *Larus* (Gulls).

1225. The skeleton of the Grey Gull (*Larus glaucoides*).

There are 20 vertebræ between the skull and sacrum, the last six of which support ribs. The first rib is free and floating; the five succeeding pairs are articulated to the sternum by bony hæmapophyses; the last two pairs of ribs are attached to the sacrum. There are 9 caudal vertebræ. The pectoral process of the humerus is strongly developed and incurved, and there is a strong ectocondyloid process.

Mus. South.

1226. The skeleton of the Cob, or Black-backed Gull (*Larus marinus*).

It presents large but shallow superorbital glandular fossæ. The angle of the jaw is much developed, and curved inwards and upwards: an oval perforation is left between the anchylosed angular and surangular pieces, and an oblong fissure between these and the dentary piece of the lower jaw. The number of vertebræ from the skull to the sacrum are 20, of which the last six support ribs which are articulated by their hæmapophyses to the sternum. The last rib is attached to the sacrum, and is joined to the preceding rib by its hæmapophysis: the first rib is free and unattached to the sternum. There are 9 caudal vertebræ.

Mus. South.

1227. The skull of the Cob, or Black-backed Gull (*Larus marinus*, Linn.).

Presented by W. Bullock, Esq.

1228. The skull of the Black-backed Gull (*Larus marinus*). *Hunterian.*

1229. The skull of the Black-backed Gull (*Larus marinus*), in longitudinal section.
Hunterian.

1230. The skull of a Gull, rather smaller than the preceding specimens from the *Larus marinus*. *Hunterian.*

1231. The skull of the Brown, or Skua Gull (*Larus catarractes*). *Hunterian.*

1232. The skull of the common Gull (*Larus canus*). *Hunterian.*

1233. The skeleton of the Three-toed Gull (*Larus tridactylus*).

It has 21 vertebræ between the skull and sacrum, the last seven of which support ribs: of these the first pair is free and floating; the six succeeding ones are articulated to the sternum by bony hæmapophyses; the last or eighth pair of ribs are attached to the sacrum, and their hæmapophyses join those of the preceding pair. There are 9 caudal vertebræ.

Mus. South.

1234. The skull of a small Gull (*Larus*). *Mus. South.*

1235. The hyoidean arch of a small Gull (*Larus*). *Presented by Dr. Leach, F.L.S.*

1236. The thorax, pelvis, and scapular arch of a small Gull (*Larus*).

There are 9 pairs of ribs, the last two being supported by sacral vertebræ: the first pair is free or floating; the rest are completed by bony hæmapophyses, all of which, save the last, articulate directly with the sternum: five pairs of these ribs support appendages. Many of the tendons of the dorso-spinal muscles are ossified.

Hunterian.

Genus *Sterna* (Terns).

1237. The skeleton of a large Tern (*Sterna caspia*).

There are 20 vertebræ between the skull and sternum, the last six of which support moveable ribs, of which the first is free; the succeeding five are articulated to the sternum by bony hæmapophyses; the seventh and eighth pairs of ribs are attached to the sacrum, the seventh being articulated to the sternum by bony hæmapophyses, whilst those of the eighth are attached to the preceding ones. There are 9 caudal vertebræ. The pectoral process of the humerus is unusually developed and incurved.

Hunterian.

1238. The skeleton of a Tern (*Sterna* (*Thalasseus*) *poliocercus*).

The number of vertebræ between the skull and the sacrum is 21, of which the last six support moveable ribs, the first sacral vertebræ supporting a similar pair. The keel of the sternum is relatively longer and deeper than in the Albatros or Petrel. The apex of the furculum is attached to a semi-ossified arch or loop, at the fore part of the apex of the keel of the sternum. The pectoral process of the humerus is remarkably developed and incurved; the ectocondyloid process is also more developed than in the Albatros. There are 8 caudal vertebræ.

Mus. Gould.

1239. The skull of the common Tern (*Sterna Hirundo*). *Purchased.*

1240. The dried head of the common Tern (*Sterna Hirundo*).

Presented by W. Bullock, Esq.

Family *Lamellirostres.*

Genus *Cygnus* (Swans).

1241. The skeleton of the Wild Swan (*Cygnus ferus*).

There are 28 vertebræ between the skull and the sacrum, the last five of which support moveable ribs: of these the first pair is free; the next four are articulated to the sternum by bony hæmapophyses; the last five pairs of ribs are attached to the sacrum and also to the sternum; but the tenth, or last rib on the left side, is very rudimentary, being only about one inch in length. There are 7 caudal vertebræ. The trachea penetrates the sternum, the apex of the furculum bending upwards and forming a hoop over it as it enters into the keel of the bone.

Mus. Brookes.

1242. The skeleton of the Wild Swan (*Cygnus ferus*).

The vertebral formula is the same as in the preceding specimen.

Mus. South.

1243. The skull of the Wild Swan (*Cygnus ferus*). *Hunterian.*

1244. The skull of the Wild Swan (*Cygnus ferus*), longitudinally bisected.

Hunterian.

1245. The skull of the Wild Swan (*Cygnus ferus*). *Purchased.*

1246. The skeleton of the trunk of a Wild Swan (*Cygnus ferus*). A portion of the right side of the sternum has been removed to exhibit the tortuous trachea which it incloses.

To the great length and peculiar course of the windpipe in this species is to be attributed its remarkably loud and harsh voice, whence the name *Hooper*, or *Whistling Swan*, has been derived; and is applied in contradistinction to the domestic or *Mute Swan*, in which, as in most other birds, the trachea proceeds at once to the lungs, without entering the sternum.

In the female of the wild species, the course of the trachea is much more limited than in the male, seldom penetrating the sternum to a greater extent than from three to four inches.

Hunterian.

1247. The sternum and scapular arch of a Wild Swan (*Cygnus ferus*).

Mus. Brookes.

1248. The sternum and scapular arch of a Wild Swan (*Cygnus ferus*). The course of the trachea within the keel of the sternum is exposed on the right side.

Presented by Sir Everard Home, Bart., F.R.S.

1249. The sternum and scapular arch of a Wild Swan (*Cygnus Bewickii*). The trachea is preserved in connection with this specimen; and the horizontal position of the terminal fold, characteristic of the species, is shown.

Presented by Dr. Leach, F.L.S.

1250. The skeleton of the Mute Swan (*Cygnus olor*).

There are 30 vertebræ between the skull and sacrum, of which the last six support moveable ribs: five other pairs of moveable ribs are attached to sacral vertebræ; the third to the ninth pairs inclusive are attached by bony hæmapophyses to the sternum.

Hunterian.

1251. The skeleton of the Mute Swan (*Cygnus olor*). *Presented by Mr. Dubois.*

1252. The skull of the Mute Swan (*Cygnus olor*). *Hunterian.*

1253. The skull of the Mute Swan (*Cygnus olor*). *Hunterian.*

1254. The skull of the Mute Swan (*Cygnus olor*). *Hunterian.*

1255. The skeleton of the Black Swan (*Cygnus atratus*).

There are 30 vertebræ between the skull and sacrum, of which the last seven support moveable ribs: the first rib is rudimentary; the second free and floating; the succeeding five articulate with the sternum by bony hæmapophyses; the last four pairs of ribs are attached to the sacrum, and the first three of these also articulate by their hæmapophyses with the sternum. There are 8 caudal vertebræ.

Purchased.

1256. The skeleton of a Black Swan (*Cygnus atratus*). It shows the same vertebral formula as in the preceding specimen. *Mus. Brookes.*

1257. The skull of a Black Swan (*Cygnus atratus*). *Purchased.*

1258. The sternum and scapular arch of the Black Swan (*Cygnus atratus*).

Presented by Sir Everard Home, Bart., F.R.S.

1259. The metatarsus of a Swan, longitudinally bisected. *Hunterian.*

Genus *Anser* (Geese).

1260. The skeleton of the common Goose (*Anser palustris*).

The number of vertebræ between the skull and sacrum is 22, the last seven of which support moveable ribs. The first of these ribs is short and straight; the second much longer, reaching to, but not articulating with, the sternum; it supports an appendage; the third rib articulates by a hæmapophysis with the sternum, and both portions support bony appendages; the five succeeding ribs are similarly completed and joined with the sternum; the last free rib has, also, a bony hæmapophysis, which does not join the sternum, but supports a shorter corresponding element of a succeeding rib, which, however, is not further developed. The last two vertebræ supporting free ribs are anchylosed with the iliac bones, and form part of the sacrum. There are 7 caudal vertebræ.

Purchased.

1261. The skeleton of the Egyptian Goose (*Anser ægyptiaca*).

The number of vertebræ from the skull to the sacrum is 21, to the last six of which are attached moveable ribs, of which four are joined by hæmapophyses to the sternum: three other pairs of ribs are attached to the sacrum, of which the first two are joined to the sternum by their hæmapophyses; that of the last is articulated with the hæmapophysis of the preceding rib.

Mus. Brookes.

1262. The skeleton of the New Holland Goose (*Cereopsis australis*).

There are two broad, but not very deep, superorbital glandular depressions, divided by a straight interorbital ridge: the roof of the orbit is cribriform: the postfrontal process is joined by continuous ossification to the lachrymal, forming a complete suborbital inverted arch. The mastoid process is small, and bent towards the paroccipital, forming a tympanic aperture behind and distinct from the os tympanicum. The outer trochlea of the metatarsus is on a level with the inner one. There are 23 vertebræ between the skull and sacrum, the last five of which support ribs: the first of these is free and floating; the succeeding four are attached by bony hæmapophyses to the sternum; the last three ribs are attached to the sacrum, and, with the exception of the last or eighth rib, also to the sternum. Bony appendages are developed from the first six pairs of ribs. There are 6 caudal vertebræ.

Mus. Gould.

Genus *Anas* (Ducks).

1263. The skeleton of a Duck (*Anas boschas*).

The number of vertebræ between the skull and sacrum is 21, the last six of which support ribs, which, save the first pair, are articulated by hæmapophyses with the sternum. The last three pairs of ribs are attached to the sacrum, the first two of which are articulated by hæmapophyses to the sternum, that of the last being articulated to the preceding rib.

Mus. South.

1264. The skeleton of a male Musk Duck (*Biziura lobata*).

There are 22 vertebræ between the skull and sacrum, of which the last seven support ribs: the first of these is free and floating; the six succeeding pairs are articulated to the sternum by bony hæmapophyses; the last two ribs are attached to the sacrum, and by bony hæmapophyses to the sternum. There are 11 caudal vertebræ.

Mus. Gould.

1265. The skeleton of a female Musk Duck (*Biziura lobata*).

There are 21 vertebræ, of which the last six support ribs: the first of these is free and floating; the succeeding five pairs are articulated by bony hæmapophyses to the sternum; the last three pairs of ribs are attached to the sacrum, and, save the last, by bony hæmapophyses to the sternum. There are 9 caudal vertebræ. The difference in the vertebral formula is due to the more complete confluence with the sacrum of the vertebra answering to the last dorsal in the male.

The male is characterized by its greater size, more rugose upper mandible, stronger occipital cristæ, and longer proportional tail. The patella is remarkable for its large size and angular form in both sexes. The outer of the three condyloid divisions of the metatarsus is much raised, as in most of the *Anatidæ*.

Mus. Gould.

1266. The skeleton of a female Sharp-tailed Duck (*Oxyura australis*).

The great development of the procnemial and ectocnemial ridges indicates this species to be a good diver. The breadth of the sternum, with two small notches posteriorly; the strength and span of the furculum; and the strong incurved pectoral processes of the humerus, also bespeak considerable powers of flight. There are 21 vertebræ between the skull and sacrum, of which the last six support ribs: the first of these is free; the rest are articulated to the sternum by bony hæmapophyses. The last two pairs of ribs are attached to the sacrum. There are 8 caudal vertebræ.

Mus. Gould.

1267. The dried head of the Eider Duck (*Anas mollissima*). *Hunterian.*

1268. The skull of the Velvet Duck (*Anas fusca*). *Presented by Dr. Leach, F.L.S.*

1269. The dried head of the Shoveller Duck (*Anas clypeata*).
Presented by W. Bullock, Esq.

1270. The skull of the Mallard, or Wild Duck (*Anas Boschas*).
Presented by Dr. Leach, F.L.S.

1271. The skull of a Duck, from New Holland. *Presented by W. Bullock, Esq.*

Genus *Mergus* (Goosanders).

1272. The skeleton of the Merganser (*Mergus Merganser*).

The sternum is elongated, with two posterior angular perforations. The keel long, with its anterior apex much produced. The procnemial crista of the tibia is much developed, and the large deeply-notched patella is articulated with the ectocnemial ridge. The malar and squamosal bones, which are very long and slender, continue distinct from each other. The number of vertebræ between the skull and sacrum is 21, the last six of which support moveable ribs: of these the first and second pairs are free; the others, together with three pairs of ribs articulated to the sacrum, have bony hæmapophyses articulating with the sternum. There are 7 caudal vertebræ.

Mus. South.

1273. The skull of the Merganser (*Mergus Merganser*). *Hunterian.*

1274. The skull of the Smew (*Mergus albellus*). *Presented by Dr. Leach, F.L.S.*

1275. The hyoidean arch of the Smew (*Mergus albellus*).
Presented by Dr. Leach, F.L.S.

1276. The hyoidean arch of the *Mergus cirratus*. *Presented by Dr. Leach, F.L.S.*

Genus *Podiceps*.

1277. The skull of the Little Grebe (*Podiceps minor*).

Order GRALLATORES.

Genus *Phœnicopterus*.

1278. The skeleton of the Red Flamingo (*Phœnicopterus ruber*).

Here the stilt-like proportions of the tibia and metatarsus, with the concomitant length of the neck, characteristic of the Order of Wading Birds, are strongly manifested. The chief peculiarities of the present genus are the completely webbed structure of the feet, in the entire bird; and, as may be seen in the skeleton, the bending down of the bones of the upper and lower beak, accompanied by an expansion and flattening of the upper, and a singular excavation of the symphysial part of the lower jaw, the alveolar borders of which bend inwards. The texture of the deflected parts of the beak is extremely light, the surface being almost everywhere minutely perforated like a sieve, except at the smooth alveolar borders. There are 23 vertebræ between the skull and sacrum, of which the last six support ribs; those of the first pair are rudimentary; the succeeding five pairs articulate with the sternum by bony hæmapophyses; the last and seventh pair of ribs are attached to the sacrum, and also reach the sternum by means of bony hæmapophyses. These hæmapophyses increase in length as they approach the sacrum. There are 9 caudal vertebræ.

The specimen from which this skeleton was prepared was brought from the Cape of Good Hope.

Purchased.

1279. The dried head of the Red Flamingo (*Phœnicopterus ruber*). *Hunterian.*

Genus *Brachypteryx*.

1280. The skeleton of the Short-winged Rail of New Zealand (*Brachypteryx Australis*).

Of the 21 vertebræ between the skull and the sacrum the nine posterior ones bear moveable ribs, the last seven of which unite with the sternum by bony hæmapophyses.

The occipital surface of the skull is moderately broad, and inclines from below upwards and forwards from the foramen magnum. The mastoid sends down a very small process outside the tympanic articulation, and a somewhat larger and thicker true mastoid process. The postfrontal is short and thick. The temporal fossa is unusually broad, and is continued into a slight depression above the process. The nasal bones and nasal process of the premaxillary are anchylosed to the frontal. The prefrontals send out a short antorbital plate, which does not reach the lachrymal bone. The external nostrils are excavated in the posterior two-thirds of the beak. The suture between the squamosal and malar portions of the straight slender zygomatic arch still remains. The angle of the lower jaw is slightly bent down. The surangular has a small elliptical perforation, and a small fissure is left between this bone, the angular, and the dentary pieces of the lower jaw. The sternum is very narrow, with a posterior median notch and two lateral long fissures: the keel is very feebly developed and with a bifid apex, from which two obtuse ridges diverge to the coracoid articulations. There is a notch in place of the episternal process. The lower surface of the sternum presents a shallow excavation on each side, between the keel and the costal articulations. The humerus equals six dorsal vertebræ of the same skeleton in length. The antibrachium is one-fourth shorter than the humerus. The metacarpus supports the rudiments of two digits, each provided with two phalanges, one of these being supported by the short anterior anchylosed metacarpal. The femur is one-third longer than the humerus, and the tibia is one-third longer than the femur: both procnemial and ectocnemial processes are well-developed: the fibular ridge is short but well-marked, terminating abruptly below: there is a bony bridge in the usual place above the trochlea of the tibia. The calcaneal process of the metatarsus is moderately large, but not perforated. There is a small rudimental metatarsal supporting a hind-toe of two joints: the trochlea for the inner toe does not extend so far down as the outer one: there is a perforation in the interspace between this trochlea and the middle one. The ischium coalesces in great part of its extent with the ilium. The ischiatic foramen is circular. The ischium also joins the pubis, completing an elongated oval foramen.

Purchased.

Genus *Tribonyx*.

1281. The skeleton of the Native Hen of Australia (*Tribonyx Mortieri*).

This bird, in the disproportionate shortness of the wings as compared with the legs, resembles, like the preceding bird, the Struthious family; but it equally belongs, by the length and narrowness of the sternum, by its two deep posterior notches, and its keel, to the Rail tribe. There are 23 vertebræ between the skull and sacrum, of which the last ten support ribs: the first two pairs are free; the succeeding eight pairs articulate with the sternum by bony hæmapophyses; the last (eleventh) pair of ribs are rudimental, and are attached to the sacrum: these do not reach the sternum. There are 7 caudal vertebræ.

Mus. Gould.

Genus *Fulica*.

1282. The skeleton of the Coot (*Fulica atra*).

There are 22 vertebræ between the skull and sacrum, the last eight of which support ribs; the first pair are free and floating. The succeeding ribs reach the sternum by means of bony hæmapophyses: the last or ninth pair of ribs are attached to the sacrum and do not reach the sternum. There are 7 caudal vertebræ. The procnemial and epicnemial ridges of the tibia are well-developed, and support an elongated patella, in this diving species of the Grallatorial Order.

Mus. South.

1283. The skull and feet of a Coot (*Fulica atra*). *Purchased.*

Genus *Gallinula*.

1284. The skeleton of the Gallinule or Water-Hen (*Gallinula chloropus*).

The lobated membranes have been left upon the toes. The large procnemial process of the tibia also indicates the diving power of this bird. The sternum is narrow, and deeply notched behind, but the keel is deep. There are 21 vertebræ between the skull and sacrum, of which the last eight support ribs: the first pair of ribs are rudimentary; the succeeding seven pairs are articulated by progressively increasing hæmapophyses with the sternum; the last or ninth pair of ribs are attached to the sacrum, but neither this nor the preceding pair reach the sternum. There are 8 caudal vertebræ.

Mus. Brookes.

1285. The dried head of the Gallinule (*Gallinula chloropus*).

Presented by W. Bullock, Esq.

Genus *Rallus*.

1286. The dried head of the Black Rail (*Rallus niger*).

Hab.—The Cape of Good Hope.

Presented by W. Bullock, Esq.

Genus *Palamedea*.

1287. The radius, ulna, carpus, metacarpus and phalanges of the right wing, showing its strong spurs, of the American Horned Screamer (*Palamedea cornuta*).

Mus. Brit.

Genus *Parra*.

1288. The skeleton of the Long-toed Coot (*Parra Jacana*).

There are 19 vertebræ between the skull and sacrum, of which the last four support ribs, reaching the sternum by their bony hæmapophyses. The antecedent probably false ribs are missing in this skeleton; the last pair of ribs is attached to the sacrum, but does not reach the sternum. There are 7 caudal vertebræ. The depth of the keel of the sternum is twice the breadth of that bone, the body of which presents two deep and wide posterior notches. The toes are remarkable for their length and slenderness.

This species inhabits the marshes of South America, and walks with facility on the floating leaves of aquatic plants, by means of its long toes.

Mus. South.

Tribe Longirostres.

Genus *Avocetta.*

1289. The skeleton of the Avocet (*Recurvirostra Avocetta*).

The typical characters of the skeleton of the *Grallæ* are well-marked in this bird; but by a singular exception to the usual form of the beak in the *Longirostres,* the long and slender mandibles are slightly curved upwards, whence the name of the genus. There are 21 vertebræ between the skull and the sacrum, of which the last eight bear moveable ribs, and the last six are united to the sternum by bony hæmapophyses: a ninth pair of ribs is attached to the sacrum, but its hæmapophysis, which supports the same element of a tenth rib, does not quite reach the sternum. In the recent bird the feet are webbed nearly to the toes. The species frequents the sea-shores of Europe, and feeds by 'scooping,' as it is termed, with its singular bill, drawing this through the mud or sand from right to left as it advances its left leg foremost, and *vice versâ,* seizing whatever small soft-bodied animal may thus be met with.

Mus. South.

1290. The skeleton of the Long-legged Plover, or Stilt-bird (*Himantopus melanopterus*).

In this species, the characteristic of its Order, viz. the length and slenderness of the tibia and metatarsus, reaches its maximum; the metatarsus being one-third longer than the entire trunk, measured from the first dorsal vertebra to the end of the pelvis. There are 20 vertebræ between the skull and sacrum, of which the last five support ribs; the first pair are free; the rest articulate with the sternum by bony hæmapophyses; the last pair of ribs are attached to the sacrum, and do not reach the sternum. There are 7 caudal vertebræ.

Mus. Brookes.

1291. The skeleton of the Long-legged Plover (*Himantopus melanopterus*).

There are 20 vertebræ between the skull and sacrum, of which the last five bear moveable ribs; the first two pairs are free, and the last four are united to the sternum by hæmapophyses. There are 7 caudal vertebræ.

Mus. South.

1292. The skeleton of the Snipe (*Scolopax Gallinago*).

The upper part of the sacrum is perforated by a double series of foramina on each side the coalesced spines. There are 21 vertebræ between the skull and sacrum, the last seven of which bear moveable ribs; the first pair are free; the rest are united to the sternum by hæmapophyses. There are 7 caudal vertebræ.

Mus. South.

Genus *Numenius.*

1293. The skeleton of the European Ibis, or Whaup Curlew (*Numenius arcuatus*).

The skull shows shallow depressions for large superorbital glands. The genus is chiefly remarkable for the great length and slenderness of the beak, which is slightly curved downwards. There are 21 vertebræ between the skull and sacrum, of which the last seven support ribs: the first pair of ribs are free; the next six pairs are articulated to the sternum by hæmapophyses, which increase in length towards the sacrum; the eighth pair of ribs are attached to the sacrum, and also to the sternum. There are 8 caudal vertebræ.

Mus. South.

1294. The skull of the Whimbrel Curlew (*Numenius Phæopus*). *Purchased.*

Genus *Ibis.*

1295. The mandibles of the Scarlet Ibis (*Ibis ruber*). *Mus. Brit.*

Genus *Machetes.*

1296. The skeleton of the Ruff, or male of the *Machetes pugnax.*

There are 21 vertebræ between the skull and sacrum, the last eight of which support ribs: of these the first and second pairs are free; the rest progressively increase in length, and are articulated by bony hæmapophyses to the sternum; the last two pairs of ribs are attached to the sacrum, but do not reach the sternum. There are 8 caudal vertebræ.

Mus. South.

Genus *Limosa.*

1297. The skeleton of the Bar-tailed Godwit (*Limosa rufa*).

It is remarkable for the extreme elongation and slenderness of the bones of the bill, and for the great depth of the keel of the sternum, the body of which is, however, deeply notched posteriorly on either side. There are 20 vertebræ between the skull and sacrum, of which the last eight support ribs: the first two pairs are rudimentary and free; the six succeeding ones articulate by bony hæmapophyses to the sternum; the ninth pair of ribs are attached to the sacrum, and do not reach the sternum.

Mus. South.

1298. The skull of the Bar-tailed Godwit (*Limosa rufa*). *Purchased.*

Genus *Tringa.*

1299. The skull of the Wood-Sandpiper (*Tringa glareola*). *Mus. Brit.*

1300. The skull of the common Sandpiper (*Tringa hypoleucos*).
Presented by Dr. Leach, F.L.S.

Tribe Cultrirostres.

Genus *Platalea.*

1301. The skeleton of the Spoon-bill (*Platalæa leucorodia*).

The chief peculiarity here consists, as the name of the bird implies, in the spoon-like expansion and flattening of the extremities of the long upper and lower mandibles. There are 22 vertebræ between the skull and sacrum, of which the last six support ribs: the first pair of ribs being free, the rest articulating by bony hæmapophyses with the sternum; the seventh and last pair of ribs are attached to the sacrum, and also join the sternum by bony hæmapophyses. There are 6 caudal vertebræ.

Mus. South.

1302. The skeleton of the Spoon-bill (*Platalæa leucorodia*). The vertebral formula is the same as in the preceding skeleton. *Purchased.*

Genus *Tantalus.*

1303. The skull of the Tantal or Great Ibis (*Tantalus Ibis*). *Purchased.*

Genus *Ciconia* (Storks).

1304. The skeleton of the White Stork (*Ciconia alba*).

The bones of the beak are long, but strong, straight, and conical; the small elliptical nostrils are pierced near the base of the upper mandible. The keel of the sternum is deep and rounded: the apex of the furculum rests upon its anterior extremity: the body of the sternum has two wide but shallow notches posteriorly. There are 20 vertebræ between the skull and sacrum, of which the last five support ribs: the first pair being free, the rest articulating to the sternum by bony hæmapophyses; the last (sixth) pair of ribs are attached to the sacrum, and also articulated to the sternum by hæmapophyses. There are 5 caudal vertebræ.

Mus. South.

1305. The skull of the White Stork (*Ciconia alba*). *Purchased.*

Subgenus *Argala* (Bare-necked Storks).

1306. The skeleton of the Indian Adjutant, or Gigantic Stork (*Ciconia Argala*).

The beak is remarkable for its size and strength, but is straight and conical, as in the true Storks: the apex of the furculum rests upon the anterior end of the sternum. The nostrils are small, elliptical, and perforated near the upper part of the base of the mandible. The atlas and axis are wanting in the present skeleton. The last six of the free vertebræ of the trunk support ribs, of which the first pair are very short: those of the second pair do not reach the sternum; the succeeding four pairs articulate with the sternum by bony hæmapophyses; the last (seventh) pair of ribs are attached to the sacrum, and also articulate with the sternum by hæmapophyses. There are 7 caudal vertebræ.

Presented by Dr. Henderson.

1307. The skull of the Gigantic Stork (*Ciconia Argala*).

Presented by Sir Everard Home, Bart., F.R.S.

1308. The right and left metacarpals or pinion-bones of the Gigantic Stork (*Ciconia Argala*). *Hunterian.*

1309. The skeleton of the African Adjutant, or Marabou (*Ciconia Marabou*).

It scarcely differs from the Asiatic species, except slightly in size. There are 21 vertebræ between the skull and sacrum, of which the last five support ribs: of these the first pair are free, the rest articulating with the sternum by bony hæmapophyses; the last (sixth) pair of ribs are attached to the sacrum, and also to the sternum. There are 7 caudal vertebræ. The difference in the costal formula between this skeleton and that of the *Ciconia Argala* depends only on the short pleurapophyses of the sixteenth vertebra having become anchylosed in the present specimen.

Purchased.

Genus *Mycteria.*

1310. The skull of the Jabiru, or American Stork (*Mycteria americana*).

Hunterian.

Family *Ardeidæ* (Herons).

Genus *Cancroma.*

1311. The skeleton of the Boat-bill (*Cancroma cochlearia*).

The bones of the upper mandible are remarkably expanded, the nasal process of the pre-maxillary forming a strong median ridge along the upper part. The nostrils are small perforations near the base. The temporal fossæ are narrow but deep, and meet in a ridge upon the parietals: the postfrontal is deeply notched, and a well-defined fossa separates the mastoid from the paroccipital process. As compared with the head, the pelvis is very small in this bird; the bones of the leg are slender, but the tibia and metatarsus are less elongated than in most of the Order. The sternum has a deep and long keel, with two slight posterior notches; the apex of the furculum is bent upwards: the bones of the wing are well developed. There are 23 vertebræ between the skull and sacrum, the last seven of which bear moveable ribs: of these only the last four pairs are attached by hæmapophyses to the sternum; there is an eighth pair of sacral ribs with hæmapophyses which join those of the preceding ribs. There are 8 caudal vertebræ.

Mus. South.

1312. The skull of the Boat-bill (*Cancroma cochlearia*). *Mus. Brit.*

Genus *Ardea.*

1313. The skeleton of the Heron (*Ardea cinerea*).

The apex of the furculum rests upon the anterior extremity of the keel of the sternum. There are 23 vertebræ between the skull and sacrum, of which the last six support ribs: the first two pairs are free; the rest are articulated to the sternum by bony hæmapophyses; the last (seventh) pair of ribs are attached to the sacrum, but do not reach the sternum.

Mus. South.

1314. The skull of the common Heron (*Ardea cinerea*). *Purchased.*

1315. The right half of a longitudinally bisected cranium of a Heron (*Ardea cinerea*).

It shows the ridge dividing the compartment for the cerebral lobe from that for the optic lobe; the deep depression on the inner surface of the petrosal, and the junction of the two posterior clinoid processes forming a bridge over the sella. The cut border of the cranial wall is thin, and shows a small proportion of diploë.

Purchased.

1316. The skull of the great White Heron (*Ardea alba*). *Hunterian.*

1317. The skeleton of the Bittern (*Ardea stellaris*).

The apex of the furculum does not reach the sternum. There are 23 vertebræ between the skull and sternum, of which the last six support ribs: the first two pairs are free; the succeeding ribs are articulated to the sternum by bony hæmapophyses; the last (seventh) pair of ribs are attached to the sacrum and do not reach the sternum. There are 8 caudal vertebræ.

Mus. South.

1318. The skull of a small Bittern (*Ardea minor*). *Purchased.*

Family *Gruidæ* (Cranes).

1319. The skeleton of the Cyrus or Serass Crane (*Grus Antigone*).

The bones of the beak are straight and conical, but relatively shorter than in the Stork; the bony nostrils form an extensive excavation in the upper mandible. The number of bone-tendons developed from the spinal muscles is considerable; they contribute to fix all the dorsal vertebræ; but the chief peculiarity of this species of Crane is the excavation of the keel of the sternum for the reception of a coil of the trachea: the apex of the furculum has coalesced with the anterior and inferior extremity of the keel: the anterior and superior extremity of the keel makes an unusual projection forwards. There are 25 vertebræ between the skull and sacrum, of which the last seven support ribs: the first rib is free and floating; the succeeding ones are articulated to the sternum by bony hæmapophyses; the eighth and ninth pairs of ribs are attached to the sacrum, and also by bony hæmapophyses to the sternum. There are 7 caudal vertebræ.

Purchased.

1320. The skeleton of the Cyrus Crane (*Grus Antigone*).

The left side of the keel of the sternum has been removed to expose the convolutions of the trachea: the vertebral and costal characters agree with those of the preceding skeleton.

Mus. South.

1321. The skull of a Cyrus Crane (*Grus Antigone*). *Hunterian.*

1322. The sternum and confluent furculum of the same Crane. *Hunterian.*

1323. The scapulæ of the same Crane. *Hunterian.*

1324. The coracoids of the same Crane. *Hunterian.*

1325. The seven dorsal vertebræ, or those which bore moveable ribs, and the last cervical vertebra of the same Crane. *Hunterian.*

1326. The pelvis of the same Crane. *Hunterian.*

1327. The left humerus of the same Crane. *Hunterian.*

1328. The tibiæ and fibulæ of the same Crane. *Hunterian.*

1329. The metatarsal bones of the same Crane. *Hunterian.*

1330. The sternum and trachea of a young Cyrus Crane (*Grus Antigone*).
Presented by Sir Everard Home, Bart., F.R.S.

1331. The dorsal vertebræ, sternum, scapular arch, and pelvis of the Cyrus Crane (*Grus Antigone*).

The left side of the sternum has been laid open, showing the intrasternal coils of the trachea.
Presented by William Clift, Esq., F.R.S.

1332. The sternum and trachea of the Cyrus Crane.

1333. The sternum and trachea of the Indian Crane.
Presented by Sir Everard Home, Bart., F.R.S.

1334. The sternum and trachea of the Indian Crane. *Hunterian.*

1335. The skeleton of the Balearic or Crowned Crane (*Grus pavonia*).

This species is remarkable for the elevation and convexity of the frontal ridge of the cranium which supports the tuft or 'crown' of unbarbed stems. The furculum touches but is not joined to the sternum. There are 26 vertebræ between the skull and sacrum, of which the last eight support ribs: the first two pairs are free; the succeeding ones are articulated to the sternum by bony hæmapophyses; the last (ninth) pair of ribs are attached to the sacrum, and also to the sternum. The caudal vertebræ are anchylosed together, the last only remaining moveable.

Mus. South

1336. The skull of the Crowned Crane (*Grus pavonia*).

Presented by Dr. Leach, F.L.S.

1337. The skull of the Crowned Crane (*Grus pavonia*), longitudinally bisected.

It shows the light cellular pneumatic diploë which separates the two tables of the cranium at the situation of the frontal protuberance.

Purchased.

1338. The dried head of the Crowned Crane (*Grus pavonia*).

Presented by W. Bullock, Esq.

1339. The skull of the Demoiselle Crane (*Grus virgo*).

Presented by Dr. Leach, F.L.S.

1340. The skull of the Demoiselle Crane (*Grus virgo*).

Presented by Dr. Leach, F.L.S.

1341. The skull of the Common Crane (*Grus cinerea*). *Hunterian.*

1342. The sternum, sternal and vertebral ribs, and scapular arch of the Common Crane (*Grus cinerea*). The keel of the sternum is excavated, and the furculum anchylosed to the keel, as in the Cyrus Crane. *Purchased.*

Genus *Psophia.*

1343. The skeleton of the Agami or Trumpeter Bird (*Psophia crepitans*).

There are 24 vertebræ between the skull and the sacrum, of which the last eight bear moveable ribs: of these the last six pairs are united to the sternum by hæmapophyses: a ninth pair of ribs is attached to the sacrum and also to the sternum. Three dorsal vertebræ have coalesced, and three remain free between these and the sacrum: the sternum is very long and narrow, without posterior notches or holes: the coracoid sends off from its inner and anterior border a long thin ridge, which forms an angle at its upper part. The procnemial and ectocnemial ridges of the tibia extend well outwards, but their base is short.

Mus. South.

Tribe Pressirostres.

Genus *Hæmatopus.*

1344. The skeleton of the Oyster-catcher (*Hæmatopus ostralegus*).

The depressions for the superorbital glands meet at a median ridge; the angle of the jaw is unusually prolonged backwards. There is a short ectocondyloid process in the humerus. There are 20 vertebræ between the skull and sacrum, of which the last eight support ribs: the first two pairs are rudimentary and free; the other six articulate with the sternum by bony hæmapophyses; the ninth and tenth pairs of ribs are attached to the sacrum, but the tenth is not joined to the sternum. There are 8 caudal vertebræ.

Mus. South.

1345. The skull of the Oyster-catcher (*Hæmatopus ostralegus*). *Hunterian.*

1346. The dried head of the Black Oyster-catcher (*Hæmatopus niger*). *Hunterian.*

Genus *Charadrius.*

1347. The skeleton of the Dottrell (*Charadrius Morinellus*).

Of the 19 vertebræ between the skull and sacrum, the last six bear moveable ribs: the first pair is free; the rest unite with the sternum by hæmapophyses; the last (seventh) pair of ribs belong to the sacrum.

Purchased.

Genus *Otis.*

1348. The skeleton of the male of the Great Bustard (*Otis tarda*).

The skull is remarkable for the extension of a strong ridge from the paroccipitals to the basisphenoid, increasing the extent of the occipital surface inferiorly for the attachment of muscles. The mastoid sends down a short triangular process outside the tympanic articulation, and an unusually long and slender true mastoid process: the postfrontal is also very long and slender. There are 21 vertebræ between the skull and the sacrum, of which the last six bear moveable ribs: the first pair are very short; the second longer, but free; the following four pairs are articulated to the sternum by hæmapophyses; two pairs of ribs are attached to the sacrum, the last of which are free. There are 7 caudal vertebræ, most of which are remarkable for the length of the transverse processes.

Mus. South.

1349. The skeleton of the female Great Bustard (*Otis tarda*).

This is rather smaller, and the vertebræ are more slender than in the male: the vertebral formula is the same, but the eighth pair of ribs join the sternum by bony hæmapophyses.

Purchased.

1350. The skull of the female Great Bustard (*Otis tarda*). *Hunterian.*

1351. The sternum of the Great Bustard (*Otis tarda*).

It has a very deep keel, and four small notches posteriorly.

Hunterian.

1352. The right femur of the Great Bustard (*Otis tarda*). *Hunterian.*

1353. The right tibia of the Great Bustard (*Otis tarda*). *Hunterian.*

1354. The skeleton of the Little Bustard (*Otis Tetrax*).

There are 21 vertebræ between the skull and the sacrum, the last six of which bear moveable ribs: the first pair is very short; the second longer, but free; the other four pairs are articulated to the sternum by hæmapophyses; the sacral ribs are wanting.

Mus. South.

Order CURSORES (*Struthious, or Wing-less Birds*).

Genus *Apteryx*.

1355. The skeleton of the Kivi (*Apteryx australis*).

The rarity and peculiarity of this the smallest known representative of the Cursorial or Struthious Order of Birds, and the additional interest which its osteology presents in connection with the remains of allied extinct gigantic species of birds, confined, like the *Apteryx*, to New Zealand, demand the following more detailed notice of the characters of the skeleton.

The bony framework of the *Apteryx* exhibits, but in a less degree than the entire bird, the Struthious disproportion between the anterior and posterior extremities, and it shows that all the ordinary bones of the wing exist, though in their feeblest state of development.

With the exception of the parts of the skeleton concerned in the formation of the nasal and auditory cavities, none of the other bones of the *Apteryx* are perforated for the admission of air, nor do they exhibit the pure white colour which characterizes the skeleton in other birds. In their tough and compact texture they resemble the bones of the Lizard tribe.

The skull of the *Apteryx* is chiefly remarkable for its smooth, expanded, elevated, pyriform cranial portion, the total absence of superorbital ridges, the completeness and the thickness of the interorbital septum, owing to the great development of the turbinal bones, the small size of the lacrymal bones, and the combination of the depressed with the elongated and slender form of the beak.

The occipital region of the cranium has a pretty regular semicircular contour, and differs from that of other Struthious birds in the greater relative extent of its base, and in the comparatively slight lateral sinuosities due to the temporal depressions. The single hemispherical tubercle in the basioccipital, for the articulation with the atlas, has not the vertical notch at the upper part observable in the Ostrich and Emeu, but is entire as in the Rhea; and the plane of the occipital foramen has the same aspect as in that bird, in which it is more nearly horizontal than in the Ostrich. The superoccipital plate forms a somewhat angular projection, corresponding with the small cerebellum within, and is bounded on each side by a vertical vascular groove, terminated by a foramen above and below: external to these grooves the exoccipitals extend outwards and downwards, in the form of obtuse processes, compressed in the antero-posterior direction, slightly convex behind and concave in front, where they form the back part of the wide meatus auditorius externus. All the parts of the occipital bone are anchylosed together, and also to the surrounding bones.

The angle between the posterior and superior regions of the cranium is scarcely produced into a ridge. The superior region is smooth and regularly convex; it is separated from the temporal depressions by a narrow ridge, a little more marked than the occipital one.

The superior is continued into the lateral regions of the cranium by a continuous curvature, so that the upper part of the small orbital cavity is convex, and its limits undefinable, there being no trace of superorbital ridge or antorbital or postorbital processes: this structure is quite peculiar to the *Apteryx* among birds, but produces a very interesting resemblance between it and the monotrematous *Echidna*.

The frontal bones gradually contract to their junction with the nasal bones, between which there is the trace of a small part of the confluent prefrontals. The narrow frontal region of the skull is traversed by a mesial longitudinal depression.

At the base of the skull we find in the *Apteryx* all the peculiarities characteristic of the Struthious birds. The body of the sphenoid sends outwards on each side two processes, of which the posterior abuts against the tympanic bone, and the anterior one, by a flattened oval articular surface against the pterygoid bone: the latter processes exist, but are much more feebly developed, in the Ibis: in most other birds, including the *Grallæ*, they are wanting: they are well-developed in the Lacertine *Sauria*. A compressed vomerine process is continued forwards from the anterior part of the basisphenoid, and this process is anchylosed to the under part of the expanded and cellular ethmoid.

The optic foramina are distinct both internally and externally, and are half an inch apart; they are perforated, not in the sphenoid ala, but in the inflected margin of the frontal bone. In these peculiarities the *Apteryx* differs from all the rest of its class: each optic foramen, however, transmits not only the optic nerve and ophthalmic artery, but also the third, fourth, first branch of the fifth and sixth nerves, as in most other birds. Of these nerves the fifth is the largest, and it is continued forwards to the nasal canal, through two foramina, one circumscribed externally by the process already mentioned, which extends from the frontal to the ethmoid; the other by the corresponding process of the lacrymal. The foramen rotundum is not only distinct, but is further apart from the foramen opticum than in any other bird. The petrous bone projects internally in the form of a thin semicircular plate of bone, commencing at the foramen ovale and extending backwards to the foramen auditorium internum, which it overhangs: this plate gives attachment to the tentorium. There is not any corresponding bony ridge developed from the upper wall of the cranium in the line of origin of the falx, as in many of the Gallinaceous birds. The anterior or cerebral division of the cranial cavity is larger in proportion to the posterior than in most other birds.

The tympanic bone is of a subcompressed trihedral form, and sends forwards into the orbit a longer and slenderer process than in the larger *Struthionidæ*: its upper articular surface is a transversely extended convex condyle, which plays in a corresponding cavity internal to the base of the zygomatic process. The opposite extremity is expanded, and presents two distinct articular convexities for the lower jaw, the inner one being the largest: above the external convexity there is a small but deep depression for the reception of the deflected extremity of the jugal bone.

The posterior extremity of the pterygoid bone is securely wedged in between the orbital process of the tympanic and the transverse process of the sphenoid: as it advances forwards it expands, as in the other *Struthionidæ*, into a thin plate of bone, which is bent upon itself with its concavity turned inwards, and is continued by anchylosis into the palatine bones, so that the limits between them cannot be defined.

The palatine bones are in like manner confluent with the maxillaries. They are pierced by two narrow elliptical posterior nasal foramina, about 3 lines in length, over which the exterior margin of each palatine bone arches from without inwards, and these overarching laminæ gradually approximate, as they advance forwards, and meet about one inch anterior to the nasal foramina, from which an imperforate plate of bone, impressed with a narrow median fissure, and composed of the confluent palatal processes of the maxillary and intermaxillary bones, is continued to the end of the beak. The limits between maxillary and intermaxillary bones are indicated by two fine oblique lines, commencing at the outer margin of the roof of the mouth, about 2½ inches from the apex of the beak.

The jugal style, which in the Ostrich may be separated in the full-grown bird into a zygomatic and malar portion, consists in the *Apteryx* of a single slender compressed twisted bone, anchylosed with the maxillary bone in front, and terminated behind by an obtuse deflected extremity, which is received into a corresponding vertical cavity in the upper part of the outer process of the tympanic bone. By this mode of attachment the tympanic bone offers increased resistance to the pressure transferred to it by the lower jaw, at the same time that it gives additional strength to the upper mandible.

The superior maxillary bone presents the singular form of a nearly perfectly flat elongated triangular plate of bone, which is imperforate, and is continued by uninterrupted ossification with the intermaxillary. The Rhea among the *Struthionidæ* makes the nearest approach to the *Apteryx* in the structure of this part of the skull; but the maxillary plate is perforated by large foramina, and sends upwards on each side a process to join the lacrymal. In the Ibis the superior maxillary bones are in the form of slender round styles, having a wide interspace between them. In the *Apteryx* the small lacrymal bones are represented by two compressed plates of bone descending obliquely forwards from the anterior extremities of the frontals, and are articulated below to a small depression in the maxillary plate. They are each pierced by a single small foramen. The frontal, nasal, and intermaxillary bones form one continuous bony piece, too strong to admit of any elastic yielding movement between the upper jaw and cranium. The nasal and the upper or mesial portion of the intermaxillary bones form an elongated depressed narrow process, convex above, and with the outer margins bent inwards beneath the long nasal passages, of which they form the outer and part of the ower boundaries.

The lower jaw presents all the usual ornithic characters with the Struthious modifications traceable in the individual peculiarities. The transversely expanded angular and articular extremities offer the inwardly extended process for the attachment of the pterygoidei muscles: the superior transverse plate behind the articular surfaces is thin and concave towards the meatus auditorius externus, and is lined by the mucous membrane of that passage, of which it forms part of the bony parietes. There are two distinct narrow oblique articular surfaces, concave in the longitudinal and convex in the transverse directions; the internal one is the largest, and behind this there is a small excavation into which a small process of the air-sac lining the tympanum is continued; and this is the only part of the skeleton not immediately concerned in the formation of the organs of hearing or smelling into which air is admitted. The entry to the air-cells in the lower jaw of the Ostrich is situated in the part corresponding to the above depression or sinus in the jaw of the *Apteryx*. Traces of the compound structure of the lower jaw are very evident in that of the *Apteryx*, and the limits of the angular, articular and coronoid pieces may be in part defined. There is a linear vacancy, bounded by the surangular and angular pieces behind, and by the bifurcate commencement of the mandibular or dentary piece in front: the surangular is compressed, and sends upwards a very slightly elevated coronoid ridge. A second narrower fissure occurs between the thick splenial element and the upper fork of the mandibular piece.

The relations of the modifications of the skull of the *Apteryx* to its peculiar habits and kind of food are well-marked and very easily traced; those which concern the maxillary portions have already been noticed in the account of the digestive system, and I need only add here, that the anchylosed condition of all the parts concerned in the formation of the upper mandible is more complete than in the larger *Struthionidæ*, and relates to the greater force with which the beak is used in obtaining the food.

The nocturnal habits of the *Apteryx*, combined with the necessity for a highly developed organ of smell, which chiefly compensates for the low condition of the organ of vision, produces the most singular modifications which the skull presents, and we may say that those cavities which in other birds are devoted to the lodgement of the eyes, are here almost exclusively occupied by the nose.

The spinal column is relatively stronger, especially in the cervical region, than in the larger *Struthionidæ*: it consists of fifteen cervical, nine dorsal, characterized by moveable ribs, and twenty-two remaining vertebræ in the sacral and caudal regions.

The dorsal vertebræ are arranged in a straight line, and slightly increase in breadth to the seventh; the transverse processes of the eighth and ninth suddenly diminish. The third, fourth, fifth and sixth dorsal vertebræ are slightly anchylosed together by the contiguous edges of their spinous processes; the seventh, eighth and ninth are overlapped by the iliac bones; but notwithstanding this partial anchylosis, the synovial articulations, both between the bodies and oblique processes, are retained in all the dorsal vertebræ, and a slight, yielding, elastic movement is permitted between those vertebræ. The breadth of the bodies of the dorsal vertebræ diminishes, and their length increases very gradually from the first to the fourth; thence the bodies become broader and shorter in the same degree to the sacrum. A short obtuse process is sent off obliquely forwards from the inferior surface of the body of each of the first four dorsal vertebræ; the corresponding surface of the succeeding ones is smooth and slightly concave from side to side. The articulation between the bodies is by the adaptation of a surface slightly concave in the vertical and convex in the transverse direction at the posterior end of one vertebra to opposite curves at the anterior end of the succeeding one. Close to the anterior surface on each side there is a hemispherical pit for the reception of the round head of the rib: this articular pit is supported on a process representing the inferior transverse process, except in the three middle dorsal vertebræ. The transverse processes are broad, flat, and square-shaped, with the anterior angle obliquely cut off to receive the abutment of the tubercle of the rib, except in the second and third, in which a small process is sent down for the same purpose from the under surface of the transverse process: the transverse processes of the last three dorsal vertebræ abut against the under or inner surface of the ilia, and are probably anchylosed thereto in old birds. The nerves issue from the interspaces of the vertebræ above the articulation of the heads of the ribs. The spinous process arises from the whole length of the arch of each vertebra; it is truncate above, and with the exception of the first, is of the same breadth throughout: all the dorsal spines are much compressed, the middle ones being the thinnest, slightly expanding at their truncate extremities, especially the three anterior ones, the first spine being notched behind to receive the contiguous angle of the succeeding one: below this there is a considerable interval between these two spines, but the rest of the spines are in contact throughout, and are probably more anchylosed in older birds than the specimen here described.

The first four sacral vertebræ send outwards parapophyses which abut against the ilia, and progressively increase in length and thickness. The breadth of these vertebræ also gradually increases; but it diminishes in the four succeeding vertebræ, in which the parapophyses are wanting: then the ninth and tenth sacral vertebræ send outwards each a pair of strong parapophyses to abut against the inner surface of the ossa innominata immediately behind the acetabulum: the anchylosis of the bodies is continued through the four succeeding vertebræ, which are of a very simple structure, devoid of transverse or oblique processes, becoming gradually more compressed and more extended vertically, so as to appear like mere bony laminæ; the line of the articulation between the bodies of these posterior sacral vertebræ is obvious, but their spines coalesce to form a continuous bony ridge, which is closely embraced by the posterior extremities of the innominata. The foramina for the nerves are pierced in the sides of the bodies of the sacral vertebræ; they are double in the anterior ones, but single in the posterior compressed vertebræ, where they are seen close to the posterior margin.

There are nine caudal vertebræ, which are deeper, and project farther below the posterior portions of the iliac bones than in the other Struthious birds: these vertebræ, as they descend, progressively increase in lateral and diminish in vertical extent; the spinal canal is continued through the first five, and they are all moveable upon each other, excepting the last two, which combine to form a vertebra analogous to the expanded terminal vertebra in other birds, but which here exceeds the rest only in its greater length, and gradually diminishes to an obtuse point. In the Ostrich the corresponding vertebra is expanded for the support of the caudal plumes, but in the *Apteryx* it offers the same inconspicuous development as in the Rhea and Emeu.

The cervical vertebræ present all the usual ornithic peculiarities. The single hypapophysis for the attachment of the complicated longus colli anticus is present in the last three vertebræ, as in the contiguous dorsals. The hypapophysial arch for the protection of the carotid arteries is first seen to be developed from the inner side of the parapophyses of the twelfth cervical vertebra, but the two sides of the arch are not anchylosed together; the interspace progressively increases in the eleventh, tenth and ninth vertebræ, and the groove widens and is lost at the fifth vertebra. The spinous process is thick and strong in the vertebra dentata, but progressively diminishes to the seventh cervical vertebra, where it is reduced to a mere tubercle; from the eleventh it progressively increases to the last cervical, in which it presents the strong quadrate figure which characterizes the same process in the dorsal vertebræ.

The large canal on each side for the vertebral artery and sympathetic nerve is formed by the anchylosis of a rudimental rib to the extremities of an upper and lower transverse process; the costal process diminishes in size in the anterior cervical vertebræ: it is wanting in the dentata, though an arterial canal of very small size is present on each side of that vertebra. In the atlas there are two small parapophyses, but no canal. The neurapophysial bony arch increases in extent as the cervical vertebræ approach the head, and in the third, fourth and fifth vertebræ this part is perforated by a small foramen on each side. The spinal cord is least protected by the vertebræ in the middle of the neck, where there is the greatest extent of motion: there is a depression on the anterior and posterior parts of the spine in the second, third, fourth, and in the last six cervical vertebræ.

The close resemblance of the Bird to the Reptile in its skeleton is well exemplified in the young Ostrich, in which even when half-grown the costal appendages of the cervical region of the vertebral column continue separate and moveable, as in the Crocodile. They are anchylosed to the first fifteen vertebræ in the *Apteryx*. The first free or dorsal rib is a slender style about an inch in length; the rest are remarkable for their breadth, which is relatively greater than in any other bird; the Cassowary in this respect approaches nearest to the *Apteryx*. The second, third, fourth and fifth ribs articulate with the sternum through the medium of slender hæmapophyses: those of the sixth also reach the sternum, but have not been preserved in this skeleton. In the first simple and floating rib, the parts corresponding to the head and neck are almost in contact. In the second rib a short and strong cervix, terminated by a hemispherical head, is given off below and in front of the tubercle, and works in a corresponding socket at the anterior margin of the vertebra. The head and tubercle, with the points of the vertebræ to which they are attached, intercept large foramina corresponding to the vertebral foramina in the cervical region. Immediately below the tubercle the rib suddenly expands, and then gradually narrows to its lower end: the neck of the rib increases in length in the third and fourth pairs and diminishes in the last two; the sixth rib begins to lose its breadth, and the rest become narrower to the last. The bony appendages to the vertebral ribs are developed in the first seven pairs: they are articulated by a broad base to a fissure in the posterior margin of these vertebral ribs a little below their middle part, and, save those of the first pair, overlap the succeeding rib: these processes are not anchylosed in the specimen described. The Rhea comes nearest to the *Apteryx* in the size of these costal appendages. The first four sternal ribs are transversely expanded at their sternal extremities, which severally present a concave surface lined with smooth cartilage and synovial membrane, and playing upon a corresponding smooth convexity in the costal margin of the sternum, which thus presents four true enarthrodial joints with capsular ligaments on each side. This elaborate structure is not, however, peculiar to the *Apteryx* among birds, but relates to the importance of the movements of the sternal ribs, which are the centres upon which the respiratory motions hinge,—the angles between the vertebral and sternal ribs, and between these and the sternum, becoming more open in inspiration when the sternum is depressed, and the contrary when the sternum is approximated to the dorsal region in expiration.

The sternum—the main characteristic of the skeleton of the bird—is reduced to its lowest grade of development in the *Apteryx*. In its small size, and in the total absence of a keel, it resembles that of the Struthious birds, but differs in the wide anterior emargination, and in the much greater extent of the two posterior fissures.

The anterior margin presents no trace of a manubrial process as in the Ostrich: on the contrary, the wide interspace between the articular cavities of the coracoid is deeply concave: in the extent of this interspace the Rhea most resembles the *Apteryx*, but its contour is almost straight; in the Cassowary the space is narrower, but is deeply notched. The articular surface for the coracoid is an open groove, which in the fresh state is covered with articular cartilage: external to this groove the anterior angles of the sternum are produced into two strong triangular processes with the apex obtuse. The costal margin is thickened, and when viewed anteriorly, presents an undulating contour, from the presence of the four articular convexities for the sternal ribs and the intermediate excavations. The sternum of the Emeu presents a similar appearance. The extent of the posterior notches is equal to one half the entire length of the sternum: the external boundaries of these notches curve towards each other.

The scapula and coracoid are anchylosed: a small perforation anterior to the articular surface of the humerus indicates the separation between the coracoid and rudimental clavicle, of which there is otherwise not the least trace.

The coracoid is the strongest bone: its inferior expanded extremity presents an articular convexity, adapted to the sternal groove before described.

The scapula reaches to the third rib: it is a simple narrow plate of bone, slightly curved and expanded at both ends, but chiefly at the humeral articulation. Its length is 1 inch.

The humerus is a slender, cylindrical, styliform bone, slightly bent, 1 inch 5 lines in length; slightly expanded at the two extremities, most so at the proximal end, which supports a transverse oval articular convexity, covered with smooth cartilage, and joined by a synovial and capsular membrane to the scapulo-coracoid articulation. A small tuberosity projects beyond each end of the humeral articular surface. The distal end of the humerus is articulated by a true but shallow ginglymoid joint with the rudimental bones of the antibrachium, and both the external and internal condyles are slightly developed.

The radius and ulna are almost straight cylindrical slender bones, each 9 lines in length. A feebly developed olecranon projects above the articular surface of the ulna. There is a minute carpal bone, two metacarpals, and a single phalanx, which supports the long curved obtuse alar claw. The whole length of this rudimental hand is 7 lines, including the claw, which measures $3\frac{1}{2}$ lines. A few strong and short quill-feathers are attached by ligament to the ulna and metacarpus.

The iliac bones in size and shape resemble those of the Struthious tribe: the length is 4 inches and 3 lines. The outer surface presents a slight concavity anteriorly, which gradually passes into a convexity posteriorly, the two surfaces not being separated by the transverse elevation observable above the acetabulum in the four large Struthious birds. A distinct epiphysial piece of bone, of a compressed and triangular form, is wedged in between the posterior extremity of the ilia and the first three caudal vertebræ.

The ischium extends backwards, parallel with the sacrum, in the form of a thin plate of bone which slightly expands to its free extremity, which is truncated.

The pubic element is a slender bony style, connected by ligament to the end of the ischium, but attached by bone at its acetabular extremity only. A short pointed process extends from the anterior margin of the origin of the pubis. In comparing the pelvis of the *Apteryx* with that of the large Struthious birds, we find that the ischia do not meet below the sacrum as in the *Rhea*, but are more distant from that and the iliac bones than in any of the Struthious birds; the pubic bones are not joined together at their distal extremities as in the Ostrich; the extremities of the ischia are not anchylosed to the superincumbent ilia as in the Cassowary. It is the Emeu which comes nearest to the *Apteryx* in the structure of the pelvis, but it also differs in the complete bony boundary of the foramen which transmits the tendon of the obturator internus, and which is completed posteriorly by ligament in the *Apteryx*.

The acetabulum communicates, as usual, by a wide opening with the pelvis: a surface covered with a cushion of thick cartilage is continued from its posterior and upper part.

The femur has the usual characters of that bone in the class of Birds. Its small round head is supported on a very short and thick neck, placed at right angles to the great and single trochanter: it presents at its superior part a large depression for the strong and complex ligamentum teres. The shaft of the femur is slightly bent, with the convexity forwards, which is increased by a thickening at the anterior part of the middle of the shaft. The condyles are separated by a wide and deep groove anteriorly, and by a triangular depression behind. The outer one is the largest, and is grooved externally, for the articulation of the head of the fibula: the inferior compressed border of the condyle is wedged in between the tibia and fibula. The length of the femur is 3 inches 9 lines. The tibia is 5 inches in length. Two angular and strong ridges are developed from the anterior part of the expanded head of the tibia; the external one affords attachment to fascia, and to the expanded tendon of the rectus femoris latissimus: the internal ridge has affixed to it the ligament of the small cartilaginous patella. The head of the tibia sends down an angular ridge posteriorly: the shaft of the bone is rounded, slightly compressed, converging to a ridge externally, to which ridge the fibula is attached in two places, beginning half an inch below the head of the fibula, and continuing attached for 10 lines; then again becoming anchylosed, after an interspace of 9 lines. In one specimen I found the fibula also anchylosed to the tibia by its expanded and thick proximal extremity: it quickly diminishes in size as it descends, and gradually disappears towards the lower fourth of the tibia. The distal end of the tibia presents the usual trochlear form, but the anterior concavity above the articular surface is in great part occupied by an irregular bony prominence.

There is a small cuneiform tarsal bone wedged into the outer and back part of the ankle-joint. The anchylosed tarso-metatarsal is a strong bone, 2 inches 3 lines in length; the upper articular surface is formed by a single broad piece. The original separation of the metatarsal bone below into three pieces is plainly indicated by two deep grooves on the anterior and posterior part of the proximal extremity: the intermediate portion of bone is very narrow anteriorly, but broad and prominent on the opposite side. The bone becomes flattened from before backwards, and expanded laterally as it descends, and divides at its distal extremity into three parts, with the articular pulleys for the three principal toes.

The surface for the articulation of the fourth, or small internal toe, is about half an inch above the distal end, on the internal and posterior aspect of the bone. A small ossicle, attached by strong ligaments to this surface, gives support to a short phalanx, which articulates with the longer ungual phalanx.

The number of phalanges in the other toes follows the ordinary law, the adjoining toe having three, the next four, and the outermost five phalanges.

Prepared from a specimen presented by the Rev. W. Cotton, M.A.

Genus *Casuarius*.

1356. The skeleton of the Cassowary (*Casuarius galeatus*).

The number of vertebræ between the skull and sacrum is 25. The pleurapophyses begin to be free at the sixteenth, which may be reckoned as the first dorsal vertebra; those at the twenty-sixth, or first sacral vertebra, are also moveably joined thereto by both head and tubercle: the four anterior pairs are progressively elongated, but have no hæmapophyses; these are present in the succeeding five pairs, but those of the last pair do not reach the sternum. The first and second dorsal vertebræ have a pair of hypapophyses; in the third this process is single, but notched below; the fourth and fifth have the hypapophysis single, broad, and compressed. The inferior surfaces of the remaining dorsal vertebræ are slightly carinate or concave below. The diapophyses and parapophyses are well-developed, especially upon the anterior dorsal vertebræ. The neural arch of each dorsal vertebra and of the last three cervical vertebræ presents two pneumatic foramina at the fore part of its base, and a large depression at the back part, which has also two or more perforations. The spinous process of the first dorsal vertebra is rudimental and cleft longitudinally; it becomes entire and gradually broader and higher as the vertebræ approach the sacrum. A median carotid groove is established on the under part of all the cervical vertebræ, save the first four, by two tubercular processes developed from the under part of the two parapophyses. The rudimental neural spine is cleft longitudinally in the last four cervical vertebræ, as if the coalescence of the neurapophyses, which is complete at their basal part, had been arrested at their apices. Besides the neural and vertebral canals, and the pneumatic foramina, there are also two other foramina in most of the cervical vertebræ on each side of the neural arch, formed by the extension of a process of a bridge of bone from that arch forwards and outwards to the diapophysis. The under surfaces of the axis and third vertebræ are carinate: the neurapophyses of the axis meet superiorly, but do not coalesce. The anchylosed pleurapophyses commence at the axis, gradually increase in length to the tenth vertebra, and beyond this also in breadth. Letters corresponding to the TABLE OF VERTEBRAL ELEMENTS are placed upon the tenth cervical vertebra and on the fifth dorsal vertebra. The sternum is oblong, keel-less but convex below, with an entire rounded posterior margin; it presents a deep but narrow excavation at the middle of its anterior margin, and two wide and shallow coracoid grooves on each side; the angles of this margin are developed into short obtuse costal processes. There are four articular surfaces for as many sternal ribs at the anterior half of each lateral margin; these surfaces are divided by deep excavations in that margin.

The cranium is remarkable for the thick lofty crest developed from the whole of the upper surface of the frontal and nasal bones; the horny covering is left upon the right half of this crest. The paroccipital processes are broad and rounded; the mastoids are more slender and pointed, and extend along the outer part of the tympanics to near their articulation with the squamosals. The basioccipital descends a little way below the level of the articular tubercle; the basisphenoid sends out two rough cellular tympanic processes, and two smooth columnar pterapophyses which abut against the true pterygoid bones. The presphenoid forms the usual elongated rostrum, which sends a median plate upwards to join the coalesced inferior borders of the orbitosphenoids: the prefrontals have coalesced with each other and with the frontals and nasals superiorly; they consist principally of the median vertical plate answering to the 'lamina perpendicularis ethmoideæ' of Anthropotomy, but send out two lateral plates answering to the 'partes planæ ethmoideæ,' which coalesce with the lacrymals and form the anterior boundary of the orbit. A portion of these plates, which are very thin, is slightly folded and, as it were, pressed forwards into the upper and back part of the nasal meatus, from the surface towards which they send off short sinuous lamellæ, and represent the parts of the human ethmoid called 'ossa turbinalia superiora.' The postfrontals are well-developed, and divided from the rest of the superorbital border by a deep notch; some traces remain of the suture between the malar and maxillary. The external bony nostrils form a long common hiatus between the palatine and nasal processes of the premaxillary. The sutures dividing the articular, dentary, and splenial pieces of the mandible remain. The sclerotic plates, thirteen in number, are preserved on the right side; they overlap each other very extensively. The parts of the hyoidean arch preserved are the two thyrohyals.

There are 9 caudal vertebræ, of which the last three are anchylosed; they have a deep perforation on each side, between the centrum and neural arch. The scapula and coracoid have coalesced; a short clavicular process extends inwards from the scapula, but without meeting its fellow or touching the sternum. With the exception of the coalescence of the coracoid, the condition of this part is closely similar to that in the Crocodile. The expanded head of the humerus presents two excavations externally; it has a well-marked pectoral ridge:

the ulna shows a rudimental olecranon; it is a little longer and broader than the radius. There are no distinct carpals: the metacarpus consists of a coalescence of three bones, the middle of which supports a single phalanx. In the pelvis the slender pubis and broader ischium extend backwards straight and almost parallel with the hinder half of the ilium. The ilium and ischium join each other posteriorly and circumscribe the long ischiatic notch. The pubis, confluent as usual with the ilium and ischium anteriorly, is free in the rest of its extent. The femora have no pneumatic foramen, either at the fore or back part of the neck: the medullary canal perforates the middle of the back part of the shaft: the intermuscular ridges which extend to the fore part of each condyle begin to diverge immediately below the great trochanter. The rotular process of the tibia developes a strong procnemial and ectocnemial ridge: the fibular linea aspera extends nearly to the distal end of the bone. The fibula remains distinct. There is no osseous bridge at the fore part of the distal end of the tibia. The calcaneal process of the tarso-metatarsus is an elongated compressed ridge, with a vascular perforation on each side leading to a single foramen at the anterior part, near the proximal end of the bone; a deep and wide excavation extends down the middle of the fore part of the metatarse. The ungual or third phalanx of the inner toe is unusually elongated and nearly straight; the outer toe, though the shortest, has, as usual, five phalanges.

Purchased.

1357. The right foot of a Cassowary (*Casuarius galeatus*). *Hunterian.*

Genus *Dromaius*.

1358. The skeleton of the Emeu (*Dromaius Novæ Hollandiæ*).

There are 26 vertebræ between the skull and sacrum, of which the last eight support ribs: of these the first three pairs are free; the next three pairs are articulated by strong bony hæmapophyses with the sternum; those of the seventh pair are long, but do not reach the sternum; the eighth and ninth pairs of ribs are free; the ninth is attached to the sacrum. There are 8 caudal vertebræ. The sternum is pointed posteriorly; the anterior angles are singularly developed and incurved. The clavicles or halves of the furculum are distinct from each other and from the coracoids: they are short and slender bones, and do not reach the sternum. Neither the ischia or pubic bones join the ilium or their fellows posteriorly.

Mus. South.

1359. The skull of the Emeu (*Dromaius Novæ Hollandiæ*), with the sheath or integument remaining on the left side of the bill, showing the place and form of the external nostril. *Presented by Sir Everard Home, Bart., F.R.S.*

1360. The cranium, with the bones partially disarticulated, of a young Emeu (*Dromaius Novæ Hollandiæ*).

Most of the sutures are unobliterated: the postfrontals are distinct bones: the prefrontals are connate, and develope a broad external cranial plate between the frontals and nasals. The occipital elements have coalesced.

Presented by the Zoological Society of London.

Genus *Rhea*.

1361. The skeleton of the Three-toed Ostrich (*Rhea Americana*).

The sternum has a single median notch posteriorly. The clavicles are absent, and are indicated only by an unusual development of the acromion scapulæ. The scapula and coracoid have coalesced, as in the Emeu. The ischia are united to each other along the greater part of their extent, as also to the ilium above and to the pubis below. The wing is more developed than in the Emeu, and the metacarpus consists of the usual three anchylosed bones supporting the common number of modified phalanges in birds. There are 22 vertebræ between the skull and sacrum, of which the last seven support ribs: the first two pairs are free; the next three pairs articulate by bony hæmapophyses with the sternum; the last three pairs of ribs are free, and of these the last (eighth) pair belong to the first of the anchylosed or sacral vertebræ. There are 6 caudal vertebræ.

Mus. South.

Genus *Struthio*.

1362. The skeleton of the Ostrich (*Struthio Camelus*).

The sternum has two posterior emarginations and a cartilaginous xiphisternal, which is sometimes the seat of a distinct ossification. The coracoid has coalesced with the scapula, and ossification has extended along the ligamentous or fibro-cartilaginous basis of the clavicles, so that these bones appear as strong acromial processes coalescing at their inner extremity with the coracoid, and leaving an elliptical space between them and that bone: the ischium has coalesced posteriorly with the pubis on each side, but the symphysis pubis, which is peculiar to this bird, is still cartilaginous. Although but two toes are developed, the third metatarsal is present, coalesced as usual with the two belonging to the toes; but it terminates below in a short pointed process, at the inner side of the trochlea supporting the larger toe. This toe is shown by the number of its phalanges (four) to answer to the middle in the tridactyle Ostrich, and the second, although the shorter toe, has the five phalanges characteristic of the outer toe. The inner (or second) toe and the back toe (first) are wanting in the Ostrich: both are present in the *Apteryx*. There are 25 vertebræ between the skull and sacrum, of which the last seven support ribs: the first two pairs are free; the succeeding five pairs are articulated to the sternum by strong bony hæmapophyses; the last (eighth) pair of ribs are attached to the sacrum, and terminate freely. There are 7 caudal vertebræ.

Hunterian.

1363. The anchylosed parts of the cranium of a nearly full-grown Ostrich (*Struthio Camelus*).

They consist of the basioccipital, basisphenoid and presphenoid, of the alisphenoids, orbitosphenoids and prefrontals, of the parietals, mastoids and petrosals. The posterior clinoid processes overhang the back part of the deep sella, into the bottom of which the carotid canals open. The foramina lacera anteriora form with the optic foramen a wide vacuity on each side. The orbitosphenoids and prefrontals overarch these vacuities anteriorly and expand into a platform, supporting the fore part of the cerebral lobes and the small olfactory ganglia, which are prolonged into the grooves continued from the anterior part of this platform. A part of the sagittal suture remains. The thick, slightly sutural surface at the fore part of the parietals and alisphenoids is exposed by the removal of the frontals.

Presented by Prof. Owen, F.R.S.

1364. The separated bones of the head of a young Ostrich (*Struthio Camelus*).

Although, as a general rule in the Class *Aves*, the separate cranial bones can be discerned only at a very early period, yet in those birds in which the power of flight is abrogated, the indications of the primitive centres of ossification endure longer; and in the species here selected for the illustration of the cranial segments, the constituent bones of the skull, with the exception of the basioccipital, 1, and basisphenoid, 5, and the two bones, 6 and 8, which coalesce with the petrosal, 16, have been separated by maceration merely.

The basioccipital (1) developes the major part of the single articular condyle, and sends down a process, more marked in the Struthious genera, and especially the Dinornis, than in most other birds: in all respects this primitively distinct bone retains the character of the centrum of its vertebra.

The exoccipitals, 12, contributing somewhat more to the occipital condyle than in the Crocodile, develope, as in that reptile, the paroccipital (24) as an outstanding exogenous ridge or process: but it is lower in position than in the Crocodile. The superoccipital (3), as compared with that of the Crocodile (No. 763), manifests more strongly the flattening and development in breadth, by which the spinous elements lose the formal character from which their name originated, and are converted from long into flat bones. It always protects the cerebellum; is absent in the Frog where this organ is a mere rudiment; and is present in the Crocodile in the ratio of the superior size of the cerebellum. The further development of the cerebellum is the condition of the superior breadth of the spine or crown of the epencephalic arch in the bird.

The second segment of the skull has for its central element a bone (5), the basisphenoid, which in the bird, as in other ovipara, is connate with that (9) which stands in the same relation to the third cranial segment; the proof of the natural distinction of these segments is given by the neural and hæmal arches. Probably the circumstance of the bodies of those vertebræ being formed by ossifications of the fibrous capsule of the notochord, representing the external or cortical parts only of such centrums, may be the condition, or a favourable physical cause of such connation. The neural arch of the parietal vertebra retains the same characters which it first manifested in fishes. Besides the alisphenoids or neurapophyses (6) impressed by the mesencephalic ganglia and transmitting the trigeminal nerves, besides the vastly expanded and again, as in fishes, divided neural spine (7) (parietal bones), the parapophysis (8) (mastoid) is independently developed. It is of large proportional size; and, owing to the raised dome of the neural arch, is relatively lower in position than in the Crocodile; it sends downwards and outwards an unusually long 'mastoid' process, and forms a large proportion of the outer wall of the chamber of the internal ear, with the bony capsule of which it speedily coalesces.

The hæmal arch of the parietal vertebra is more reduced than in the Crocodile, and owes much of its apparently typical character to the retention of the thyrohyals (46, 47) borrowed from the branchial arches of the visceral system, which are feebly and transitorily manifested in the embryo bird. These spurious cornua project freely or are freely suspended.

The bones (10) of the third neural arch (called 'orbitosphenoids') protect a smaller proportion of the prosencephalon than in the Crocodile, but maintain their neurapophysial relation to it and to the optic nerves: the neural spines (11) (frontal bones) cover a larger proportion of the hemispheres, and, with their homotypes (7), exhibit a marked increase of development in conformity with that of the cerebral centres protected by their respective arches. The parapophysis of the frontal vertebra (12) (postfrontal) is relatively smaller in the bird than in the cold-blooded vertebrates, and is rarely ossified from an independent centre, as it is in the Emeu. The hæmal arch of the frontal vertebra has been transferred backwards to the parietal one; its pleurapophysis (28) (the tympanic), which is simple, as in the Crocodile, articulating exclusively with the parietal parapophysis (8) (mastoid), though this in some birds unites with that of the frontal vertebra. In the young Ostrich and many other birds, traces of the composite character of the hæmapophysis (mandibula) are long extant; and bear obviously a homological relation to the teleologically compound character of the same element in the Crocodile: for the pieces, Nos. 29, 29', 30' and 31 ultimately, and in most birds early, coalesce with each other and with the hæmal spine (32) (dentary element), the halves of which are confluent at the symphysis.

The centrum (13) (vomer) of the nasal vertebra is always single, and, when it does not remain distinct, coalesces with the neurapophyses (prefrontals), 14, and pleurapophyses (palatines), 20, of its own segment, and sometimes also with the rostral production of the frontal centrum (9): it is elongated and pointed at its free termination, and deeply grooved above where it receives the above-named rostrum; indicating both by its form and position that it owes its existence, as bone, to the ossification of the outer capsule of the anterior end of the notochord. In the Ostrich the long presphenoidal rostrum intervenes between the vomer (13) and prefrontals (14). These latter bones manifest, however, all the essential neurapophysial relations to the rhinencephalon and olfactory nerves: but they early coalesce together, or are connate, as in the tail-less Batrachians. The neural spine (nasals) (15) is divided along the middle line; but in most birds the suture becomes obliterated and the spine coalesces with its neurapophyses, with the frontal spine, and with those parts of the hæmal arch of the nasal vertebra with which it comes in contact.

The pleurapophyses (palatines) (20) of this inverted arch retain their typical connections with the nasal centrum and neurapophyses at one end, and with the hæmapophysis (maxillary) (21) at the other end, and they also support the constant element of the diverging appendage of the arch (pterygoid). The hæmapophysis (maxillary) (21) resumes in birds more of its normal proportions and elongated slender form: but the hæmal spine (premaxillary) (22) is largely developed though undivided, and sends upwards and backwards from the part corresponding to the symphysis of the spine, when this element is divided, a long pointed process (22'), which joins and usually coalesces with the neural spine (15) and divides the anterior outlet of the hæmal canal into two apertures called the nostrils. The modification of the hæmal arch of the nasal vertebra in the Lizard tribe is here repeated. The pleurapophysial appendage (pterygoid), 24, connects the palato-maxillary arch with the tympanic, and in the Ostrich and a few other birds, also with the basisphenoid 5: the second or hæmapophysial ray of the diverging appendage (malar and squamosal) is developed in all Birds as in the squamate Saurians; combining the movements of the hæmal arch of the nasal vertebra with that of the frontal vertebra, and consisting of the two styliform ossicles (malar 26 and squamosal 27) which extend from the hæmapophysis, 21, 21'', to the pleurapophysis, 28: the essential relationship of the compound ray, 26 and 27, with the nasal vertebra, is indicated by their becoming confluent with its hæmapophysis (at 22''), whilst they always maintain an arthrodial articulation with the pleurapophysis (28) of the succeeding vertebra.

The bones of the splanchno-skeleton intercalated with the segments of the endoskeleton in the bird's skull are the petrosal (16), between the neural arches of the occipital and parietal vertebræ, early coalescing with the elements of those vertebræ with which it comes in contact; the sclerotals (17), interposed between the frontal and nasal neural arches; and the thyrohyals (17), retained in connection with the debris of the hæmal arch of the parietal vertebra. The olfactory capsule remains cartilaginous. The dermal bone (lacrymal, 73) is well-developed and constant: a second supraorbital dermal bone is occasionally present.

Purchased.

1365. The skull of a young Ostrich (*Struthio Camelus*).

It shows the principal sutures of the cranium, the bones of which are numbered according to the Table of Synonyms.

Hunterian.

1366. The thorax, pelvis, and scapular arch of the same young Ostrich.

It shows the ligamentous condition of the clavicles: the halves of the sternum, which are ossified from distinct centres, are still separate: the distinction of the coracoid from the scapulæ, and of the ischium from the pubis and ilium, may be seen. The limits of the bodies of the 20 sacral vertebræ are also distinguishable. The symphysis of the pubis is cartilaginous.

Hunterian.

1367. The bones of the wing of a young Ostrich (*Struthio Camelus*).

The antibrachium is one-third the length of the humerus: the carpus presents two bones, placed between the metacarpus and antibrachium. The metacarpus consists of three bones:

the one to the radial side, answering to that of the index-finger, is very short; it supports a digit of two phalanges, the second phalanx being armed with a long curved and pointed claw: the third metacarpal, answering to that of the digitus annularis, is bent, its extremity resting against that of the large and straight middle metacarpus, with which it subsequently becomes anchylosed: the middle digit consists of three phalanges; the outer one of two phalanges. In all birds the three metacarpals, here seen to be distinct, coalesce with one another and form a single bone, having an interesting analogy to the metatarsus, which likewise consists in all birds of a coalescence of the three bones supporting the corresponding toes, namely, those answering to the second, third and fourth in the pentadactyle foot.

Hunterian.

1368. Three cervical vertebræ of an Ostrich, articulated to show the structure of the joint. *Hunterian.*

1369. The sternum of an Ostrich, with the sterno-costal bones attached on the left side. *Hunterian.*

1370. The third sterno-costal bone of an Ostrich, right side. *Hunterian.*

1371. The sixth sterno-costal bone of an Ostrich, right side. *Hunterian.*

1372. The scapular arch of an Ostrich.

The coracoid has coalesced with the scapula, from which a broad clavicle is developed as a free process like a long acromion: it is the homologue of the half of the furculum in other birds.

Hunterian.

1373. The left humerus of an Ostrich, in longitudinal section. *Hunterian.*

1374. The left ulna of an Ostrich. *Hunterian.*

1375. The fourth and fifth dorsal vertebræ of an Ostrich, articulated to show the structure of the joint. *Hunterian.*

1376. The sixth dorsal vertebra, with the left rib, articulated. *Hunterian.*

1377. The seventh and eighth dorsal vertebræ of an Ostrich. *Hunterian.*

1378. The first free vertebral rib of an Ostrich, right side. *Hunterian.*

1379. The second rib of an Ostrich, right side. *Hunterian.*

1380. The fourth rib of an Ostrich, right side. *Hunterian.*

1381. The fifth rib of an Ostrich, right side. *Hunterian.*

1382. The seventh rib of an Ostrich, right side. *Hunterian.*

1383. The ninth rib of an Ostrich, right side. *Hunterian.*

1384. The ninth rib of an Ostrich, left side. *Hunterian.*

1385. The sacral and caudal vertebræ of a young Ostrich.

The neural arch of the fifth sacral vertebra has advanced and rests over the interspace between its own and the preceding centrum: at the eleventh vertebra it has resumed its normal position and connections. The pleurapophyses of the fifth to the eleventh sacral vertebræ inclusive have undergone a corresponding change of position, and are articulated by an expanded head, by synchondrosis, to a rough flat surface formed by the base of the neurapophysis and by a portion of their own and of the preceding centrum; some have been detached to show this articular surface: those of the tenth, eleventh and twelfth sacral vertebræ remain; their distal extremities expand and coalesce, forming a broad abutment applied to the iliac bones. The diapophyses are directed upwards and outwards against the same part, and are of considerable length, especially in the ninth to the fifteenth sacral vertebræ. The spines of all the vertebræ are very lofty, compressed laterally, and already confluent with each other at the middle of the sacrum. The dilated part of the neural canal is formed by the increased breadth and flatness of the centrums, and by the wide expanse of the neural arches at the middle of the sacrum. In the seventh to the ninth of these arches there is a wide aperture in each between the diapophysis and the base of the spine. The outlets for the nerves are single and at the interspace of the neural arches, but those at the middle of the canal show two grooves for the separate exit of the motor and sensory roots. In the caudal vertebræ the under part and sides of the centrum show deep longitudinal excavations and pneumatic foramina, resembling the vertebræ of certain fishes; parapophyses as well as diapophyses are developed from most of the terminal vertebræ in this specimen.

Presented by Prof. Owen, F.R.S.

1386. The iliac bones of the same young Ostrich. They are longer and narrower, especially posteriorly, than in other birds. *Presented by Prof. Owen, F.R.S.*

1387. The vertically and longitudinally bisected sacrum and pelvis of a young Ostrich.

It shows the progressively increasing capacity of the spinal canal and the double orifices for the escape of the nerves, the motor and sensitive roots of which do not unite until they have passed out. The centrum of the first sacral vertebra remains distinct from the second, although its neural arch and spine have coalesced with those of the second vertebra and with the ilia. Traces of the articulation between the centrum of the second and third sacral vertebræ remain: they are obliterated in the remaining vertebræ, and the bodies of all are cellular and permeated by air. The spines of 17 sacral vertebræ are shown in this section: they are very lofty, compressed from before backwards, consist of little more than a lacework of osseous tissue, and diverge in curves from the neural arches, through the interspace between the iliac bones, with both of which their margins are confluent, and which they thus serve to bind firmly together. By the peculiar cellular and pneumatic structure of the parts, not more osseous texture is expended in performing the office of tie-beams across the elongated roof of the pelvis than is absolutely required.

Presented by Prof. Owen, F.R.S.

1388. A vertically and longitudinally bisected sacrum and coalesced iliac bones of the *Dinornis didiformis.* It also shows the great expanse of the spinal canal for that part of the spinal cord in connection with the nerves of the large and strong hinder extremities. All traces of the original joints between the bodies of the vertebræ, with the exception of the last, are obliterated. The primitive distinction of the neural arches is indicated by a series of elegant undulating folds of the roof of the spinal canal: the motor and sensitive roots issue separately, as in other birds.

Prepared from a specimen presented by the Very Rev. Archdeacon Williams.

1389. The right femur of an Ostrich, in longitudinal section, to show its internal cancellated structure. *Hunterian.*

1390. The right femur of an Ostrich, in longitudinal section. *Hunterian.*

1391. The right femur of a young Ostrich. *Hunterian.*

1392. One moiety of the proximal end of a longitudinally bisected left femur of an Ostrich. *Hunterian.*

1393. One moiety of the distal end of a longitudinally bisected left femur of an Ostrich. *Hunterian.*

1394. The right tibia of an Ostrich, in longitudinal section. *Hunterian.*

1395. The right tibia of a young Ostrich. *Hunterian.*

1396. The left fibula of a young Ostrich. *Hunterian.*

1397. The right tarsus of a young Ostrich. *Hunterian.*

1398. The right tarsus of an Ostrich, in longitudinal section. *Hunterian.*

Order RASORES.

Genus *Crax.*

1399. The skeleton of the Crested Curassow (*Crax Alector*).

There are 19 vertebræ between the skull and sacrum, of which the last six bear moveable ribs: of these the first two pairs end freely; the rest articulate with the sternum by bony hæmapophyses: there is a seventh pair of ribs attached to the sacrum. There are 6 caudal vertebræ. The last dorsal vertebra is free, and intervenes between the sacrum and four dorsals which have coalesced into a single bone. The calcaneal ossicle is preserved in both legs.

Mus. South.

1400. The dried head of the Crested Curassow (*Crax Alector*).

Presented by W. Bullock, Esq.

1401. The skeleton of the Galeated Curassow (*Ourax Pauxi*, Cuv.).

This species is remarkable for the sudden expansion and elevation of the base of the short and thick upper mandible, like a tumour. The mastoid joins the postfrontal: the centrum of one vertebra preserves its articulation between the sacrum and the four anchylosed dorsals, but its spine has coalesced with that of the sacrum. There are 20 vertebræ between the skull and the sacrum, of which the last six bear moveable ribs: of these the last four pairs are articulated to the sternum by hæmapophyses; there is a seventh pair of ribs attached to the sacrum. There are 6 caudal vertebræ.

Purchased.

Genus *Penelope.*

1402. The skeleton of the Crested Guan (*Penelope cristata*).

The sternum is narrow, with four deep posterior notches and a short but deep keel; the episternal process is perforated both vertically and transversely. The arch of the furculum is long and narrow. Four of the dorsal vertebræ have coalesced into one bone; a single free vertebra intervenes between this and the sacrum. The calcaneal ossicle is preserved in the left leg. The metatarsus of the back-toe is moderately strong and twisted; the lacrymals are largely developed. There are 21 vertebræ between the skull and sacrum, the last six of which support ribs: of these the first two pairs are free; the rest have hæmapophyses which join the sternum; the last (seventh) pair of ribs are attached to the sacrum, and are also joined to the sternum by hæmapophyses that support rudiments of another pair. There are 5 caudal vertebræ.

Mus. South.

1403. The sternum and trachea of the Marail Guan (*Penelope Marail*).

This species is crestless, and the trachea, in both sexes, forms a curve at the upper and fore part of the sternum, before it divides into the bronchi. See the 'Linnæan Transactions,' vol. iv. pl. 9. fig. 2.

Hunterian.

Genus *Pavo.*

1404. The skeleton of a Peacock (*Pavo cristatus*).

There is one vertebra with a free centrum between the four coalesced dorsals and the sacrum, but the spine of this is partially anchylosed by the ossified bone-tendons with both. The terminal coalesced caudal vertebræ, forming the so-called 'ploughshare-bone,' develope a flat osseous platform above, for the support of the long dorsal plumes, or 'tail-coverts,' which the Peacock raises and spreads by the action of the true tail-feathers, with the aid of peculiar muscles. The calcaneal ossicle is preserved in the right leg: a strong bony spur is developed from the inner and posterior ridge of the coalesced metatarsus, which seems to represent the proximal part of that element of the back toe. The number of vertebræ between the skull and sacrum is 20, of which the last six bear moveable ribs: of these the first two pairs are free; the rest are joined to the sternum by hæmapophyses; a seventh pair of ribs articulate with the sacrum.

Mus. South.

1405. A mutilated skull of a Peacock (*Pavo cristatus*).

The occipital tubercle is reniform, notched above; the paroccipitals join the transversely extended sides of the basisphenoid, circumscribing the posterior boundary of the tympanic cavity: the mastoid unites with the postfrontal. The fore part of the frontal has a rough surface and a deep median notch. The long nasal process of the premaxillary is divided by a median cleft.

Hunterian.

Genus *Meleagris*.

1406. The skeleton of a male Turkey (*Meleagris Gallopavo*).

There are 20 vertebræ between the skull and the sacrum, the last six of which bear moveable ribs: of these the last four pairs are united to the sternum by hæmapophyses; a seventh pair of ribs articulate with the sacrum. There are 6 caudal vertebræ. The calcaneal ossicle which plays upon the inner and back part of the tibial trochlea is preserved in both legs. An osseous splint, which seems to represent the proximal part of the metatarsal of the back toe, is anchylosed by both its extremities to the other coalesced metatarsals. The sternum is abnormally twisted. The mastoid is confluent with the postfrontal.

Mus. South.

1407. The skeleton of a female Turkey (*Meleagris Gallopavo*).

This is from a young individual, and two moveable vertebræ intervene between the coalesced dorsals and the sacrum. The number of vertebræ between the skull and sacrum is 21, of which the last seven have moveable ribs: of these the first two pairs are free; the rest are articulated with the sternum by hæmapophyses; those of the last pair supporting rudiments of another pair of hæmapophyses. There are 4 free caudal vertebræ. The difference between the vertebral formula of this and the preceding skeleton depends merely on the anchylosis of an additional vertebra in the older individual with the sacrum.

Purchased.

1408. The cranial part of the skull of a Turkey.

The occiput is broader and more produced downwards than in the Peacock. The paroccipital joins the basisphenoid, and the mastoid joins the postfrontal. The fore part of the frontal is smooth and concave.

Hunterian.

Genus *Numida*.

1409. The skeleton of the common Pintado, or Guinea-fowl (*Numida Meleagris*).

Of the 20 vertebræ between the skull and sacrum, the last six bear moveable ribs, of which the last four pairs are united to the sternum by hæmapophyses; a seventh pair of ribs is attached to the sacrum. The caudal vertebræ are wanting. An obtuse crest of bone is developed from the frontals.

Mus. South.

1410. The furculum of the common Guinea-fowl (*Numida Meleagris*).

Its apex is simply compressed, and presents no excavation for the reception of a loop of the trachea.

Hunterian.

1411. A part of the skeleton of the trunk, including the 14 cervical and the 6 dorsal vertebræ, with the ribs, sternum and scapular arch, of the Crested Pintado (*Numida cristata*).

The first two pairs of ribs are free, the second pair supporting appendages; the four succeeding pairs of ribs have, in addition, hæmapophyses which articulate with the sternum; the twentieth, or last, vertebra of this specimen is free, whilst the four preceding dorsals are anchylosed together. The apex of the furculum does not touch the keel of the sternum; it is developed into a compressed cup or bulla, opening forwards, where it receives a turn of the trachea.

This peculiar structure is described by Dr. Latham in his 'General History of Birds,' vol. viii. 1823, p. 149; where, referring to this specimen, he says:—"This doubt" (as to the species of *Numida*) "has been cleared up to me by the ingenious and indefatigable Mr. Clift, of the College of Surgeons, who showed me the bird, from which a breast-bone and trachea were taken, precisely similar in structure, and was no other than the Crested species."

Presented by Sir Joseph Banks, Bart., P.R.S.

Genus *Gallus*.

1412. The skeleton of the male of the Common Fowl (*Gallus domesticus*).

The mastoid has coalesced with the postfrontal. One free vertebra intervenes between the sacrum and the four coalesced dorsal vertebræ. The iliac bones meet and unite above the spine of the sacrum, leaving two longitudinal intervening channels. The sternum has a long and moderately deep keel, but only a small part of its body is ossified; this is characterized by a prominent compressed episternal process, by two elongated costal processes, and by the four deep and wide notches posteriorly, which convert the lateral parts of the sternum into mere long bifurcate processes; the lower branch is the longest, and extends parallel with the keel; the upper and shorter branch bends upwards external to the two posterior hæmapophyses. The clavicles are almost straight, and unite at an acute angle to form the furculum, the apex of which is expanded, compressed, and produced downwards. The coracoids are comparatively narrow. The bones of the wing are relatively short. All the characters of the sternum and scapular arch indicate a low power of flight. The legs are powerfully developed, particularly the metatarsal segment, which with the tibia is shorter, but much stronger, than in the *Grallatores*. The toes are moderately long, strong, and in the usual number, the back-toe being supported by a well-developed half-twisted metatarsal. The chief characteristic of the anchylosed metatarsals is the thick conical bony process for the support of the spur. There are 20 vertebræ between the skull and the sacrum, the last six of which bear moveable ribs: of these the first two pairs are free, the rest are joined by hæmapophyses to the sternum; the last (seventh) pair of ribs are attached to the sacrum. There are 6 caudal vertebræ.

Mus. South.

1413. The skull of the Common Fowl. *Hunterian.*

1414. The skull of a variety of the Common Fowl (*Gallus domesticus*), having a spherical bony cyst above the orbits.

Whether this peculiarity of the skull should properly constitute a variety is uncertain, being apparently the result of disease alone: the latter opinion is supported by the authority of Pallas.

Hunterian.

Genus *Phasianus.*

1415. The skull of the Silver Pheasant (*Phasianus nycthemerus*). *Hunterian.*

Genus *Tetrao.*

1416. The skeleton of the Capercailzie, or Cock of the Woods (*Tetrao urogallus*).

This is chiefly remarkable for the prolongation of the angle of the jaw upwards and backwards. The mastoid process coalesces with the postfrontal. The spines of the last five dorsal vertebræ have coalesced into a continuous osseous ridge, and the centrum of the last dorsal alone remains free; the rest form a continuous crest of bone, sending down deep processes from each, the ends of the first three being blended together. The scapula is of unusual length, reaching to the ilium. The apex of the furculum is much prolonged and expanded. Both the episternal and costal processes of the sternum are produced. The calcaneal ossicle which plays upon the back part of the tibial trochlea is preserved in both legs. The distal rudiment of the innermost metatarsal supports, as usual, the short back-toe. There are 20 vertebræ between the skull and sacrum, of which the last six support ribs: of these the first two pairs are free; the four succeeding ones articulate with the sternum by bony hæmapophyses; the last (seventh) rib is attached to the sacrum, but does not reach the sternum. There are 6 caudal vertebræ.

Mus. South.

1417. The hyoidean arch of the Capercailzie (*Tetrao urogallus*).

Presented by Dr. Leach, F.L.S.

1418. The skeleton of the Ptarmigan (*Tetrao Lagopus*).

The four dorsal vertebræ in advance of the last are anchylosed together, of which the centrums are compressed, and indicated chiefly by their long hypapophyses, which also coalesce together at their lower extremities. The pelvis is of remarkable breadth in all this family. There are 22 vertebræ between the skull and sacrum, of which the six last support moveable ribs: of these the first two pairs are free; the remainder are articulated to the sternum by hæmapophyses: the last (seventh) rib is attached to the sacrum, but does not reach the sternum. There are 7 caudal vertebræ.

Mus. South.

Genus *Bonasia.*

1419. The dried head of the American Ruffed Grouse (*Bonasia umbella*).

Hunterian.

Genus *Perdix.*

1420. The skeleton of the Francolin, or Red-legged Partridge (*Perdix francolinus*).

The four posterior notches of the sternum extend as far forwards as the commencement of the keel. There is a callosity behind the middle of each metatarsus, where the spur is developed in the Cock. The mastoid joins the postfrontal. There are 20 vertebræ between the skull and sacrum, of which the last six support ribs: the first two pairs are free and floating; the remainder are articulated to the sternum by hæmapophyses; the last (seventh) pair of ribs are attached to the sacrum: a single free dorsal vertebra intervenes between the four coalesced dorsals and the sacrum. There are 7 caudal vertebræ.

Mus. South.

Genus *Pterocles.*

1421. The natural skeleton of the male Ganga (*Pterocles arenarius*).

The number of vertebræ between the skull and sacrum is 20, of which the last seven support moveable ribs: of these the first two pairs terminate freely; the rest are attached to the sternum by hæmapophyses; there is an eighth pair of ribs attached to the sacrum. The four posterior notches of the sternum are of moderate depth, and the keel is long and deep; these modifications being in accordance with the length of the wing, and the remarkable powers of flight of the birds of this genus. The integument is preserved upon the long and slender tridactyle feet, showing that they are naked above the tibio-tarsal joint.

Purchased.

1422. The natural skeleton of the trunk and extremities of the female Ganga (*Pterocles arenarius*).

The vertebral formula corresponds with the preceding, except that the pleurapophyses of the fourteenth vertebra are anchylosed, and those of the two following vertebræ terminate freely. The hæmapophyses of the sacral ribs reach the sternum. The two median posterior notches of the sternum are converted into foramina: the two lateral ones are wide and deep, their outer boundaries being slender and parallel with the hæmapophyses. The keel of the sternum is very deep. One free vertebra intervenes between the sacrum and four coalesced dorsals, from the anterior of which are developed long hypapophyses united together at their extremities. The furculum is more slender, and the pelvis shorter and broader than in the male. There is no trace of a back-toe. In many of its osteological characters the *Pterocles* resembles the Bustards (*Otis*) more than the Partridges or Grouse.

Purchased.

Genus *Hemipodius.*

1423. The skeleton of the Tasmanian Hemipode (*Hemipodius varius*).

The deep angular posterior notches, of which there are only two in the present genus, have converted the sides of the sternum into long styliform processes. The furculum forms a long slender arch; the bones of the wing are short. The metatarsus is short and strong. The toes, three in number, are very powerful, with curved ungual phalanges. There are 18 vertebræ between the skull and sacrum, the last six of which bear moveable ribs: of these the last four pairs are articulated to the sternum by hæmapophyses; a seventh pair of ribs is attached to the sacrum. There are 6 caudal vertebræ. Not any of the dorsal vertebræ are anchylosed together.

Mus. Gould.

Family *Columbidæ* (Pigeons).

Genus *Lophyrus* (Crown Pigeons).

1424. The skeleton of the Molucca Crown Pigeon (*Lophyrus coronatus*).

Of the 18 vertebræ between the skull and sacrum, the five posterior bear moveable ribs, the last two pairs of which are united to the sternum by hæmapophyses. The first sacral vertebra bears a pair of ribs which articulate with the sacrum. There is a superoccipital foramen. The mastoid is obsolete, and the postfrontal is very feebly developed. The prefrontal sends out an antorbital process, but this does not reach the lacrymal, which forms the rest of the anterior boundary of the orbit. The bones of the upper beak coalesce with the broad anterior border of the frontals at five points, by the nasal process of the premaxillary in the middle, by the nasals, and by the frontal processes of the maxillary most external to and separated from the nasals by the backward extension of the bony nostrils, which are continued forwards to within a short distance of the apex of the beak. A single free dorsal vertebra intervenes between the two coalesced dorsals and the sacrum. The keel of the sternum is of great depth; the body of the sternum narrow, and excavated by two wide external notches and two small median ones: the episternum is a simple tubercle: the costal processes are strong and truncate. A lamelliform process extends from the mesial side of the proximal end of the coracoid and curves forwards. The deltoid process of the humerus presents a thick obtuse angular form: a small tubercle represents the ectocondyloid process. The proximal end of the metatarsus sends backwards a strong, vertically perforated, calcaneal process, and is perforated itself from before backwards internal to this process. There is a well-marked surface for the half-twisted short metatarsal of the back-toe.

Mus. Brookes.

1425. The skeleton of part of the trunk of the Crown Pigeon (*Lophyrus coronatus*), including the pelvis and seven antecedent vertebræ, with the ribs and sternum.

In the first of these vertebræ the pleurapophysis simply completes the lateral foramen for the vertebral artery: in the five following vertebræ it assumes the size and shape of a rib, which ends freely in the first two, and in the rest is joined to the sternum by a hæmapophysis: the last pair of ribs is attached to the sacrum, and supports the rudiments of the coadapted ends of the pleurapophysis and hæmapophysis of a seventh pair of ribs.

Hunterian.

1426. The sternum of the Crown Pigeon (*Lophyrus coronatus*). *Hunterian.*

Genus *Phaps.*

1427. The skeleton of the Lesser Bronze-winged Pigeon (*Phaps elegans*).

Of the 18 vertebræ between the skull and sacrum, the five posterior bear moveable ribs: of these the last four pairs are united to the sternum by hæmapophyses; a sixth pair of ribs are attached to the sacrum; their hæmapophyses join those of the last pair of dorsal ribs. A single free dorsal vertebra intervenes between the three confluent dorsals and the sacrum. The median small pair of the four posterior notches characteristic of the sternum of the Pigeons are here converted into foramina.

Hab. Western Australia.

Mus. Gould.

Genus *Columba.*

1428. The skeleton of the common Pigeon (*Columba œnas*).

Of the 18 vertebræ between the skull and sacrum, the six posterior bear moveable ribs: of these the first two pairs are free; the rest are united to the sternum by hæmapophyses: a seventh pair of ribs is attached to the sacrum, the hæmapophyses of which join those of the last pair of dorsal ribs. The ligament is preserved which connects the apex of the furculum with that of the keel of the sternum: the two median of the four posterior sternal notches are converted into foramina. A single free dorsal vertebra intervenes between the sacrum and the three coalesced dorsals.

Hunterian.

1429. The skeleton of a Pigeon (*Columba œnas*).

Of the 18 vertebræ between the skull and sacrum, the six posterior bear moveable ribs: of these the first two pairs are free; the rest are united to the sternum by hæmapophyses.

The keel of the sternum has a slight bend towards the right side: this probably relates to the habit of flying in circles, and to a tendency to describe the circle in one direction requiring a greater force for the downward stroke of the wing on one side, and consequently a greater space for the development of the pectoral muscles of that side.

Mus. South.

1430. The skeleton of the Carrier Pigeon (*Columba œnas*, var.).

Of the 18 vertebræ between the skull and sacrum, the last five bear moveable ribs, of which the four posterior pairs are united to the sternum by hæmapophyses. There is a sixth pair of ribs attached to the sacrum, the hæmapophyses of which support rudiments of the same elements of a seventh pair of ribs. The sternum presents the accidental variety of the bending of the keel to the right side, and the two median notches are converted into foramina.

Purchased.

1431. The skeleton of a Tumbler Pigeon (*Columba œnas*, var.).

The atlas and dentata are wanting: of the other 16 vertebræ between the skull and sacrum, the five posterior bear moveable ribs, of which the last four pairs are united to the sternum by hæmapophyses: there is a sixth pair of ribs attached to the sacrum, the hæmapophyses of which join those of the last pair of dorsal ribs. The development of the bones of the beak is arrested in this variety. The posterior notches of the sternum are shallower than usual. The metatarsals do not attain their normal length.

Hunterian.

1432. The skull of a Tumbler Pigeon. *Purchased.*

1433. The skull and hyoid bone of the Cushat, or Ring-dove (*Columba palumbus*).

Hunterian.

1434. The skull of *Columba palumbus*. *Purchased.*

1435. The skull of the Rock-dove (*Columba livia*). *Purchased.*

Order SCANSORES.

Family *Psittacidæ* (Maccaws, Parrots, Cockatoos).

Genus *Macrocercus*.

1436. The skeleton of the Blue and Yellow Maccaw (*Macrocercus ararauna*).

In this skeleton the bony suborbital process, continued from the lacrymal, does not reach the postfrontal, nor does this join the mastoid. There are 17 vertebræ between the skull and sacrum, of which the six posterior support moveable ribs: of these the last four pairs articulate with the sternum. The two anterior sacral vertebræ also support ribs, the first of which joins the sternum.

Mus. South.

1437. The skeleton, with the hyoid arch, larynx and trachea of the Blue and Yellow Maccaw (*Macrocercus ararauna*).

The suborbital arch of bone is complete. Of the 18 vertebræ between the skull and sacrum, the last six bear moveable ribs: of these the last four pairs unite with the sternum. The first two sacral vertebræ also bear ribs, both pairs of which articulate with the sternum.

1438. The skull and upper mandible of the great Red and Blue Maccaw (*Macrocercus Macao*).

1439. The dried head of the Blue and Yellow Maccaw (*Macrocercus ararauna*).

Genus *Plyctolophus* (*Cacatua*, Brisson).

1440. The skeleton of the Crested Cockatoo (*Plyctolophus galeritus*).

Of the 18 vertebræ between the skull and sacrum, the six posterior bear moveable ribs, the last four pairs of which articulate with the sternum: there are also two pairs attached to the sacrum, the first of which joins the sternum. The mastoid coalesces with the postfrontal, and this by an extension of ossification below the orbit with the lacrymal. The sternum is entire. The coracoid sends off a curved lamellar process from its inner side near its upper end.

Mus. Gould.

1441. The skeleton of the Pink Cockatoo (*Plyctolophus Leadbeateri*).

Of the 17 vertebræ between the skull and sacrum, the six posterior bear moveable ribs, the last four pairs of which unite with the sternum. The sacral rib joins the sternum.

Mus. Gould.

Subgenus *Licmetis*.

1442. The skeleton of the Long-billed Cockatoo (*Plyctolophus* (*Licmetis*) *nasicus*.

Of the 18 vertebræ between the skull and sacrum, the six posterior bear moveable ribs: the last four pairs of these unite with the sternum: there are also two pairs of ribs attached to the sacrum, the first of which unites with the sternum. The mastoid has coalesced with the postfrontal, and this, by continuous ossification beneath the orbit, with the lacrymal.

Mus. Gould.

Genus *Nestor*.

1443. The upper mandible and sheath of the lower mandible of the Hook-billed Parrot (*Nestor hypopolius*). *Presented by John Gould, Esq., F.R.S.*

Genus *Calyptorhynchus*.

1444. The skeleton of the Yellow-eared Black Cockatoo (*Calyptorhynchus xanthonotus*).

The number of vertebræ between the skull and sacrum is 18, and of these the last six support moveable ribs, the five posterior pairs of which articulate with the sternum. The orbits are small, but with an entire bony circumference, due to an extension of ossification from the lacrymal to the postfrontal. The mastoid does not join the postfrontal in this species. There is a small superoccipital foramen: the paroccipitals are bent backwards. The upper mandible, consisting of the coalesced nasals, maxillaries and premaxillaries, presents the short, deep and broad proportions, with the small circular nostrils perforated near the base, and the hooked apex, characteristic of the Parrot-tribe. This mandible is articulated below by the palatines to the vomer and presphenoid, and by the pterygoids to the tympanics; above by a transversely extended linear moveable articulation with the broad frontal. The lower jaw is of unusual depth: the articular surface for the tympanic forms a longitudinal groove. The aspect of the external trochlea of the metatarsus is outwards and a little backwards: the toe which it supports is turned backwards, and, with the inner toe, opposes the two anterior toes, thus forming the 'scansorial foot' characteristic of the order of which the Parrots are the type.

Mus. Gould.

1445. The skeleton of the male of the Western Black Cockatoo (*Calyptorhynchus naso*).

Of the 18 vertebræ between the skull and sacrum, the six posterior bear moveable ribs, the last four pairs of which unite with the sternum: there are also two pairs of sacral ribs, of which the first joins the sternum. In this species there is a continuity of ossification from the mastoid to the postfrontal and from this to the lacrymal. The right perforation of the sternum has not been obliterated by the ossification of the aponeurotic membrane. The wings are shorter and the flight less powerful and extensive in this than in the preceding species.

Mus. Gould.

1446. The cranium and four cervical vertebræ of the Banksian Cockatoo (*Calyptorhynchus Banksii*).

The depth of the upper beak exceeds its length. There is a superoccipital foramen. The paroccipitals are produced directly backwards. The mastoids join the postfrontals and are continued forwards by continuous ossification to join the lacrymals, forming a bony zygomatic arch above, and nearly parallel with, the true one which is composed of the slender malar and squamosal bones. The horny sheaths of the mandibles are preserved; the lower one is of unusual depth.

Mus. Gould.

1447. The skull of a *Calyptorhynchus*, longitudinally and vertically bisected.

Mus. Gould.

1448. The skull of a *Calyptorhynchus*, transversely bisected through the middle of the cranial cavity. *Mus. Gould.*

Genus *Platycercus* (Parrakeets).

1449. The skeleton of the Red-capped Parrakeet (*Platycercus pileatus*).

Of the 17 vertebræ between the skull and sacrum, the five posterior bear moveable ribs, the last four pairs of which unite with the sternum. There are also two pairs of sacral ribs, both of which join the sternum.

Mus. Gould.

Genus *Polyteles*.

1450. The skeleton of the Black-tailed Parrakeet (*Polyteles melanura*).

Of the 18 vertebræ between the skull and sacrum, the seven posterior bear moveable ribs; the last five pairs of these unite with the sternum; there are also two pairs of ribs attached to the sacrum, of which the first joins the sternum.

Mus. Gould.

Genus *Lathamus*.

1451. The skeleton of the Swift Lorikeet (*Lathamus discolor*).

Of the 18 vertebræ between the skull and sacrum, the six posterior bear moveable ribs: of these the last five pairs unite with the sternum; there is a seventh pair attached to the sacrum, which also joins the sternum. In this species the suborbital tract of bone is complete by the junction of the lacrymal with the anteriorly produced mastoid: the sternum presents the same form and development as in the genus *Euphema*. The furculum is small and slender.

Mus. Gould.

Genus *Euphema*.

1452. The skeleton of the Blue-banded Grass-Parrakeet (*Euphema chrysostoma*).

Of the 18 vertebræ between the skull and sacrum, the six posterior bear moveable ribs: of these the last four pairs unite with the sternum: there are also two pairs of ribs attached to the sacrum, of which the first articulates with the sternum. The sternum is of great extent, and the keel of unusual depth in this genus of swift-flying Parrots; but there are two moderately large oval vacuities near the posterior border, which describes a semicircle. The suborbital process of the lacrymal does not quite reach the mastoid.

Mus. Gould.

Genus *Trichoglossus* (Lories).

1453. The skeleton of the Lory (*Trichoglossus concinnus*).

Of the 17 vertebræ between the skull and sacrum, the six posterior bear moveable ribs: of these the last four pairs unite with the sternum: two other pairs of ribs are attached to the sacrum, the first of which joins the sternum. The suborbital process of the lacrymal rests upon the slender zygomatic arch, and the mastoid descends and touches the same arch. The right posterior small perforation of the sternum is almost obliterated. The spines of the dorsal vertebræ form a continuous ridge of bone, but are not anchylosed.

Mus. Gould.

Genus *Psittacus*.

1454. The skeleton of the Ash-coloured Parrot (*Psittacus erithacus*).

The suborbital process of the lacrymal terminates before it has extended halfway beneath the orbit. Of the 19 vertebræ between the skull and the sacrum, the seven posterior bear moveable ribs; and of these the last five pairs unite with the sternum. The first two sacral vertebræ also bear ribs, both pairs of which articulate with the sternum.

Hunterian.

1455. The skeleton of a Parrot (*Psittacus erithacus*).

The suborbital process of the lacrymal very nearly attains the mastoid: the postfrontal is feebly developed. Of the 19 vertebræ between the skull and sacrum, the seven posterior bear moveable ribs and the last five unite with the sternum: there are also two pairs of sacral ribs.

Mus. South.

1456. The skeleton of a Parrot (*Psittacus*).

The ossification continued below the orbit from the lacrymal joins the mastoid, but not the postfrontal. The right humerus has been fractured near its middle and united. Of the 19 vertebræ between the skull and sacrum, the seven posterior bear moveable ribs, and of these the last five pairs unite with the sternum. The first two sacral vertebræ also bear ribs, both pairs of which articulate with the sternum.

Hunterian.

1457. The skeleton of a Parrot (*Psittacus viridis*).

In this specimen, the ossification continued from the lacrymal beneath the orbit does not quite reach the postfrontal: the mastoid terminates freely: the paroccipitals are slightly extended backwards at their extremities. Of the 18 vertebræ between the skull and sacrum, the six posterior support moveable ribs, and of these the last four pairs articulate with the sternum: the sacral ribs are wanting.

Mus. South.

1458. The left half of a vertically-bisected cranium of a Parrot (*Psittacus*).

The suborbital process of the lacrymal approaches, but does not join, the mastoid: the postfrontal is a mere tubercle: the paroccipital is slightly produced backwards: the tentorial ridge dividing the prosencephalic from the mesencephalic cavity is more developed than in the Crane, as is also the ridge to which the falx is attached. The petrosal fossa is comparatively shallow.

Hunterian.

Genus *Ramphastos* (Toucans).

1459. The skeleton of the Black-billed Toucan (*Ramphastos luteus*, Gmel., Linn.).

Latham, in his 'History of Birds,' edit. 1822, vol. ii. p. 280, when giving the generic characters of the Toucan, mentions but one smooth-billed species, as an exception to the others; all of which, he observes, have the edges of their mandibles more or less irregularly notched or serrated. *Ramphastos glaber* is the species cited as differing in this particular from the rest; although in most other respects resembling the female of the Green-winged Toucan (*Ramphastos viridis*). The bird from which the above skeleton was made was in a living state in the menagerie at Exeter Change, and appeared to be full-grown. Except in the circumstances of the edges of the bill being perfectly smooth (which, if observed, is omitted by Latham), and in the general colour of the body, which was a dusky grey, the rest of the plumage and external characters strictly corresponded with his description of the black-billed species.

Purchased.

1460. The skull of the Toco Toucan (*Ramphastos Toco*). *Mus. Brit.*

1461. The mandibles of the Yellow-breasted Toucan (*Ramphastos Tucanus*).

Mus. Brit.

1462. The skull of the Yellow-breasted Toucan (*Ramphastos Tucanus*). *Mus. Brit.*

1463. The skull of the Yellow-breasted Toucan (*Ramphastos Tucanus*).

The horny sheaths of the mandibles have been removed.

Mus. Brit.

1464. The skull of the Red-billed Toucan (*Ramphastos erythrorhynchus*). *Mus. Brit.*

1465. The horny sheath of the upper mandible of the Red-billed Toucan (*Ramphastos erythrorhynchus*). *Mus. Brit.*

1466. The lower mandible of a Toucan. *Hunterian.*

Genus *Corythaix.*

1467. The skull of a Touraco (*Corythaix*).

The mastoid and postfrontal processes are small and pointed. The lacrymals are large, as are the antorbital processes of the prefrontals.

Purchased.

Genus *Picus.*

1468. The skeleton of the Woodpecker (*Picus viridis*).

The cranium is remarkable for a shallow canal extended along its upper median line and inclining between the orbits towards the right nostril. The long cornua (thyrohyals) of the hyoid arch play in this groove, having their fixed point in the nostril and arching backwards and downwards over the cranium to join the basihyal. The extremities of the scapula are deflected and slightly expanded. The form and position of the external distal trochlea of the metatarsus present the usual characteristics of this part in the *Scansores*. The coalesced terminal caudal vertebræ develope a broad flat plate below, with a groove on each side between it and the transverse processes, affording a firm basis of attachment to the stiff tail-feathers, which prop up the bird while clinging to the vertical trunk of trees in quest of its insect food.

Of the 19 vertebræ between the skull and sacrum, the seven posterior bear moveable ribs: of these, the last five pairs unite with the sternum. The first sacral vertebra bears a pair of ribs, which unite with the hæmapophyses of the last dorsal pair.

Mus. South.

1469. The skeleton of a Woodpecker (*Picus viridis*).

Of the 19 vertebræ between the skull and sacrum, the six posterior bear moveable ribs, the last five pairs of which unite with the sternum. There is one pair of sacral ribs, which join the last dorsal pair. The sclerotic plates are preserved in this skeleton.

Purchased.

1470. The skull of the Green Woodpecker (*Picus viridis*).

Presented by William Home Clift, Esq.

1471. The skull of the Great Black Woodpecker (*Picus martius*). *Hunterian.*

1472. The skull of a long and slender-billed Woodpecker (*Picus*). *Mus. Brit.*

1473. The mandibles of the White-billed, or large American Woodpecker (*Picus principalis*). *Presented by W. Bullock, Esq.*

1474. The skull of the Buff-crested Woodpecker (*Picus melanoleucus*). *Mus. Brit.*

1475. The sternum, scapular arches and proximal ends of the humeri of a Woodpecker (*Picus viridis*), showing the capsular ossicles of the shoulder-joint.

Presented by Prof. Owen, F.R.S.

Genus *Cuculus* (Cuckoos).

1476. The skeleton of the Cuckoo (*Cuculus canorus*).

Of the 19 vertebræ between the skull and sacrum, the five posterior bear moveable ribs, the last four pairs of which unite with the sternum: there are also two pairs of sacral ribs. The postfrontals are obsolete, and the mastoids very feebly developed: the interorbital space is narrow, but the surface for the attachment of the upper beak is extended transversely by the anchylosed lacrymals. The apex of the furculum joins the keel of the sternum. The outer trochlea of the metatarsus is directed outwards, but not so much backwards as in the more typical *Scansores*.

Mus. South.

1477. The skull of a Cuckoo (*Cuculus palliolatus*, Lath.)?

Hab.—New Holland.

Presented by William Home Clift, Esq.

Order PASSERES.

Tribe Syndactyli.

Genus *Alcedo*.

1478. The skeleton of the Kingfisher (*Alcedo ispida*).

The temporal depressions meet at a ridge on the parietals: the sternum has four notches posteriorly: there is no episternal process, but its equivalent is developed from the anterior border of the keel, which touches the apex of the furculum. The upper extremity of each half of the furculum sends forwards a broad and thin process. There are 19 vertebræ between the skull and sacrum, the last six of which bear moveable ribs, and of these the last four pairs unite with the sternum: there is also a pair of sacral ribs. There are 7 caudal vertebræ.

Presented by Sir Anthony Carlisle, F.R.S.

1479. The skeleton of a Kingfisher (*Alcedo ispida*).

Of the 19 vertebræ between the skull and sacrum, the six posterior bear moveable ribs, and of these the last four pairs join the sternum. There is also a pair of sacral ribs.

Mus. South.

1480. The skull of the Kingfisher (*Alcedo ispida*).

Presented by Dr. Leach, F.L.S.

1481. The skeleton of the Great Australian Kingfisher (*Dacelo gigantea*).

It is remarkable for the large proportional size of the skull, and for the strength and the breadth of the conical beak. The temporal fossæ meet at a median ridge. The occipital surface is nearly flat. The number of vertebræ between the skull and sacrum is 19, of which the last six bear moveable ribs: of these, the last four pairs are united to the sternum. There is also a pair of sacral ribs, similarly united to the sternum by bony hæmapophyses, which are overlapped by the outer and hinder angle of the sternum. The furculum sends off a process near its scapular end. The metatarsus is short in proportion to the tibia.

Hunterian.

1482. The skull of the Great Australian Kingfisher (*Dacelo gigantea*).

The plane of the occipital foramen looks obliquely downwards and backwards. The post-frontal is larger than the mastoid, and there is an accessory process from the alisphenoid. The temporal fossa is bounded by a ridge both mesially and laterally. The lacrymal bone is unusually developed, and the prefrontal process is wedged into it.

Presented by George Bennett, Esq., F.L.S.

Family *Meropidæ* (Bee-eaters).

Genus *Eurystomus.*

1483. The skeleton of the Southern Eurystome (*Eurystomus australis*).

The tibiæ and metatarsi are very long and slender: the procnemial processes form vertical equilateral triangular plates: the ectocnemial processes are short and hooked downwards. There are 17 vertebræ between the skull and sacrum, the last six of which bear moveable ribs; and of these the last four pairs are articulated to the sternum by hæmapophyses. There is a pair of sacral ribs.

Hunterian.

Genus *Coracias.*

1484. The skeleton of the Roller (*Coracias garrula*).

The mastoid process is obsolete: the postfrontal is unusually long, and descends vertically to the squamosal or zygomatic process of the upper jaw: the sternum has four notches posteriorly. There are 19 vertebræ between the skull and sacrum, the last six of which bear moveable ribs; and of these the last five pairs are joined to the sternum: there is a pair of sacral ribs, the hæmapophyses of which join those of the last dorsal pair. There are 8 caudal vertebræ.

Mus. South.

1485. The skeleton of the Bengal Roller (*Coracias Bengalensis*).

There are 17 vertebræ between the skull and sacrum, the pairs of moveable ribs attached to the last four of which unite with the sternum. The false ribs anterior to these are wanting. There is one pair of sacral ribs. The long descending postfrontal joins the squamosal.

Mus. South.

Genus *Buceros.*

1486. The skeleton of the Pied Hornbill (*Buceros violaceus*).

The atlas and axis vertebræ are wanting: of the 17 remaining vertebræ between the skull and sacrum, the six posterior bear moveable ribs; of these the second, third and fourth pairs unite with the sternum: there is one pair of sacral ribs, the hæmapophyses of which join those of the last dorsal pair of ribs.

The chief characteristic of the birds of this genus is the unusually large size of the beak, and the development of a bony process from its upper part; the horny coverings of both are preserved in this skeleton. The nostrils are small, and are pierced at the back part of the base of the upper mandible in the interspace between it and the superimposed bony processes. The mastoid and postfrontal are moderately long and slender, but do not meet. The zygomatic processes of the upper mandible are thicker than usual in relation to its superior size. The occipital surface is broad and well defined, and the vertebræ of the neck retain their full size to near the cranium. The two upper ones support posterior metapophyses. The calcaneal ossicles are preserved.

Mus. Brookes.

1487. The skeleton of a younger specimen or female of the Pied Hornbill (*Buceros violaceus*).

In this skeleton also the atlas and axis are wanting, and perhaps also another cervical vertebra. Of the 16 vertebræ which remain between the skull and sacrum, the last six support moveable ribs; and of these the second, third and fourth pairs join the sternum: the sacral pair of ribs are wanting. The horny sheath of the mandibles has been removed from the left side. The sternum has two shallow notches behind in both skeletons.

Mus. Langstaff.

1488. The skull of a Rhinoceros Hornbill (*Buceros Rhinoceros*). *Hunterian.*

1489. The skull of a Rhinoceros Hornbill (*Buceros Rhinoceros*), from which the horn-like process has been removed; showing the light cancellous structure of the beak to which it was attached. *Hunterian.*

1490. The mandibles and portions of the tympanic bones of a Rhinoceros Hornbill (*Buceros Rhinoceros*). *Mus. Brit.*

1491. The horny sheath of the upper mandible of a Rhinoceros Hornbill (*Buceros Rhinoceros*). *Hunterian.*

1492. The mandibles and crest of the Rhinoceros Hornbill (*Buceros Rhinoceros*), longitudinally and vertically bisected. *Hunterian.*

1493. The skull of the Helmet Hornbill (*Buceros galeatus*). The horny sheath is left on the beak; the hinder half of the cranium has been removed, which shows the strong vertical median bony wall dividing the fore-part of the prosencephalic chamber *Presented by Sir T. S. Raffles, F.R.S.*

1494. The mandibles, with their horny sheath, of the Helmet Hornbill (*Buceros galeatus*). *Mus. Leverianum.*

1495. The skull of a Helmet Hornbill (*Buceros galeatus*), vertically and longitudinally bisected.

It shows the denser texture of the cancellous bases of the upper beak, and especially of its large upper process. The prosencephalic median septum is very dense: the septum dividing the prosencephalic from the mesencephalic chamber is unusually developed. The occiput has been cut away. The long postfrontal nearly touches the squamosal. The mastoid, though smaller, is well developed.

Hunterian.

1496. The upper mandible, with its horny sheath, and the anterior part of the cranium of a Helmet Hornbill (*Buceros galeatus*), longitudinally and vertically bisected; showing the thick and dense horny covering in front of the superimposed process of the mandible. *Hunterian.*

1497. The horny sheath of the upper mandible of a Helmet Hornbill (*Buceros galeatus*). *Presented by Sir Joseph Banks, Bart., P.R.S.*

1498. A longitudinal section of the horny covering of the upper mandible of a Helmet Hornbill (*Buceros galeatus*). *Hunterian.*

1499. The skull, with the horny sheaths of the mandibles, of the Bifronted Hornbill (*Buceros bicornis*). *Hunterian.*

1500. The skull, with the horny sheaths of the mandibles and the dried skin of the head, of a Bifronted Hornbill (*Buceros bicornis*). *Mus. Brit.*

1501. The cranium of a Bifronted Hornbill (*Buceros bicornis*). The crest has been removed to show the light reticulate structure of the osseous platform attaching it to the upper mandible. *Presented by Sir William Blizard, F.R.S.*

1502. The skull of a Bifronted Hornbill (*Buceros bicornis*), longitudinally and vertically bisected, with part of the crest and the horny sheaths of the mandibles removed.

The vertical course of the nasal passage is exposed at the base of the mandible. The prosencephalic chamber has not the dense vertical septum, as in the *Buceros galeatus*. The small size of the occipital condyle in proportion to the head is very remarkable in the present singularly modified skull, in which it seems only to serve as the pivot for its movements.

Hunterian.

1503. The skull, wanting the back part of the cranium, but with the horny sheaths of the mandibles, of the Wreathed Hornbill (*Buceros plicatus*).

Mus. Brookes.

1504. The dried head of the male Abba Gumba, or Abyssinian Hornbill (*Buceros Abyssinicus*). *Presented by Henry Salt, Esq.*

1505. The skull of the female Abyssinian Hornbill (*Buceros Abyssinicus*).

Presented by Henry Salt, Esq.

1506. The mandibles and crest of the Flat-crowned Hornbill (*Buceros planiceps*).

Hunterian.

1507. The dried head of the Hornbill (*Buceros*).

1508. The skull of the Pied Hornbill (*Buceros Malabaricus*). *Hunterian.*

1509. The skull of the Panayan Hornbill (*Buceros Panayensis*).

Congo Expedition, 1816.

1510. The skull of the Angola, or Stripe-tailed Hornbill (*Buceros fasciatus*).

Congo Expedition, 1816.

1511. The skull of the Angola Hornbill (*Buceros fasciatus*).

Congo Expedition, 1816.

1512. The skull of a young Pied Hornbill (*Buceros Malabaricus*).

Mus. Leverianum.

1513. The skull of a young African Hornbill (*Buceros*). *Congo Expedition*, 1816.

Genus *Upupa*.

1514. The skeleton of the Hoopoe (*Upupa Epops*).

There are 19 vertebræ between the skull and sacrum, the last six of which bear moveable ribs, and the last four pairs of which unite with the sternum.

Mus. South.

1515. The skull of the common Hoopoe (*Upupa epops*). *Hunterian.*

1516. The skull of the common Hoopoe (*Upupa epops*).
Presented by William Home Clift, Esq.

Tribe Heterodactyli.

Genus *Cypselus*.

1517. The skeleton of the Swift (*Cypselus Apus*).

Of the 16 vertebræ between the skull and sacrum, the five posterior bear moveable ribs, the last four pairs of which unite with the sternum: there are two pairs of sacral ribs. The sternum is entire and long, but does not extend so far back as in the Humming-birds. The depth of the keel exceeds the greatest breadth of the sternum. The arch of the furculum is wide and rounded. The scapula is narrow, but of great length, almost reaching to the ilium. The humerus is very short and thick, with strong pectoral and deltoid processes, and with a trochlear groove on the back of the outer condyle. The ulna is more than twice as thick as the radius; both are short and straight. The metacarpus surpasses them in length, and the proximal phalanx of the middle digit is unusually broad and deeply excavated on its outer surface, for the attachment of the bases of the long primaries, or quill-feathers of flight. Not any of the four toes are directed backwards, and the outer or fourth toe, with the third as well as the second, have but three phalanges.

The chief modifications in the skeleton of this bird relate to its wonderful powers of flight; the shortness of the metatarsus and the position of the toes, to its habit of clinging to and climbing vertical surfaces, and to its defective powers of perching.

Mus. South.

1518. The skull of the Swift (*Cypselus Apus*). *Purchased.*

Genus *Trochilus*.

1519. The skeleton of a Humming-bird (*Trochilus Clemenciæ*).

The occipital region is indented by two vertical channels, which converge as they ascend, bounding laterally the cerebellar prominence and meeting upon the upper median depression, between the cerebral prominences: the long cornua of the hyoid play in these channels. The lacrymals are large, and form the anterior boundaries of the capacious orbits.

The chief peculiarity in the skeleton of the birds of this family is the great extent of the sternum, which reaches backwards to below the last caudal vertebra, and the enormous depth of the keel, which surpasses that of the entire thorax. The humerus is short, but characterized, like that in the Mole, by the strength of its processes and ridges. There is a separate olecranon or ulnar patella: the modified metacarpal and phalangeal bones which support the primaries, or principal feathers of flight, are both long and strong. The bones of the leg are small and slender. There are 17 vertebræ between the skull and sacrum, the last six of which bear moveable ribs, and of these the last five pairs are articulated to the sternum. There are 5 caudal vertebræ.

Presented by Charles Stokes, Esq., F.R.S.

1520. The skeleton of a Humming-bird (*Trochilus Kingii*).

This species is remarkable for the great southern extent of its range. The individual from which the skeleton was prepared was shot by one of the officers of Captain King's circumnavigatory expedition, whilst hovering over flowers during a snow-storm, in Patagonia.

There are 17 vertebræ between the skull and sacrum, the last five of which bear moveable ribs, and of these the last four pairs are articulated to the sternum. There are two pairs of sacral ribs, and 6 caudal vertebræ.

Presented by Charles Stokes, Esq., F.R.S.

1521. The skeleton of a Humming-bird, of the genus *Trochilus*.

Of the 16 vertebræ between the skull and sacrum, the four posterior ones bear moveable ribs, the last three pairs of which unite with the sternum: there are two sacral ribs.

Purchased.

1522. The skeleton of another species of Humming-bird, of the genus *Trochilus*.

Of the 16 vertebræ between the skull and sacrum, the last four bear moveable ribs, of which the last three pairs are joined to the sternum: there are two sacral ribs.

Purchased.

1523. The skeleton of a Humming-bird, of the genus *Orthorhynchus*.

Of the 15 vertebræ between the skull and sacrum, the four posterior bear moveable ribs, of which the last three pairs unite with the sternum: there are two sacral ribs, the first of which joins the sternum.

Purchased.

The three preceding skeletons are suspended under the same glass shade, and demonstrate well the characteristics of the bony fabric of the most diminutive, most active, and most beautiful of birds.

Genus *Caprimulgus*.

1524. The skeleton of the common Goat-sucker (*Caprimulgus europæus*).

The sternum has a long and deep keel, with two moderate posterior notches: the pectoral and deltoid processes of the humerus are both well-developed, and the antibrachium, and manus, or pinion-bones, are long, especially as compared with the tibia and metatarsus. The outer toe has not more than three phalanges. There are 17 vertebræ between the skull and sacrum, of which the last five bear moveable ribs, and of these the last four pairs are united to the sternum: there is a pair of slender sacral ribs, which do not reach the sternum.

Mus. South.

1525. The skull of the European Goat-sucker (*Caprimulgus europæus*).

Hunterian.

Genus *Ægotheles.*

1526. The skeleton of a Goat-sucker (*Ægotheles cristatus*).

Of the 18 vertebræ between the skull and sacrum, the six posterior bear moveable ribs, the last four pairs of which unite with the sternum: there is one pair of sacral ribs. There are 7 caudal vertebræ. The sternum presents four large angular vacuities posteriorly. The fourth toe has the usual number of phalanges, viz. five.

Mus. Gould.

1527. The skeleton of the Crested Goat-sucker (*Ægotheles cristatus*).

The two outer of the four angular vacuities of the sternum are notches in this skeleton. The apex of the furculum unites with the point of the sternal keel. The mastoid does not join the postfrontal; both processes are short: the number of vertebræ between the skull and sacrum is 18, of which the last six bear moveable ribs, and of these the last four pairs are united to the sternum. There is one pair of sacral ribs.

Hab. Van Diemen's Land.

Hunterian.

1528. The skeleton of an Australian Goat-sucker (*Podargus humeralis*), with the horny parts of the mandible and tongue preserved.

Both the cranium and beak are remarkable for their great breadth, and the bony base of the upper mandible is more developed than in the *Ægotheles*. The temporal fossæ are long, but narrow, and are arched over, as in the Crocodile, by the union of the mastoid with the postfrontal. The lacrymals have coalesced with the nasals and maxillaries, the bones of the upper beak retaining a moveable articulation with the frontal. The sternum has four posterior notches. There are 18 vertebræ between the skull and sacrum, the last six of which bear moveable ribs, and of these the last four pairs are articulated to the sternum: there is one pair of sacral ribs, which do not reach the sternum. There are 7 caudal vertebræ.

Mus. Gould.

Tribe Cantores.

Genus *Hirundo*.

1529. The skeleton of *Hirundo pacifica*.

Of the 19 vertebræ between the skull and sacrum, the six posterior bear moveable ribs, of which the last four pairs join the sternum: there is one pair of sacral ribs. The sternum is rather small, compared with that of other members of the Swallow-tribe, and presents the usual Passerine characters of two posterior angular notches and a produced and bifurcate episternum. The keel, however, is deep.

Hunterian.

1530. The skull of a Swallow (*Hirundo rustica*). *Purchased.*

Family *Certhiadæ* (Creepers).

1531. The skeleton of the Brown Reed-Creeper (*Dasyornis australis*).

Of the 17 vertebræ between the skull and sacrum, the five posterior bear moveable ribs, the last three pairs of which unite with the sternum: there is a pair of sacral ribs. The mastoid and postfrontal are represented by a simple continuous ridge, forming the upper boundary of the temporal depression, which is divided by a vertical ridge, and is separated by a horizontal one from the base of the skull. The apex of the furculum joins that of the sternum, and the apex of the pubis joins that of the ischium, leaving two foramina between those bones.

Mus. Gould.

1532. The skeleton of Temminck's Creeper (*Orthonyx Temminckii*).

Of the 18 vertebræ between the skull and sacrum, the six posterior have moveable ribs, of which the last five pairs unite with the sternum: there is one pair of sacral ribs, which also join the sternum. The expanded apex of the furculum joins the fore part of the keel of the sternum.

Mus. Gould.

Genus *Sitella*.

1533. The skeleton of the Black-capped Creeper (*Sitella melanocephala*).

Of the 17 vertebræ between the skull and sacrum, the six posterior bear moveable ribs, of which the last five pairs articulate with the sternum. The expanded apex of the furculum joins the fore part of the keel of the sternum. The membrane filling up the posterior notches of the sternum has become ossified.

Hunterian.

Genus *Dicæum.*

1534. The skeleton of the Scarlet Creeper (*Dicæum rubrum*).

Of the 17 vertebræ between the skull and sacrum, the last six bear moveable ribs, of which the last five pairs join the sternum: there is one pair of sacral ribs, which do not join the sternum. The metatarsi are longer than the tibiæ.

Mus. Brookes.

Genus *Certhia.*

1535. The skull of the Common Creeper (*Certhia familiaris*). *Presented by Dr. Leach, F.L.S.*

Genus *Sitta.*

1536. The skeleton of the Nuthatch (*Sitta europæa*).

There are 18 vertebræ between the skull and sacrum, of which the last six bear moveable ribs, and of these the last five pairs unite with the sternum: the pair of sacral ribs do not reach the sternum.

Mus. South.

Tribe Conirostres.

Genus *Sturnus.*

1537. The skeleton of the Starling (*Sturnus vulgaris*).

The apex of the furculum rests upon the anterior extremity of the keel of the sternum: the episternal process is trifurcate. There are 19 vertebræ between the skull and sacrum, the last six of which bear moveable ribs, and of these the last five pairs unite with the sternum: there is one pair of sacral ribs. There are 7 caudal vertebræ.

Mus. South.

1538. The skeleton of the Starling (*Sturnus vulgaris*).

There are 19 vertebræ between the skull and sacrum, the last six of which bear moveable ribs; of these the last five pairs articulate with the sternum: there is one pair of sacral ribs.

Purchased.

1539. The skull of the Starling (*Sturnus vulgaris*). *Presented by Dr. Leach, F.L.S.*

1540. The skull of the Starling (*Sturnus vulgaris*). *Purchased.*

Genus *Zanthornis.*

1541. The skeleton of the Lesser Troopial (*Zanthornis minor*).

Of the 17 vertebræ between the skull and the sacrum, the six posterior bear moveable ribs, the last four of which unite with the sternum: the first sacral vertebra also bears a pair of ribs.

Mus. South.

Genus *Strepera.*

1542. The skeleton of the Pied Crow-shrike (*Strepera graculina*).

The base of the upper beak arises suddenly above the frontal region. The first phalanx of the hind-toe is unusually elongated. There are 18 vertebræ between the skull and sacrum, the last six of which bear moveable ribs, and of these the last five pairs are attached to the sternum: there is one pair of sacral ribs.

Mus. Gould.

Genus *Anthochæra.*

1543. The skeleton of the Tasmanian Wattle-bird (*Anthochæra carunculata*).

There are 18 vertebræ between the skull and sacrum, the last six of which bear moveable ribs, and of these the last five pairs are articulated to the sternum: there is one pair of sacral ribs. There are 6 caudal vertebræ.

Mus. Gould.

Genus *Cracticus.*

1544. The skeleton of a New Holland Crow (*Cracticus streperus*).

There are 19 vertebræ between the skull and sacrum, the last seven of which support moveable ribs: of these the first two pairs are free; the five succeeding ones are articulated with the sternum; an eighth pair of ribs is attached to the sacrum, but does not reach the sternum. There are 8 caudal vertebræ.

Mus. Gould.

1545. The skeleton of a Tasmanian Crow (*Cracticus hypoleucus*).

Of the 18 vertebræ between the skull and sacrum, the five posterior bear moveable ribs, the last three pairs of which unite with the sternum: the sacrum bears a single pair of ribs, which also join the sternum.

Mus. Gould.

1546. The skull of a Raven (*Corvus corax*). *Hunterian.*

1547. The skull of a Raven (*Corvus corax*), vertically and longitudinally bisected, with the horny sheaths of the bill retained. *Purchased.*

1548. The skeleton of the Carrion Crow (*Corvus corone*).

Of the 19 vertebræ between the skull and sacrum, the six posterior bear moveable ribs, the last five pairs of which unite with the sternum: there is one pair of sacral ribs, which join the hæmapophyses of the last dorsal pair. The mastoid is more developed than in the Hooded species of Crow.

Mus. South.

1549. The skull of the Carrion Crow (*Corvus corone*). *Purchased.*

1550. The skeleton of the Hooded Crow (*Corvus cornix*).

Of the 20 vertebræ between the skull and sacrum, the seven posterior bear moveable ribs, the last five pairs of which unite with the sternum: there is one pair of sacral ribs, which almost join the sternum. The postfrontal and mastoid are moderately developed. A strong ridge is continued down the back part of the metatarsus.

Mus. South.

1551. The skull of the Hooded Crow (*Corvus cornix*).

Presented by Dr. Leach, F.L.S.

1552. The skull of the Hooded Crow (*Corvus cornix*). *Purchased.*

1553. The skull of a Rook (*Corvus frugilegus*). *Hunterian.*

1554. The bisected skull of a Rook (*Corvus frugilegus*), with the outer table removed, exposing the reticulate union of the walls of the fine cancelli of the diploë along a plane parallel with that table, which union is described as a third or intermediate table of the skull by the Donor, *J. H. Stewart, Esq.*

1555. The skull of the Jay (*Corvus* (*Garrulus*) *glandarius*). *Hunterian.*

Genus *Coccothraustes*.

1556. The skeleton of the Grosbeak (*Coccothraustes communis*).

This is remarkable for the tumid development of the bones of the upper and lower beak: the processes answering to the mastoid are unusually advanced; the postfrontals terminate the superorbital plate, which is slightly bent upwards. The paroccipitals are broad and much produced downwards. The coronoid processes of the lower jaw are unusually developed. The episternal process is bifurcate. There are 19 vertebræ between the skull and sacrum, of which the last six bear moveable ribs: of these the last five pairs are articulated to the sternum: there are two pairs of sacral ribs, neither of which directly join the sternum. There are 6 caudal vertebræ.

Mus. South.

1557. The skeleton of the Grosbeak (*Coccothraustes communis*).

There are 19 vertebræ between the skull and sacrum, the last six of which bear moveable ribs, and of these the last five pairs unite with the sternum: there are two pairs of sacral ribs, which do not directly join the sternum. The sclerotic rings are preserved in this skeleton. There are 7 caudal vertebræ.

Purchased.

1558. The skull of the Grosbeak (*Coccothraustes communis*).

Presented by Dr. Leach, F.L.S.

1559. The skull of the male Green Grosbeak (*Coccothraustes Chloris*). *Purchased.*

1560. The skull of the female Green Grosbeak (*Coccothraustes Chloris*).

Purchased.

Genus *Loxia*.

1561. The skeleton of the Crossbill (*Loxia curvirostra*).

Of the 18 vertebræ between the skull and sacrum, the six posterior bear moveable ribs, of which the last five pairs unite with the sternum: there is one pair of sacral ribs. The upper beak is slightly bent to the left, and the pointed symphysis of the lower jaw is more strongly twisted to the right. The process answering to the mastoid is a vertical ridge, almost equally bisecting the wide temporal fossa: the occipital ridges are unusually well-developed in this small bird. These indications of great muscular power acting upon the head and beak, accord with the known habits of the bird in wrenching out the seeds of the pine-cones, which form its chief and favourite food. The apex of the furculum joins that of the sternum.

Mus. South.

1562. The skull of the Crossbill (*Loxia curvirostra*).

Presented by Sir Everard Home, Bart., V.P.R.S.

1563. The skull of the Crossbill (*Loxia curvirostra*).

Presented by Sir Everard Home, Bart., V.P.R.S.

1564. The skeleton of the Virginian Cardinal (*Loxia Cardinalis*).

Of the 18 vertebræ between the skull and sacrum, the six posterior bear moveable ribs, the last five pairs of which unite with the sternum: there is one pair of sacral ribs. The base of the mastoid process extends from the tympanic articulation half-way towards the frontal. The coronoid process of the lower jaw is well-developed, as is usual in the *Conirostres*. The episternal process is bifurcate, each branch being attached by ligament to the proximal ends of the furculum: the apex of that bone is expanded, but does not touch the keel of the sternum.

Mus. Brookes.

Genus *Linaria*.

1565. The skeleton of the Linnet (*Linaria cannabina*).

There are 15 vertebræ between the skull and sacrum, the last six of which bear moveable ribs: of these the last five pairs unite with the sternum: there is one pair of sacral ribs. There are 6 caudal vertebræ.

Purchased.

Genus *Carduelis*.

1566. The skeleton of the Goldfinch (*Carduelis communis*).

There are 16 vertebræ between the skull and sacrum, of which the last six bear moveable ribs: of these the last five pairs articulate with the sternum: there is one pair of sacral ribs.

Purchased.

1567. The skull of the Goldfinch (*Carduelis communis*).

Presented by Dr. Leach, F.L.S.

1568. The skull of the Goldfinch (*Carduelis communis*).

Presented by Dr. Leach, F.L.S.

1569. The skull of the Siskin (*Carduelis spinus*). *Presented by Dr. Leach, F.L.S.*

1570. The skull of the Siskin (*Carduelis spinus*). *Presented by Dr. Leach, F.L.S.*

Genus *Pyrgita*.

1571. The skeleton of the House Sparrow (*Pyrgita domestica*).

There are 18 vertebræ between the skull and sacrum, of which the last six bear moveable ribs: of these the last five pairs are joined to the sternum: there is one pair of sacral ribs. The apex of the furculum joins that of the keel of the sternum.

Presented by W. Home Clift, Esq.

1572. The skull of the House Sparrow (*Fringilla domestica*). The process answering to the mastoid is continued from the middle of the temporal fossa, in advance of the small process in front of the tympanic articulation.

Presented by W. Home Clift, Esq.

Genus *Plectrophanes.*

1573. The skull of the Snowfleck (*Plectrophanes nivalis*).

Presented by Dr. Leach, F.L.S.

Genus *Emberiza.*

1574. The skull of the common, or Yellow Bunting (*Emberiza citrinella*).

Presented by Dr. Leach, F.L.S.

Genus *Parus.*

1575. The skull of the Great Titmouse (*Parus major*).

Presented by Dr. Leach, F.L.S.

Genus *Alauda.*

1576. The skeleton of a male Lark (*Alauda arvensis*).

The apex of the furculum is connected with the process extending from the anterior part of the keel of the sternum. The chief characteristic of this skeleton is the great length of the phalanges of the back-toe, and of the almost straight claw which they support. There are 17 vertebræ between the skull and sacrum, the last six of which bear moveable ribs: of these the last four pairs are united to the sternum: there is one pair of sacral ribs. There are 6 caudal vertebræ.

Mus. South.

1577. The skeleton of a female Lark (*Alauda arvensis*).

There are 17 vertebræ from the skull to the sacrum, the last six of which bear moveable ribs: of these the last four pairs unite with the sternum: there is one pair of sacral ribs. There are 7 caudal vertebræ.

Presented by Dr. Willis, F.R.S.

Genus *Pardalotis.*

1578. The skeleton of the Striped Pipit (*Pardalotis striatus*).

Of the 18 vertebræ between the skull and sacrum, the seven posterior bear moveable ribs, the last five pairs of which articulate with the sternum: there is one pair of sacral ribs. The sternum presents the usual Passerine characters; namely, the two posterior triangular vacuities and the bifurcated episternum.

Mus. Gould.

Genus *Regulus.*

1579. The skull of the Golden-crested Wren (*Motacilla regulus*, Linn.).

Presented by Dr. Leach, F.L.S.

Genus *Curruca.*

1580. The skeleton of the Nightingale (*Curruca luscinia*).

There are 18 vertebræ between the skull and sacrum, of which the last seven bear moveable ribs: of these the last five pairs are articulated to the sternum: there is one pair of sacral ribs. There are 6 caudal vertebræ.

Presented by Henry Cline, Esq.

Genus *Accentor.*

1581. The skull of the Hedge-Sparrow, or Warbler (*Accentor modularis*).

Presented by Dr. Leach, F.L.S.

Genus *Motacilla.*

1582. The skull of the White Wagtail (*Motacilla alba et cinerea*).

Presented by Dr. Leach, F.L.S.

1583. The skull of the common Wagtail (*Motacilla Yarrellii*). *Purchased.*

Genus *Petroica.*

1584. The skeleton of the *Petroica bicolor.*

Of the 16 vertebræ between the skull and sacrum, the last five bear moveable ribs, the last four pairs of which unite with the sternum: there are two pairs of sacral ribs, which join the sternum. The iliac bones form, together, a triangular plate, with the angles truncate, traversed by a sharp median ridge, and much expanded posteriorly, where they are crossed by a transverse ridge.

Mus. Gould.

Genus *Malurus.*

1585. The skeleton of a male Malurus (*Malurus cyaneus*).

Of the 16 vertebræ between the skull and sacrum, the six posterior bear moveable ribs, the last four pairs of which articulate with the sternum: there are two pairs of sacral ribs. The sternum is entire in this species, the membrane that filled the posterior notches, still indicated by their thickened borders, having become ossified. The apex of the long and slender furculum joins that of the keel of the sternum. The tibiæ and metatarsi are long and slender.

Mus. Gould.

Genus *Acanthiza.*

1586. The skeleton of the *Acanthiza uropygialis.*

Of the 18 vertebræ between the skull and sacrum, the six posterior bear moveable ribs, the last four of which articulate with the sternum. The coracoids are long and slender, exceeding in length the sternum, which presents the usual Passerine characters. The chief peculiarity in the skeleton of this species is the length and slenderness of the tibiæ and metatarsi.

Mus. Gould.

Genus *Oriolus.*

1587. The skull of a Golden Oriole (*Oriolus galbula*). *Purchased.*

Genus *Eulabes.*

1588. The skeleton of the Mino Grackle (*Eulabes mino*).

Of the 18 vertebræ between the skull and sacrum, the five posterior bear moveable ribs, the last four pairs of which unite with the sternum: there are two pairs of sacral ribs. Both the postfrontals and mastoids are very feebly developed. The episternum is bifurcate. The apex of the furculum joins that of the keel of the sternum. The broad compressed spines of the dorsal vertebræ form an almost continuous crest with those of the sacrum, but the lines of separation are discernible in these and in the centrums below.

Mus. South.

Genus *Meliphaga.*

1589. The skeleton of the Honeybird (*Meliphaga chloronata*).

There are 16 vertebræ between the skull and sacrum, the last six of which bear moveable ribs, and of these the last five pairs unite with the sternum: there is one pair of sacral ribs. There are 6 caudal vertebræ.

Mus. Gould.

Genus *Cinclosoma.*

1590. The skeleton of the male of Latham's Cinclosome (*Cinclosoma Lathami*).

The keel of the sternum is very long and deep, but the sternum has two deep notches posteriorly; and the angle of the furculum, and shortness of the wing bones, indicate this to be not a bird of powerful flight. There are 19 vertebræ between the skull and sacrum, the last six of which bear moveable ribs: of these the last five pairs are united to the sternum: there is one pair of sacral ribs.

Mus. Gould.

1591. The skeleton of *Cinclosoma punctatum.*

Of the 19 vertebræ between the skull and sacrum, the six posterior bear moveable ribs, the last five pairs of which unite with the sternum: the sacral pair of ribs also articulates with the sternum. The two posterior notches of the sternum are unusually wide and deep, and the lateral process which bounds them externally is suddenly expanded and overlaps the last pair of ribs.

Mus. Gould.

Genus *Turdus.*

1592. The skull of the Fieldfare Thrush (*Turdus pilaris*).

Presented by Dr. Leach, F.L.S.

1593. The skull of the Singing Thrush (*Turdus musicus*).

Presented by Dr. Leach, F.L.S.

1594. The skull of the Redwing Thrush (*Turdus iliacus*).

Presented by Dr. Leach, F.L.S.

Genus *Tyrannus.*

1595. The skeleton of the Flycatcher (*Tyrannus Dominicensis*).

Of the 19 vertebræ between the skull and sacrum, the six posterior bear moveable ribs, the last five pairs of which unite with the sternum: there is one pair of sacral ribs, which also join the sternum. The mastoid arches down from above the tympanic articulation, and is long and pointed. The episternum is bifurcate: the costal process is well-developed: the apex of the furculum does not reach that of the keel of the sternum. The broad, square, compressed spines of the six dorsal vertebræ are connected together at their upper extremities.

Mus. South.

Genus *Muscicapa.*

1596. The skeleton of the White-fronted Flycatcher (*Muscicapa albifrons*).

Of the 18 vertebræ between the skull and sacrum, the six posterior bear moveable ribs, the last five pairs of which articulate with the sternum: there is one pair of sacral ribs. The apex of the furculum joins that of the keel of the sternum. The posterior notches are converted into triangular foramina.

Mus. Gould.

Genus *Rhipidura.*

1597. The skeleton of *Rhipidura motacilloïdes.*

Of the 18 vertebræ between the skull and sacrum, the seven posterior bear moveable ribs, the last five pairs of which articulate with the sternum.

Mus. Gould.

Genus *Cracticus.*

1598. The skeleton of the *Cracticus Inglisii.*

Of the 19 vertebræ between the skull and sacrum, the six posterior bear moveable ribs, the last five pairs of which unite with the sternum: there is one pair of sacral ribs, which also joins the sternum. The mastoid and postfrontal are moderately developed: an oval foramen is left between the angular and surangular pieces of the lower jaw. The sternum has two posterior notches and a bifurcate episternum. The bony bridge at the distal end of the tibia extends from the middle of the anterior surface to above the outer condyle. The calcaneal process of the metatarsus has two perforations and two grooves. The short metatarsal of the back-toe is strongly developed, and supports a long and powerful hind-claw. The base of the beak presents two perforations on each side in advance of the ascending process of the maxillary.

Mus. Gould.

Genus *Vanga.*

1599. The skeleton of a female Australian Shrike (*Vanga destructor*).

Of the 19 vertebræ between the skull and sacrum, the seven posterior bear moveable ribs, the last six of which unite with the sternum: there is one pair of sacral ribs. The mastoid and postfrontal are slender and prolonged downwards, the latter almost to the zygoma. There is a slender styliform process on the inner side of the mastoid, of nearly equal length. There are two perforations on each side the base of the upper mandible.

Mus. Gould.

1600. The skeleton of an Australian Shrike (*Vanga Cuvieri*).

Of the 19 vertebræ between the skull and sacrum, the seven posterior bear moveable ribs, the last five of which unite with the sternum: there is one pair of sacral ribs. The same peculiarities are observable in this as in the *Vanga destructor.*

Mus. Gould.

Order ACCIPITRES.

Tribe Nocturnæ.

Genus *Bubo.*

1601. The skeleton of the Horned Owl (*Bubo europæus*).

The number of vertebræ between the skull and sacrum is 19, and of these the six posterior support moveable ribs; a seventh pair of ribs is attached to the first sacral vertebra. The hæmapophyses of the third to the sixth pair of ribs inclusive articulate directly with the sternum: the pleurapophyses of the same ribs support bony appendages. The orbits are remarkable for their size, and particularly for the great extension and anterior aspect of their posterior wall, which is chiefly due to the broad antero-posteriorly compressed postfrontal. There is a small superoccipital foramen, and a larger foramen on each side of it. The breadth of the cerebral cavity exceeds its length. The tarso-metatarsals are deeply excavated posteriorly, and the outer distal trochlea is much bent backwards.

Mus. Brookes.

1602. The skeleton of the Great Horned Owl (*Bubo maximus*).

Of the 19 vertebræ between the skull and sacrum, the six posterior bear moveable ribs, the last five pairs of which unite with the sternum: there is a (seventh) pair of ribs attached to the sacrum, but not to the sternum. The sternum, in this as in the preceding skeleton, has four posterior notches. A strong superorbital bone is attached to each antorbital process.

Mus. South.

Genus *Athene*.

1603. The skeleton of an Australian Owl (*Athene fortis*).

Of the 19 vertebræ between the skull and sacrum, the six posterior bear moveable ribs, the last five pairs of which unite with the sternum: there is one pair of sacral ribs, which does not reach the sternum. The postfrontals, mastoids and paroccipitals have each the form of broad thin plates, compressed from before backwards, the postfrontals being unusually produced downwards to increase the large orbit, and to give it a more anterior aspect. The frontals form a convex prominence above the base of the beak, and send off two short antorbital processes. The angle of the jaw is unusually produced inwards: the pterygoid terminates between this and the orbital process of the tympanic. The sternum presents four posterior notches. There is no osseous bridge in front of the distal end of the tibia, but a strong one spans from the middle of the fore part of the proximal end of the metatarsus to its outer border. The calcaneal process is produced backwards, and is expanded at its extremity. The inner condyle of the metatarsus is bent backwards and inwards. The fibula has coalesced with the tibia at two points.

Mus. Gould.

Genus *Otus*.

1604. The sternum and scapular arches of a Horn Owl (*Otus*). *Hunterian.*

Genus *Syrnium*.

1605. The skull of the Wood-Owl (*Syrnium aluco*).

Presented by William Clift, Esq., F.R.S.

1606. The skull of the Wood-Owl (*Syrnium aluco*). *Hunterian.*

Genus *Strix*.

1607. The skull of a Barn-Owl (*Strix flammea*), with the bones partially separated and artificially articulated together.

The basioccipital, exoccipitals, and superoccipital, the basisphenoid, alisphenoid, and presphenoid are anchylosed together, being usually the first parts of the cranium that coalesce in birds. The Numbers upon these and the other separated bones accord with those in the Table of Synonyms. The frontals are unusually prominent and convex. The vomer seems not to have been ossified. The tympanic is articulated to the mastoid by two small condyles, the posterior one supported on the pedicle, below the root of which is the pneumatic foramen. The surangular, angular, and articular are partially anchylosed together; the dentary and splenial pieces remain distinct.

Purchased.

The following are parts of the same disarticulated skeleton of an Owl. *Hunterian.*

1608. The cranium and lower jaw.

1609. The sternum, pelvis, four ribs, and four vertebræ of the same.

1610. The furculum.

1611. The right coracoid and scapula.

1612. The left coracoid and scapula.

1613. The right humerus.

1614. The right ulna.

1615. The right radius.

1616. The right metacarpus.

1617. The left humerus.

1618. The left ulna and radius.

1619. The left metacarpus.

1620. The right femur, tibia, fibula and metatarsus, with the patella.

1621. The left femur, tibia, fibula and metatarsus, with the patella.

Tribe DIURNÆ.

Genus *Pandion.*

1622. The skeleton of an Osprey (*Pandion ossifragus*).

Of the 19 vertebræ between the skull and sacrum, the six posterior bear moveable ribs, the last five pairs of which articulate with the sternum: there are two sacral ribs uniting directly with the sternum. The sternum presents two small perforations posteriorly. The superorbital ossicles are preserved articulated to the lacrymals. The chief characteristic in this skeleton is seen in the great strength of the metatarsi and toes. The metatarsus is traversed by three strong, almost equidistant, longitudinal ridges, one anterior and two posterior, the latter intercepting a wide and deep channel for the flexor tendons of the toes: the small metatarsal bone of the strong back-toe is half twisted outwards, forming a fulcrum for the flexor tendons of that toe. The first phalanx of the inner toe is extremely short; the second characteristically strong: the claw-phalanges progressively decrease in size as the number of the toe-phalanges increases.

Presented by Robert Keate, Esq.

1623. The skull of the Brown River Osprey (*Falco fluvialis*). *Purchased.*

Genus *Haliastur.*

1624. The skeleton of the Pondicherry Sea-Eagle (*Haliastur Ponticerianus*).

Of the 19 vertebræ between the skull and sacrum, the six posterior bear moveable ribs, the last five pairs of which articulate directly with the sternum: there are two pairs of sacral ribs which articulate with the sternum. The proximal phalanx of the inner toe has coalesced with the middle one in this species.

Hunterian.

Genus *Haliaëtus.*

1625. The skull of the White-headed, or American Sea-Eagle (*Haliaëtus leucocephalus*). *Presented by Dr. Leach, F.L.S.*

1626. The skull of the White-headed Sea-Eagle (*Haliaëtus leucocephalus*).

Hunterian.

1627. The skeleton of the Cinereous Earne, or Sea-Eagle (*Haliaëtus albicillus*).

Of the 19 vertebræ between the skull and sacrum, the six posterior bear moveable ribs, the last five pairs of which unite with the sternum: there are two pairs of sacral ribs, which articulate with the sternum directly. The sternum is entire. The tibiæ and metatarsi are of characteristic strength, but the anterior ridge in the metatarsus is less strongly marked than in the Osprey. The short proximal phalanx of the inner toe has coalesced with the middle one. The span of the arch of the powerful furculum reaches its maximum in this species of Raptorial bird.

Mus. South.

Genus *Aquila.*

1628. The skull of a Golden Eagle, from the Himalayan Mountains (*Aquila chrysaëtos?*). *Presented by Lieut.-Colonel Finch.*

1629. The sternum and scapular arch of a Golden Eagle (*Aquila chrysaëtos*).

Presented by William Clift, Esq., F.R.S.

1630. The hyoidean arch of the Golden Eagle (*Aquila chrysaëtos*).

Presented by Dr. Leach, F.L.S.

1631. The skull of an Eagle (*Aquila imperialis*), wanting the tympanics and pterygoids. The right superorbital bone is preserved, attached to the right lacrymal.

Hunterian.

1632. The sternum of an Eagle from Van Diemen's Land (*Aquila fucosa*).

Presented by Ronald Gunn, Esq.

Genus *Falco.*

1633. The skeleton of the Peregrine Falcon (*Falco peregrinus*).

Of the 20 vertebræ between the skull and sacrum, the seven posterior bear moveable ribs, the last five pairs of which unite with the sternum: there is one pair of sacral ribs, which also unite with the sternum by strong bony hæmapophyses. The premaxillary portion of the bones of the upper beak is not only strong, short, hooked, and sharp-pointed, as in other diurnal Birds of Prey, but has a toothed process on each side characteristic of the true *Falconidæ*. The fossa for the insertion of the temporal and masseter muscles is unusually extended upon the outer side of the ramus of the lower jaw. The external nostrils are subcircular perforations just behind the curved transverse line indicating the extent of the cere upon the upper mandible, the bones of which have coalesced with the frontal. The pre-frontal sends out a broad square antorbital process, which coalesces with the descending one of the lacrymal: the recurrent superorbital process of this bone is of great length. The post-frontal presents a medium development, the mastoid a more feeble one: the paroccipitals are simple plates bounding the back of the tympanic cavity. The cerebellum causes a strong prominence at the middle of the occipital region. A single free dorsal vertebra intervenes between five coalesced dorsals and the sacrum. The furculum forms a wide arch and is unusually broad: the sternum is broad, with two perforations. The bony bridge crossing the extensor tendon at the fore part of the distal end of the tibia extends from the middle protuberance to above the outer condyle; not, as in most of the *Gallinæ* and *Grallæ*, to the inner condyle. There is a distinct calcaneal ossicle behind the tarsal joint, as well as the strong and long calcaneal process at the back of the anchylosed metatarsals. The short metatarsal of the back-toe presents a broad, well-developed, convex, articular surface for the strong back-toe.

Presented by James Abernethy, Esq.

1634. The skeleton of a Peregrine Falcon (*Falco peregrinus*).

Of the 20 vertebræ between the skull and sacrum, the seven posterior bear moveable ribs, of which the last five pairs articulate with the sternum: the single pair of sacral ribs also unite directly with the sternum. A single free dorsal vertebra intervenes between the five anchylosed dorsals and the sacrum.

Mus. South.

1635. The skeleton of the Merlin (*Falco æsalon*).

Of the 19 vertebræ between the skull and sacrum, the seven posterior bear moveable ribs, the last five pairs of which unite with the sternum: there is a single pair of sacral ribs, which also join the sternum, and support the hæmapophyses of another pair. This skeleton presents the same characters of the dorsal vertebra, sternum, and tibia, as in the foregoing species, but the legs are longer and more slender in proportion to the wings.

Mus. South.

1636. The skeleton of the Hobby (*Falco subbuteo*).

Of the 20 vertebræ between the skull and sacrum, the seven posterior bear moveable ribs, the last four pairs of which unite with the sternum: there is one pair of sacral ribs, which also unite with the sternum. The sternum presents two posterior perforations. A single free dorsal vertebra intervenes between five coalesced dorsals and the sacrum. The osseous bridge at the fore part of the distal end of the tibia has two arches extending from the inter-condyloid prominence, the one to above the external, the other to above the internal condyle. The calcaneal bones are preserved in this skeleton.

Mus. South.

1637. The skeleton of the Kestrel (*Falco tinnunculus*).

Of the 19 vertebræ between the skull and sacrum, the seven posterior bear moveable ribs, the last five pairs of which articulate with the sternum: there is a single pair of sacral ribs, which also join the sternum. This presents the same characters of the dorsal vertebræ, sternum, and tibia, as are noticed in the preceding skeleton.

Mus. South.

Genus *Astur*.

1638. The skeleton of the Goshawk (*Astur palumbarius*).

Of the 19 vertebræ between the skull and sacrum, the six posterior bear moveable ribs, the last five pairs of which articulate with the sternum: there are two pairs of sacral ribs, the first of which unites directly with the sternum. Not any of the dorsal vertebræ are anchylosed.

Hunterian.

Genus *Ieracidea*.

1639. The skeleton of an Australian Hawk (*Ieracidea Berigora*).

Of the 20 vertebræ between the skull and sacrum, the seven posterior bear moveable ribs, the last five pairs of which unite with the sternum: the sacrum bears one pair of ribs, articulating also with the sternum. One free dorsal vertebra intervenes between the sacrum and five coalesced dorsal vertebræ. The sternum presents two small perforations posteriorly.

Mus. Gould.

Genus *Nisus*.

1640. The skeleton of the Sparrow Hawk (*Nisus communis*, Cuv.).

Of the 19 vertebræ between the skull and sacrum, the six posterior bear moveable ribs, the last five pairs of which unite with the sternum: the sacrum bears two pairs of ribs, both of which join the sternum. The metatarsals are relatively longer and more slender in this species than in the Buzzard.

Mus. Brookes.

1641. The skeleton of the Sparrow Hawk (*Nisus communis*).

Of the 19 vertebræ between the skull and sacrum, the six posterior bear moveable ribs, the last five pairs of which articulate with the sternum: there are two sacral ribs, the posterior of which does not join the sternum.

Mus. South.

1642. The skeleton of a Sparrow Hawk (*Nisus communis*).

Of the 17 vertebræ between the skull and sacrum, the six posterior bear moveable ribs, the last five pairs of which are joined to the sternum: there are two pairs of sacral ribs, both of which join the sternum. The right radius and ulna have been fractured, and partially reunited.

Purchased.

1643. The skull of the Sparrow Hawk (*Nisus communis*). *Purchased.*

1644. The skull of the Sparrow Hawk (*Nisus communis*). *Hunterian.*

1645. The scapulæ, coracoids, furculum, and proximal ends of the humeri of a Sparrow Hawk (*Nisus communis*). *Hunterian.*

Genus *Buteo.*

1646. The skeleton of the common Buzzard (*Buteo vulgaris*, Cuv.).

The tooth-like process is not developed from the premaxillary. The postfrontal is longer and broader than in the Falcon. The tibiæ and metatarsals are longer and more slender: the osseous bridge at the fore part of the distal end of the tibia extends from the middle to above the inner condyle in this skeleton. Of the 19 vertebræ between the skull and sacrum, the six posterior bear moveable ribs, the last five pairs of which unite with the sternum: the sacrum bears two ribs, both of which join the sternum. Not any of the dorsal vertebræ are anchylosed.

Mus. South.

1647. The skeleton of the common Buzzard (*Buteo vulgaris*).

Of the 19 vertebræ between the skull and sacrum, the six posterior bear moveable ribs, the last five pairs of which articulate with the sternum: the two pairs of sacral ribs also unite with the sternum. The sternum is entire. Not any of the dorsal vertebræ are anchylosed.

Purchased.

1648. The skeleton of the Red Buzzard (*Buteo rufus*).

Of the 19 vertebræ between the skull and sacrum, the six posterior bear moveable ribs, the last four of which unite with the sternum: the two sacral ribs join the sternum directly. Not any of the dorsal vertebræ are here anchylosed: the sternum presents two very small perforations posteriorly.

Purchased.

Genus *Elanus* (Gledes).

1649. The skull of the Swallow-tailed Glede (*Elanus furcatus*). *Purchased.*

Genus *Circus.*

1650. The skeleton of the Hen-harrier (*Circus Pygargus*).

Of the 19 vertebræ between the skull and sacrum, the six posterior bear moveable ribs, the last five of which articulate with the sternum: there are two pairs of sacral ribs. In this species the tibiæ and metatarsi are unusually elongated.

Purchased.

1651. The hyoidean arch of the Marsh Harrier (*Circus cinerarius*).

Presented by Dr. Leach, F.L.S.

Genus *Milvus*.

The following specimens are parts of the same skeleton of a Kite (*Milvus communis*).

Hunterian.

1652. The furculum.

1653. The right coracoid.

1654. The right scapula.

1655. The left coracoid.

1656. The left scapula.

1657. The right humerus.

1658. The right ulna.

1659. The right radius.

1660. The right metacarpus.

1661. The left humerus.

1662. The left ulna.

1663. The left radius.

1664. The left metacarpus.

1665. The right femur.

1666. The right tibia and fibula.

1667. The right metatarsus.

1668. The left femur.

1669. The left tibia and fibula.

1670. The left metatarsus.

Genus *Gypogeranus*.

1671. The skeleton of the Secretary Buzzard (*Gypogeranus Secretarius*).

Of the 19 vertebræ between the skull and sacrum, the last five bear moveable ribs, of which the four posterior pairs unite with the sternum: there are two pairs of sacral ribs, which also articulate with the sternum. The sternum is pointed behind, and shows only a feeble trace of two notches. The chief peculiarity in this species is the great length of the tibiæ and metatarsi, which present grallatorial proportions: these relate to the characteristic and peculiar food of this bird, which consists of snakes, the venomous species of which are thus held down at a distance from the trunk whilst being despatched by wounds from the beak. In this specimen the apex of the furculum has coalesced with the keel of the sternum, which also shows an abnormal development of bone along its margin.

Purchased.

1672. The skeleton of the Secretary Buzzard (*Gypogeranus Secretarius*).

Of the 19 vertebræ between the skull and sacrum, the five posterior bear moveable ribs, the last four pairs of which unite with the sternum: there are two pairs of sacral ribs, which also join the sternum.

Mus. South.

Genus *Percnopterus.*

1673. The skeleton of an Egyptian Vulture (*Percnopterus ægyptiacus*).

Of the 19 vertebræ between the skull and sacrum, the five posterior bear moveable ribs, the last four pairs of which articulate with the sternum: there are two pairs of sacral ribs, which also join the sternum.

Mus. South.

Genus *Gypaëtus.*

1674. The skeleton of the Griffon Vulture (*Gypaëtus barbatus*).

Of the 19 vertebræ between the skull and sacrum, the five posterior bear moveable ribs, the last four pairs of which articulate with the sternum: there are two pairs of sacral ribs, which also unite with the sternum.

Mus. Brookes.

Genus *Cathartes.*

1675. The skeleton of the Turkey Vulture (*Cathartes aura*).

Of the 18 vertebræ between the skull and sacrum, the four posterior bear moveable ribs, the last three pairs of which unite with the sternum: of the two pairs of sacral ribs, the first pair unites directly with the sternum. The sternum presents two perforations and two notches posteriorly, the notches being next the keel.

Purchased.

1676. The skeleton of the Californian Vulture (*Cathartes californianus*).

Of the 18 vertebræ between the skull and sacrum, the five posterior bear moveable ribs, the last four pairs of which unite with the sternum: there are two pairs of sacral ribs, both of which articulate with the sternum directly. The sternum presents two posterior notches.

Mus. South.

Genus *Vultur.*

1677. The skeleton of the Arabian Vulture (*Vultur monachus*).

Of the 20 vertebræ between the skull and sacrum, the four posterior bear moveable ribs, the last three pairs of which unite directly with the sternum: there are two pairs of sacral ribs, which also articulate with the sternum.

Hunterian.

1678. The skull of the Red-headed Vulture (*Vultur ruficeps*). *Purchased.*

1679. The skeleton of the European Vulture (*Vultur fulvus*).

Of the 20 vertebræ between the skull and sacrum, the four posterior bear moveable ribs, the last three pairs of which articulate with the sternum: there are also two pairs of sacral ribs, both of which join the sternum directly. The sternum presents two perforations posteriorly.

Mus. South.

Genus *Sarcoramphus.*

1680. The skeleton of the King-Vulture (*Sarcoramphus Papa*). *Mus. Brookes.*

1681. The cranium and fifteen consecutive vertebræ of a Vulture.

The base of the beak has two small irregular perforations behind the external nostrils. The nasal process of the premaxillary is bifid where it anchyloses with the frontal, and a longitudinal cleft separates it on each side from the true nasal bones: these overlap the antorbital processes of the frontal before they coalesce with that bone. The nasal process of the premaxillary is supported by the upper platform of the coalesced prefrontals: these send downwards and outwards an angular antorbital process from each side, the base of which is perforated by the olfactory nerves, and developes a small bent plate of bone, answering to the superior turbinal in Mammalia. The postfrontals are strong and moderately long: the mastoids are small, and behind these is a short tympanic process. A ligament passes from the lower angle of the paroccipital to behind the articular cavity of the lower jaw. The cervical vertebræ are broad: the first four short; the next five of moderate length: from the last of these the spinous process, which had almost disappeared on the four anterior ones, begins to rise and progressively increases, assuming the form of a quadrate compressed plate in the last two vertebræ. In these the pleurapophyses resume their moveable articulations: those of the fourteenth vertebra are more slender and not longer than the preceding anchylosed pair; the next increases in length. None of the cervical vertebræ have hypapophyses after the third. The broad base of the neural arch, formed by extension of ossification from the anterior to the posterior zygapophyses, is perforated in the third vertebra and deeply notched in the fourth; these lateral extensions of the neural arch cease to be developed in the succeeding vertebræ. The extent to which the posterior expanded aperture of the neural arch slides over the succeeding vertebra is shown well in the fifth, sixth and seventh cervicals by the smooth surface and by the absence of ridges or processes on the anterior intus-suscepted portion of the arch. It is bounded by two short lateral ridges, above and behind which are three other ridges, all longitudinal, the middle one representing the spinous process. The infundibular expansions of the two extremities of the spinal canal are well shown in these vertebræ, which enjoy a great extent of motion upon each other.

Hunterian.

1682. The four succeeding free vertebræ, with the sacrum, coccyx and pelvis of the same Vulture.

The extremities of the diapophyses and neural spines join each other by extension of ossification. The first two anchylosed vertebræ of the sacrum show articulations for free ribs. There are eight coccygeal vertebræ, reckoning the last coalesced mass as one: anterior zygapophyses are developed from the first three; the neural arch is obliterated only in the last. Bifid hypapophyses are developed from the last five coccygeals, and strong transverse processes from the first six. The neural spine of the first coccygeal is bifid. The pelvis is chiefly remarkable for the shortness and slenderness of the pubic bones, which terminate at half the length of the ischium.

Hunterian.

The following specimens are parts of the same skeleton:—

1683. The ribs (pleurapophyses and hæmapophyses).

1684. The sternum.

1685. The right scapula and coracoid.

1686. The left scapula and coracoid.

1687. The coalesced clavicles, or furculum.

1688. The right humerus.

1689. The left humerus.

1690. The right radius and ulna, with one carpal bone.

1691. The left radius and ulna.

1692. The right metacarpal, with the second carpal bone.

1693. The left metacarpal, with the second carpal bone.

1694. The two phalanges of the principal digit of the right wing.

1695. The two phalanges of the principal digit, and the phalanx of the second digit of the left wing.

1696. The femur, tibia and fibula, and the tarso-metatarsus of the right side.

1697. The femur, tibia and fibula, tarso-metatarsus and two phalanges of the middle digit of the left side.

Class MAMMALIA.

Subclass *IMPLACENTALIA.*

Order MONOTREMATA*.

The principal osteological characters of this Order are :—the second clavicle, or 'coracoid,' extending, as in Birds and Lizards, from the scapula to the sternum, and anchylosing at full growth with the scapula; the epicoracoid, as in Lizards; the marsupial bones; the supplementary tarsal bone supporting the perforated spur in the male; the long persistence of distinct pleurapophyses in the vertebra dentata. All the species are pentadactyle on both fore and hind feet, and are devoid of true calcified teeth.

Genus *Ornithorhynchus.*

1698. The partially disarticulated skeleton of a young Duck-mole, or Platypus (*Ornithorhynchus paradoxus*).

The cranium exhibits traces of many of its sutures, and some remain very evident, as the coronal, fronto-nasal, and the suture between the exoccipitals and the superoccipital. The auditory ossicles are preserved *in situ*. The horny teeth are displayed apart from the jaws. The transverse processes of the atlas are perforated parallel to the anterior border of the neural arch, from below upwards, forwards and inwards, for the passage of the vertebral artery. The odontoid is not anchylosed to the axis; it articulates with the neural arch, as well as with the lower cortical portion of the body of the atlas, and it developes forward and a little upward a long odontoid process. The true body of the axis bears neurapophyses and a neural spine, upper and lower transverse processes and pleurapophyses, which last are not anchylosed and leave a wide vertebral foramen, circumscribed by the articulation of the 'head' with the parapophysis, and of the 'tubercle' with the diapophysis. The harmoniæ between the diapophyses and pleurapophyses are obvious in the remaining cervical vertebræ, the arterial foramen being completed by the anchylosis of the head of the pleurapophysis with the

* Gr. *μόνος, single, τρῆμα, hole*: in reference to the single cloacal outlet for the excrements and products of generation.

parapophysis. An inferior spine is developed from the centrum of each cervical vertebra, except the atlas, which sends off two diverging processes (hypapophyses) from its inferior surface. The first rib developes a small tubercle, which is articulated to the diapopophysis of the first dorsal vertebra; its head articulates to the interspace between the first dorsal and last cervical vertebræ: the second rib is similarly articulated, but by a still shorter tubercle: the remaining ribs articulate by their head alone to the vertebral interspaces, except the last (seventeenth), which is supported exclusively by the centrum of the seventeenth dorsal vertebra. The hæmapophyses of the second to the sixth dorsal vertebræ inclusive are ossified, and are joined by short cartilaginous bars to the pleurapophyses, but articulate directly with their hæmal spines or sternal bones. The ilium articulates with a strongly developed lower transverse process (parapophysis) of the first sacral vertebra, and by a part, answering to the tubercle of a rib, with the upper transverse process of the same vertebra, a space or foramen being thus circumscribed in the same manner as the vertebral foramen is formed in the axis vertebra: the part of the ilium corresponding with the head of the rib also articulates with part of the parapophysis of the second sacral vertebra. The latter processes are well developed in all the caudal vertebræ. Coalescence is nearly complete between the scapulæ and coracoids: the clavicles and episternum are distinct. The manubrium sterni is divided by a median harmonia. The capsular ossicle of the shoulder-joint is distinct, and attached to the proximal epiphysis of the humerus.

Presented by George Bennett, Esq., F.L.S.

1699. The skeleton of the Platypus, or Duck-mole (*Ornithorhynchus paradoxus*).

All the cranial sutures are obliterated in this mature specimen. The skull articulates with the atlas, as in all Mammalia, by two condyles developed from the exoccipital elements. There is a circular notch which is almost a complete foramen above the foramen magnum, the plane of which is nearly vertical. The premaxillary bones are broad, flat, and diverge, with their extremities bent towards each other, but without meeting. The broad and flattened extremities of the mandibles similarly diverge, but to a less degree. There are two broad and shallow sockets at the back part of the maxillaries, and two below in the corresponding parts of the mandibles for the horny grinding teeth: the floor of the alveolus is cribriform, for the passage of the vessels and nerves to the matrix of the tooth. The mandible articulates by a convex condyle on each side to the base of the squamosal. The atlas has two broad transverse processes and two strong hypapophyses, but no upper spine. The axis is chiefly remarkable for the persistence of the articulation between its broad and short rib and its upper and lower transverse processes. The ribs of the succeeding cervicals are here anchylosed to their respective vertebræ: they progressively diminish in size, as do likewise the spinous processes of the cervical vertebræ, which are seven in number and have no zygapophyses. The eighth vertebra has its ribs or pleurapophyses moveably articulated with it, and the inferior or hæmal arch is completed by hæmapophyses which articulate with a broad hæmal spine or first bone of the true sternum. This character of the eighth vertebra or segment establishes the commencement of the dorsal region in all Mammalia, and this region terminates with the last vertebra supporting moveable ribs. There are 17 dorsal vertebræ in the *Ornithorhynchus*; six, including the first, have hæmapophyses and hæmal spines, and the hæmapophyses are ossified along their sternal halves; those of the succeeding ribs, as far as the fifteenth, are cartilaginous, much expanded, and overlap one another like broad scales; the last two pairs of ribs are free or floating. Most of the vertebral ribs have undergone a slight displacement forwards, and articulate over the interspace of their own and the antecedent centrum. This character of a greater or less number of the ribs is constant in the Mammalia. The vertebræ without moveable ribs that intervene between the dorsals and the anchylosed mass forming the sacrum are called 'lumbar vertebræ'; they are two in number in the *Ornithorhynchus*. There are also two sacral vertebræ, and twenty caudal vertebræ; these are remarkable for the length, breadth, and flattened or depressed character of their transverse processes, which cease to be developed only in the last vertebra; they support at an early period of life distinct rudiments of ribs at their extremities. The dorsal nerves perforate the neural arch directly: the cervical and lumbar nerves pass out by the intervals of the neurapophyses. The scapulæ are compressed curved plates, vertical in position, like the other pleurapophyses: they have coalesced with their hæmapophyses, the 'coracoids,' which articulate below to the modified hæmal spine, called 'episternum,' and also with the succeeding spine, called 'manubrium,' or first bone of the true sternum. Two plates of bone—dismemberments of the coracoid, but attached along their anterior borders—extend their attachments also to the elongated T-shaped episternum. The clavicles are two curved styles, extending from the acromion to the upper transverse bar of the episternum. The humerus is remarkable for its shortness and breadth, especially of its two extremities. There is a small sesamoid ossicle above the internal tuberosity, answering to the capsular ossicle in the shoulder-joint of birds: the inner condyle is perforated. The ulna is equally remarkable for its large and transversely extended olecranon. There are five digits: the first, or inner one, with two phalanges; each of the rest with three;—a numerical arrangement which is tolerably constant in the Mammalian Class. The femur is short, broad and flattened, but less powerfully developed than the humerus. The fibula strikingly resembles its homotype, the ulna, by its superior length to the tibia, and especially by the great development and terminal expansion of the process answering to the olecranon which extends above and behind its proximal articulation with the femur. In this skeleton, which has belonged to a male, is shown the singular spur-like perforated ossicle articulated to the accessory tarsal bone behind the ankle-joint. The digits of the foot are the same in number, and have the same number of phalanges as those of the hand.

The ilium, ischium, and pubis have coalesced, and the symphysis of the pubis and ischium is obliterated. Two moderately long and broad marsupial bones are articulated to the brim of the pelvis, and the pubis sends out two processes near its proximal end. In all the chief essential characters of the skeleton,—as the double occipital condyle, the convex condyles of the lower jaw and their articulations with the squamosals, the number of cervical vertebræ (seven), the flattened articular surfaces of the centrums of the vertebræ joined by the intervertebral cushions, and the numbers of the phalanges of the digits of the fore and hind feet, —the mammalian nature of the *Ornithorhynchus* is manifested: but the flattened edentulous fore part of the jaws, the small, smooth and sutureless cranium, the persistence of the articulations of the second cervical ribs, the fully developed coracoids and epicoracoids with the large T-shaped episternum, the ossified hæmapophyses separated by cartilages from the pleurapophyses, the spur-like appendages of the tarsi, and the inferior spines developed from the four anterior dorsals, are all singular instances of resemblance to the skeletons of the oviparous Vertebrates.

Presented by William Clift, Esq., F.R.S.

1700. The skeleton of a male *Ornithorhynchus paradoxus*, with the tegumentary parts of the beak and of the digits. The relations of the clavicles to the episternum are well shown in this skeleton. *Mus. South.*

1701. The skull of the *Ornithorhynchus paradoxus*. It shows well the prenasal ossicle, developed in the anterior part of the cartilaginous septum of the nose.

Presented by Sir Everard Home, Bart., V.P.R.S.

1702. The skull of the *Ornithorhynchus paradoxus*. A portion of the right side of this cranium has been removed, to exhibit the cavity and the partial ossification of the falx, which is natural in this species.

Presented by Sir Everard Home, Bart., V.P.R.S.

1703. The skull of an *Ornithorhynchus paradoxus*. A vertical section has been taken transversely in front of the orbits, showing the large, complex and delicate turbinal bones, and the wide canals for the transmission of the large trigeminal nerves to the integuments of the beak.

Prepared from a specimen presented by Dr. Hobson.

Genus *Echidna*.

1704. The skeleton of the Spiny Platypus (*Echidna Histrix*).

The jaws in this species are slender and elongated, and wholly edentulous: the premaxillaries diverge from their base, curve inwards towards each other, and meet to circumscribe the external nostrils. The cranium is smooth and devoid of ridges and processes, but the sutures continue longer than in the *Ornithorhynchus*. In this young but nearly full-grown specimen the pleurapophyses are wanting in all the cervical vertebræ, not having become anchylosed. There are 16 dorsal vertebræ, which resemble in their modifications those of the *Platypus*; 3 lumbar, 3 sacral, and 12 caudal vertebræ. The scapulæ are vertical, but broader than in the *Platypus*: the coracoids are still disunited from them, and are complete, articulating with the sternum and episternum; they also support epicoracoids. The distinction of the clavicles from the anterior transverse bar of the episternum is here well shown. The humerus attains its maximum of breadth in this burrowing Monotreme: the epiphyses at both proximal and distal ends are still distinct, and are subdivided, there being an ossicle for each tuberosity at the proximal end. The base of the enormously developed inner condyle is obliquely perforated: the olecranon is bifid, and less expanded than in the *Ornithorhynchus*; but both bones are stronger in the shaft, and the metacarpal and phalangeal bones are singularly short and thick, and support very long and strong burrowing claws. The articulations remain between the three constituent bones of the os innominatum: the marsupial bones are longer and more slender than in the *Ornithorhynchus*. The fibula developes a process answering to the olecranon. The short perforated spur-like ossicle, articulated to the back of the tarsal joint, indicates the sex of the individual to which this skeleton has belonged. The innermost toe or hallux is very short; the second is the longest toe; the other three toes gradually decrease in length. The calcaneum sends forwards a short thick process like a sixth toe.

Mus. South.

1705. The skull, wanting the lower jaw, of the *Echidna Histrix.*

Presented by Ronald Gunn, Esq.

1706. The skull of an *Echidna,* partially disarticulated.

Presented by Prof. Owen, F.R.S.

1707. The anterior part of the cranium of an *Echidna,* bisected horizontally to show the extent and complexity of the superior part of the turbinal capsules of the organ of smell. *Prepared from a specimen presented by Dr. Hobson.*

1708. Portions of the skeleton of a young *Echidna Histrix.*

These comprise the mutilated trunk, and portions of three extremities. The neurapophyses of the atlas have not coalesced with each other, and there is no neural spine. The transverse processes have a minute perforation for the vertebral artery. The odontoid is distinct from the centrum of the axis, and articulates largely with the neural arch of the atlas. The body of the axis is still disunited from its neural arch: it sends out a short parapophysis on each side, and the neural arch developes a deep compressed diapophysis: the pleurapophysis, which articulates with both these processes, is compressed and deeper than it is long: it contributes little to the formation of the vertebral canal, in consequence of the approximation of the ends of those upper and lower transverse processes. The harmoniæ between the 'head' of the pleurapophysis and the parapophysis, and between the 'tubercle' and the diapophysis, continue distinct in the remaining cervical vertebræ; and the mode of formation of the vertebral foramen, agreeably with the typical composition of the vertebræ themselves, is instructively demonstrated. The first 'dorsal' vertebra is characterized, as in the *Ornithorhynchus,* by the different form and proportions of its pleurapophyses, which join by hæmapophyses the sternum. Not any of the cervical vertebræ have zygapophyses, save the atlas. The dorsal nerves directly perforate the neurapophyses of the second and succeeding dorsal vertebræ.

The incomplete walls of the acetabula,—a character by which the *Echidna* resembles the bird,—are well seen in the present disarticulated skeleton.

Presented by Dr. Hobson.

The following are parts of one and the same skeleton of the *Echidna Hystrix*.

Presented by Ronald Gunn, Esq.

1709. The atlas.

1710. The vertebra dentata.

1711. A chain of vertebræ, including the last five cervical, the dorsal, lumbar, and four of the caudal vertebræ.

1712. The pelvis: it consists of four vertebræ, the three anterior of which have coalesced and are anchylosed to the ilia; the transverse processes of the fourth abut against the ilium, but anchylosis has not taken place.

1713. The marsupial bones.

1714. The coalesced right scapula and coracoid.

1715. The coalesced left scapula and coracoid.

1716. The coalesced clavicles and episternum.

1717. The humeri.

1718. The ulnæ.

1719. The radii.

1720. The femora.

1721. The left tibia.

1722. The fibulæ.

1723. The bones of the right and left fore-foot, with the distal epiphyses of the radius and ulna preserved with the left foot. The carpus consists of seven bones, the scaphoid and lunar having coalesced.

Order MARSUPIALIA.

Tribe Poephaga.

Genus *Macropus.*

1724. The skeleton of a male of the Great Kangaroo (*Macropus major*).

The length from the end of the premaxillaries to the end of the tail, following the curves of the spine, is 6 feet 2 inches: the length of the thorax is 13 inches. The length of the anterior extremity, from the head of the humerus, is $18\frac{1}{2}$ inches: the length of the posterior extremity, from the head of the femur, is 37 inches. The inner condyle of the humerus is perforated. The scaphoid and lunar bones are confluent in the wrist. The innermost toe of the hind-foot, or hallux, is absent in this genus; the second and third toes are extremely slender, inclosed as far as the ungual phalanx in a common fold of integument, and reduced to the function of cleansing the fur. The offices of support and progression are performed by the two outer toes, and principally by the fourth, which is enormously developed: these toes are supported, as usual, by the os cuboides, which is correspondingly large, whilst the naviculare and the cuneiform bones are proportionally reduced in size. The marsupial bones are comparatively small. The transverse process of the last cervical vertebra, the true and complex nature of which is demonstrated in the skeletons of the Monotremes, is pierced, like the rest, by the vertebral artery. 13 vertebræ are dorsal, 6 are lumbar, 2 are sacral, and 22 are caudal, the first fourteen of which have hæmapophyses.

The teeth in place are, $i\,\frac{3-3}{1-1}$, $p\,\frac{1-1}{1-1}$, $m\,\frac{3-3}{3-3}$; the last molar is still undeveloped in both jaws.

Prepared from a specimen presented by Ronald Gunn, Esq., of Launceston, Tasmania.

1725. The skeleton of a female Kangaroo (*Macropus major*).

The transverse processes of the seventh cervical vertebra are perforated: 13 vertebræ are dorsal, 6 are lumbar, 2 are sacral, and 20 are caudal: of these last, the third to the eighth inclusive bear hæmapophyses, but some of those elements have been lost from the succeeding vertebræ. The marsupial bones are proportionally longer in this than in the male skeleton: the patellæ are unossified in both, and the fibula is immoveably united to the lower half of the tibia.

The dentition is at the same stage as in the preceding male skeleton, but the last molars are a little further advanced.

Mus. Brookes.

1726. The vertically bisected cranium of a Kangaroo (*Macropus major*).

The four grinders in each moiety consist of the second deciduous molar and the three anterior true molars: the crown of the fourth molar is visible in its formative alveolus, and the premolar is exposed above the deciduous molar which it was about to displace. The constituent bones are numbered according to the TABLE OF SYNONYMS.

Purchased.

1727. The disarticulated bones of the head of a young Kangaroo (*Macropus major*).

They are numbered on coloured labels answering to the TABLE OF SYNONYMS.

The size of the jaws indicates that the animal had died at the period when the young Kangaroo has begun to quit the pouch, but still returns to it for occasional refuge.

The teeth in use are, $i\,\frac{1-1}{1-1}$, $m\,\frac{2-2}{2-2}$; or one incisor and two molars on each side of both upper and lower jaws. The incisors are *i* 1, or the first of the three in the upper jaw, and the single long procumbent incisor in the lower jaw. The molars are the deciduous series, and answer to the last two deciduous molars in the Hog and Dog; viz. *d* 3 and *d* 4. The crown of the second incisor is visible in the premaxillary bone, and a foramen exposes the germ of the third incisor. The crown of the first permanent true molar, and the germ of that of the second, may be discerned in their formative alveoli.

Presented by Prof. Owen, F.R.S.

1728. The skull of a young Kangaroo (*Macropus major*).

All the incisors are permanent: the outer ones above are nearly in place. The deciduous molars, *d* 1 and *d* 2, are *in situ*, together with the first true molar, *m* 1, in both jaws: the germ of the premolar, which after the fall of the deciduous molars becomes the first of the permanent series, is exposed in the cavity of reserve, on the left side of both upper and lower jaws.

Presented by Mr. Mornay, 1809.

1729. The mutilated skull of a young Kangaroo (*Macropus major*), exhibiting the permanent premolar teeth in their formative alveoli or cavities of reserve.

The molar teeth *in situ* are the two deciduous molars, *d* 1 and *d* 2, and the first true molar, *m* 1, on each side of both jaws. The premolar, which becomes the first or foremost of the permanent series, is still incomplete and in its cavity of reserve: this is laid open on the left side of the upper and the right side of the under jaw. The elements of the occipital bone being still un-united, the superoccipital and interparietal have been removed, showing the commencing development of the bony tentorium from the parietals. The nasal bones are removed, showing the coalesced prefrontals. The left tympanic is also removed, in order to show the continuation of the tympanic cavity into the air-cell of the zygoma, by the pneumatic foramen at the back part of that process.

Hunterian.

1730. The skull of a Kangaroo (*Macropus major*), showing the next stage of dentition, which consists in the acquisition of an additional (the second true) molar tooth (*m* 2), and the complete extrication of the crown of the third upper incisor.

The dental formula is here, therefore, $i\,\frac{3-3}{1-1}$, $m\,\frac{4-4}{4-4}$; of which the first and second are the deciduous molars; the third is the first true molar, *m* 1; and the fourth, the second true molar, *m* 2: the teeth which are still concealed in the jaws are the premolar, *p* 4 (the germ of which is exposed on the right side of the upper jaw), and the third and fourth true molars.

The sutures of the elements of the occipital bone are still unobliterated: the left exoccipital, the left tympanic, and the right ramus of the mandible are wanting.

Hunterian.

1731. The skull of a female Kangaroo (*Macropus major*).

The dental formula is, $i\,\frac{3-3}{1-1}$, $m\,\frac{4-4}{3-3}$: but it exhibits a more advanced stage than the preceding. The four molars on the left side of the upper jaw are all of the permanent series, the first being the spurious molar or premolar, the others, the first, second and third true molars. On the right side the second deciduous molar has not been shed, and the premolar is exposed immediately above it. In the lower jaw the deciduous molars are shed on both sides, and the grinders in place are the first, second and third true molars: the premolar had not cut the gum on either side, but is most advanced in the right ramus. This is an instructive stage of dentition.

The sutures between the basioccipital and exoccipital are obliterated; those between the exoccipitals and superoccipital still remain.

Purchased.

1732. The skull of a male Kangaroo (*Macropus major*), showing a corresponding stage of dentition to that of the foregoing specimen.

The crown of the second deciduous molar, *d* 4, still remains on the left side of the upper jaw, and that of its successor, the premolar, *p* 4, is exposed immediately above it. Both have been removed on the right side, showing the socket for the two long roots of the premolar. The crown of the fourth true molar is still sunk in its alveolus. The right ramus of the lower jaw is preserved, showing the premolar, *p* 4, and the first, second and third true molars in place, and the summits of the crown of the fourth true molar exposed by artificial removal of part of the alveolus.

Hunterian.

1733. The skull of a female Kangaroo (*Macropus major*).

The premolar, *p* 4, and the three anterior true molars, are in place on each side of both jaws, and the fourth molar is rather more advanced than in the preceding specimen. The elements of the occipital bone have completely coalesced.

Hunterian.

1734. The skull of a female Kangaroo (*Macropus major*).

The anterior half of the last molar, *m* 4, is extricated from its alveolus: the premolars are still retained: a portion of the outer alveolar wall has been removed from the right ramus, exposing the sockets of the anterior molars and the dental canal. From the menagerie at Exeter Change.

Purchased.

1735. The cranium of a female Kangaroo (*Macropus major*).

The last (fourth true) molar, *m* 4, is in place, the premolars are shed and their sockets obliterated. The calvarium has been removed, showing the termination of the carotid canals in the back part of the sella tunica; and the common crescentic fissure at its fore part, which answers to the foramina optica and foramina lacera anteriora. The deep cerebellar fossæ in the petrosals are also worthy of notice. The entocarotid perforates the interspace between the ali- and basi-sphenoid, grooving most deeply the former: it converges, inclining forwards and upwards, towards its fellow, and terminates, separated by a median bar of bone equal to the diameter of the canal, from its fellow.

Presented by Prof. Owen, F.R.S.

The four following specimens, from the same Donor, show the progress of development of the molar series in the left ramus of the lower jaw of the *Macropus major*, and are figured in the Article Teeth, 'Cyclopedia of Anatomy,' vol. iv.

1736. The two deciduous molars, *d* 1, *d* 2, and the first true or permanent molar, *m* 1, are in place, the crown of the second true molar is seen buried in its socket, and the socket of the third true molar, with the germ of that tooth, is visible. The premolar is artificially exposed in its closed alveolus below the interspace between the two deciduous molars.

1737. The molar teeth in use are four in number, the second true molar having risen into place without the loss of any of the deciduous molars. Besides the orifice of the alveolus of the third molar, a groove is now continued backwards from its posterior part, which leads to a minute foramen opening into the small cell containing the germ of the fourth molar. The deciduous teeth have been pushed forward, as it were, by the rising of the second true molar into place, but without a corresponding advance of the reserve-socket of the premolar, *p* 4, the crown of which is now, therefore, directly beneath the second deciduous molar, *d* 4.

1738. In this jaw the grinders in use are four in number, as in the preceding specimen, but the first milk-molar has been shed, and the third true molar has risen into place. The crown of the premolar has now risen into close contact with that of the second deciduous molar, and has excited absorption of much of its fangs.

1739. In this jaw the grinders in use are also four in number, but they consist of the premolar, *p* 4, and the three anterior true molars, both milk-molars having been shed. The crown of the fourth molar may be seen in its alveolus, which is here widely open above.

The lower jaw of the *Macropus laniger* in the Palæontological Series also shows four grinding teeth in place, but these consist of the four true molars, the premolar having been shed.

1740. The skeleton of Bennett's Kangaroo (*Macropus Bennettii*).

The inner condyle of the humerus is perforated. The patella is not ossified. The fibula closely adheres to the lower half of the tibia. The seventh (last) cervical vertebra is pierced by the vertebral artery: 13 vertebræ are dorsal, 6 are lumbar, 2 are sacral, and 22 are caudal: all of the latter have hæmapophyses, save the first. The neural arches of the lumbar vertebræ have two small perforations near their anterior margin, or towards their upper part, for the passage of vessels, not nerves. Both metapophyses and anapophyses are developed from the posterior dorsal and lumbar vertebræ, in addition to the ordinary transverse processes or diapophyses. There are four grinders in use on each side of both jaws, which consist of the two deciduous molars and the first and second true molars.

Presented by Jacob Bell, Esq., M.P.

1741. The skull of a rather younger individual of the *Macropus Bennettii*, in which the second true molars, *m* 2, have scarcely come into place.

Presented by George Bennett, Esq., F.L.S.

1742. The skull of an older individual of the *Macropus Bennettii*.

There are five molar teeth in use on each side of both jaws, the third true molar having come into place without either of the milk-molars having been shed: the germ of the premolar is exposed above the second and part of the first milk-molar. The sutures between the exoccipitals and superoccipital remain: those between the exoccipitals and basioccipital are obliterated.

Hunterian.

1743. The skull of a full-grown specimen of *Macropus Bennettii*, showing the full series of permanent grinding teeth in use.

These consist of the premolar, *p* 4, and four true molars, *m* 1—4, the two deciduous teeth having been shed, and the premolar and last molar having come into place: the acquisition of the last molar in this and many other small species of Kangaroo is not accompanied by the displacement of the premolar, as in the *Macropus major*.

Hunterian.

1744. The skull of a young Kangaroo (*Macropus laniger*), prepared to exhibit the teeth.

The permanent premolars are relatively larger and more simple than in *Macropus major*: the third superior incisors are smaller, and the first superior incisors larger. The palate is entire. The two deciduous molars and the first true molar are in place: the permanent premolar is exposed *in situ*, on the left side of both the upper and the lower jaw. The germ of the last molar, *p* 4, is not developed. The teeth of the left side, with the exception of the premolars, are removed and separately displayed: they are the three incisors, *i* 1, *i* 2, *i* 3, the deciduous molars, *d* 1 and *d* 2, and the first, *m* 1, second, *m* 2, and third, *m* 3, true molars in the upper jaw: the teeth in the lower jaw correspond with those above, except that one large procumbent incisor is opposed to the three upper incisors.

Hunterian.

1745. The mutilated skull of a small species of Kangaroo (*Macropus Derbianus*).

It corresponds in dimensions with the skull of the *Macropus Houtmanni*, but the third incisor of the upper jaw has its outer surface entire, and is notched only at its hinder border. It exhibits the full dentition of maturity, viz. $i\,\frac{3-3}{1-1}$, $p\,\frac{1-1}{1-1}$, $m\,\frac{4-4}{4-4}$.

Mus. Brookes.

1746. The mutilated skull, wanting the lower jaw, of a Kangaroo (*Macropus Parma*).

It corresponds in size and in the small proportion of the middle incisor of the upper jaw with the species of Kangaroo called "Parma" by Mr. Gould. It was referred in the former edition of the 'Osteological Catalogue' (p. 77, No. 482), to the Aroe species (*Macropus Brunii*), but differs in the absence of canines and the smaller size of the premolars.

Hunterian.

1747. The skull of the Red-bellied Kangaroo (*Macropus Billardierii*).

Rudimental canine teeth exist in the upper maxillary bones. The molar series of $\frac{5-5}{5-5}$ here consists of the two deciduous molars (*d* 3, *d* 4), and of the first three true molars (*m* 1, *m* 2, *m* 3): the crown of the premolar is exposed on the right side.

Mus. Brookes.

1748. The skull, wanting the lower jaw, of an older individual of the Red-bellied Kangaroo (*Macropus Billardierii*).

The molar series of $\frac{5-5}{5-5}$ here consists of the premolar and four true molars. A rudimental canine is still preserved on the left side of the upper jaw.

Mus. Brookes.

1749. The skull of a male Houtman's Kangaroo (*Macropus Houtmanni*, Gould).

Mus. Gould.

1750. The skull of a female of the same species (*Macropus Houtmanni*).

The adult dentition is shown in both: minute sockets of germs of canines may be seen in the upper jaw of the male.

Mus. Gould.

1751. The skull of a Long-tailed Hare-Kangaroo (*Lagorchestes leporoïdes*), from the north of South Australia.

The dental formula is, $i\,\frac{3-3}{1-1}$, $c\,\frac{1-1}{0-0}$, $p\,\frac{1-1}{1-1}$, $m\,\frac{4-4}{4-4}=30$. The canines are rudimental: the molars in the present individual consist of the two deciduous molars and three anterior true molars. The premolar is exposed on the right side of the upper jaw.

Mus. Gould.

1752. A skull of the Hirsute Hare-Kangaroo (*Lagorchestes hirsutus*).

The deciduous molars are displaced, and the crown of the premolar exposed on the right side of the upper jaw. The second deciduous molar is preserved on the left side of the upper jaw, and both deciduous molars on each side of the lower jaw.

Mus. Gould.

1753. The skull of a young individual of the same species of Hare-Kangaroo.

The deciduous molars and the three anterior true molars are in place. The germ of the premolar is exposed on the right side of the upper jaw: there are germs of canines also in the upper jaw.

Mus. Gould.

1754. The skull of the Broad-headed Hare-Kangaroo, *Lagorchestes campestris* (*Bettongia campestris*, Gould).

The affinities to the preceding more typical examples of the subgenus are shown by the very rudimental canines, by the fewer and fainter grooves on the premolar, by the larger size of its posterior inner tubercle, and by the smaller size of this tooth as compared with the typical *Hypsiprymni*; by the larger relative size of the true molars, and the stronger development of the transverse ridges connecting their outer and inner tubercles; and above all by the shedding of the deciduous molars before the last true molars come into place, as shown in the present example, which by its size appears to have belonged to a female.

From South Australia.

Presented by Governor Sir George Grey, C.B.

1755. The skull of a somewhat older individual of the same species of *Lagorchestes*.

The permanent dentition is in place, and shows the rare variety of a supernumerary molar tooth on each side of the upper jaw, making the dentition, $i\,\frac{3-3}{1-1}$, $c\,\frac{1-1}{0-0}$, $p\,\frac{1-1}{1-1}$, $m\,\frac{5-5}{4-4}=32$. A portion of the jaw is removed above the right upper premolar, exposing its long fangs, and the absence of any germ of a successor.

Presented by Governor Sir George Grey, C.B.

1756. The skull of a young individual of the same species of *Lagorchestes*.

The deciduous molars are still retained, with the first and second true molars. The crown of the premolar is exposed on the right side of the upper jaw.

Presented by Governor Sir George Grey, C.B.

The following detached bones are from the *Macropus major*.

1757. The atlas and dentata.

1758. The fifth and sixth cervical vertebræ.

1759. Two dorsal vertebræ.

1760. Five lumbar vertebræ.

1761. The ninth caudal vertebra.

1762. The left scapula.

1763. The left radius, in longitudinal section.

1764. The right carpus and metacarpus.

1765. The pelvis, with the marsupial bones.

1766. The left femur.

1767. The right femur, in longitudinal section.

1768. The left tibia and fibula.

1769. The right tibia and fibula, in longitudinal section, showing the distinction of the two closely united bones.

1770. The left os calcis. 1771. The left astragalus.

1772. The left scaphoid.

1773. The left tarsus, metatarsus, and phalanges. *Hunterian.*

1774. The inferior spongy bones of a Kangaroo (*Macropus*). *Hunterian.*

1775. The carpal, metacarpal and phalangeal bones of a Kangaroo (*Macropus*). *Hunterian.*

1776. The shaft of the right tibia and fibula of the *Macropus laniger*, in longitudinal section; showing the close apposition without confluence of the two bones at their distal halves: also the dense walls and medullary cavity of the tibia, and of the proximal part of the fibula. *Presented by John Gould, Esq., F.R.S.*

Genus *Hypsiprymnus*.

1777. The skeleton of Hunter's Potoroo, or Kangaroo-Rat (*Hypsiprymnus Hunteri*).

The inner condyle of the humerus is perforated. The fabellæ, or sesamoid ossicles behind the outer condyle of the femur, are preserved. The large metatarsal of the fourth toe of the left hind-foot is swollen and diseased at its extremity: the toe has been lost. The fibula adheres in the lower two-thirds of its extent with the tibia, but the line of separation s obvious: in the *Hypsiprymnus myosurus* the fibula is quite distinct from the tibia. There are 7 cervical vertebræ, and the transverse process of the sixth is first perforated by the vertebral artery: 13 vertebræ are dorsal, 6 are lumbar, 2 sacral, and 24 caudal, of which last the third to the nineteenth inclusive bear hæmapophyses.

The generic character is shown by the normal development of the upper canines, and by the large and grooved premolars.

Hunterian.

1778. The skull of Hunter's Potoroo (*Hypsiprymnus Hunteri*).

It exhibits the final stage of acquisition of the permanent teeth, the last true molars and all the premolars save one being in place. The right premolar, lower jaw, has not yet displaced the two deciduous teeth, which it equals in extent; and there are, therefore, six teeth in the molar series on this side of the jaw: viz. *d* 1, *d* 2, *m* 1, *m* 2, *m* 3, *m* 4.

Presented by Dr. Hobson.

1779. The skull of the same species of Potoroo, vertically and longitudinally bisected.

All the permanent teeth are in place: the bones are numbered on coloured labels corresponding with the TABLE OF SYNONYMS.

Presented by Prof. Owen, F.R.S.

1780. The skull of a female of the Rat-tailed Potoroo (*Hypsiprymnus murinus*).

This specimen was taken from the skin originally described by Hunter, and figured in White's 'Journal of a Voyage to New South Wales,' p. 286, as the "Potoroo."

Dental formula:—$i\,\frac{3-3}{1-1}$, $c\,\frac{1-1}{0-0}$, $p\,\frac{1-1}{1-1}$, $m\,\frac{4-4}{4-4}=30$. The molar teeth have been worn quite flat and smooth.

This skull shows a longer and more tapering face, longer and narrower nasals, more slender zygomata, and a more triangular occiput than that of the *Hypsiprymnus Hunteri*.

Hunterian.

1781. The skeleton of a male of the Rat-tailed Potoroo (*Hypsiprymnus murinus*).

The inner condyle of the humerus is perforated. There are 7 cervical, 12 dorsal, 7 lumbar, 2 sacral, and 23 caudal vertebræ. The second to the fifth caudal inclusive bear hæmapophyses. The transverse process of the seventh cervical is perforated by the vertebral artery. The fabellæ are preserved. The patellæ are not ossified. The tibia and fibula are distinct.

Mus. Gould.

1782. A partially disarticulated skeleton of a male Rat-tailed Potoroo (*Hypsiprymnus murinus*).

The dental formula is, $i\,\frac{3-3}{1-1}$, $c\,\frac{1-1}{0-0}$, $p\,\frac{1-1}{1-1}$, $m\,\frac{4-4}{4-4}=30$. There are 7 cervical, 13 dorsal, 6 lumbar, and 2 sacral vertebræ: the caudal vertebræ are not all preserved.

Presented by George Bennett, Esq., F.L.S.

1783. The skull of a male *Hypsiprymnus murinus*, from Murray River, South Australia. *Presented by Governor Sir George Grey, C.B.*

1784. The skull of a male *Hypsiprymnus murinus*. *Mus. Gould.*

1785. A vertically bisected skull of a male *Hypsiprymnus murinus*. *Mus. Gould.*

1786. The skull of a female of the same species of Potoroo.

The canines are relatively smaller than in the male.

Purchased.

1787. The skull of a young female of the same species of Potoroo.

The last true molars are nearly in place, but the two deciduous molars are retained. From Mount Bryan, South Australia.

Presented by Governor Sir George Grey, C.B.

1788. The skull of a young male of the same species of Potoroo.

The last molars are in place on each side of the upper jaw, and the deciduous molars being still retained, the series of grinders includes six teeth: the progress of dentition is more tardy in the lower jaw.

Presented by Governor Sir George Grey, C.B.

1789. The skull of a young male of the same species of Potoroo.

The last true molars are completely in place, and the deciduous molars are retained: so that the dental formula seems to be, $i\,\frac{3-3}{1-1}$, $c\,\frac{1-1}{0-0}$, $p\,\frac{1-1}{1-1}$, $m\,\frac{5-5}{5-5}=34$. The crowns of the permanent premolars of the right side are exposed in both upper and lower jaws. The skull is mutilated behind.

Presented by George Bennett, Esq., F.L.S.

1790. The skull of a younger individual of the same species of Potoroo.

The dentition consists of the permanent incisors and canines, the deciduous molars, and the first permanent true molar: it corresponds with that of the young Kangaroo (No. 1728), but differs in the complete acquisition of the third or outer incisors of the upper jaw, as well as of the canines.

Presented by George Bennett, Esq., F.L.S.

1791. The ossa innominata, with one of the marsupial bones, of a young *Hypsiprymnus myosurus.*

It shows a small additional ossicle contributing to the acetabulum, and excluding the pubis from any share therein.

Presented by Prof. Owen, F.R.S.

Tribe Rhizophaga.

Genus *Phascolomys.*

1792. The skeleton of the Wombat (*Phascolomys Vombatus*).

The seventh (last) cervical vertebra is perforated by the vertebral artery: 15 vertebræ bear ribs, the first six of which articulate directly with the sternum, and the remaining nine intermediately. The twenty-third vertebra from the skull bears a short flattened and horizontally expanded pleurapophysis, which is suturally articulated to it; inclusive of this there are 4 lumbar vertebræ: 4 vertebræ have partially coalesced into a sacrum, but two only of these abut against the ilia. There are 10 caudal vertebræ, none of which have hæmapophyses. The hæmapophysial part of the atlas is not ossified, and the wide interspace of the neurapophyses below is filled by ligamentous substance, upon which the true body of the atlas, here forming a strong odontoid process, rests. The metapophysis rises suddenly from the outside of the prozygapophysis of the twelfth dorsal, increases in length to the second lumbar, diminishes by degrees to the second sacral, and is rudimental in the following sacral and caudal vertebræ. A rudiment of the anapophysis is first discernible on the eleventh dorsal: the process gradually increases to the last dorsal, diminishes in the lumbar, and disappears in the last of that series. The sutures between the short straight pleurapophysis and diapophysis of the first lumbar vertebra still in a great degree remain; the anchylosis is only partial, and the proportion of the autogenous and exogenous elements of the so-called 'transverse process' are plainly demonstrated. The diapophysis, moreover, is not suppressed on the last dorsal vertebra, as in some of the *Quadrumana*, *Carnivora* and *Rodentia*. The serial homology of the transverse processes of the lumbar vertebræ is here, therefore, manifested in the most unequivocal way; both metapophyses and anapophyses coexist with diapophyses in the last four dorsal and the first three lumbar vertebræ. So that, whether the metapophysis or the anapophysis be the part called 'tubercle' by some Anthropotomists, neither of them are, in the lumbar vertebræ, the process named 'transverse' in the thoracic vertebræ: that process, to which the name 'diapophysis' is restricted in the present Catalogue, is continued distinctly into the lumbar region, and is there lengthened out by a superadded 'pleurapophysis,' which is ossified from a distinct centre in the Wombat.

Presented by Sir Everard Home, Bart., V.P.R.S.

1793. The skull of the Wombat (*Phascolomys Vombatus*).

It is remarkable for its breadth, the flatness of the upper surface, the strength of the arched zygomata, and the extraordinary expansion of the inflected angle of the lower jaw.

Presented by Sir Everard Home, Bart., V.P.R.S.

1794. The mutilated skull of a Wombat (*Phascolomys Vombatus*), prepared to exhibit the teeth.

The formula of these is, $i\,\frac{1-1}{1-1}$, $p\,\frac{1-1}{1-1}$, $m\,\frac{4-4}{4-4}=24$. All the teeth are long, deeply implanted, curved in segments of a circle, and with an undivided and uncontracted base. The lower incisors are the least curved. The premolars present no trace of that compressed structure which characterizes them in the Koala and Kangaroos, but have a wide oval transverse section; those of the upper jaw being traversed on the inner side with a slight longitudinal groove. The true molars are double the size of the premolars: the superior ones are also traversed by an internal longitudinal groove, but this is so deep and wide that it divides the whole tooth into two prismatic portions, with one of the angles directed inwards. The inferior molars are in like manner divided into two trihedral portions, but the intervening groove is here external, and one of the facets of each prism is turned inwards.

Presented by Sir Everard Home, Bart., V.P.R.S.

1795. The skull of a Wombat (*Phascolomys Vombatus*), longitudinally and vertically bisected.

Part of the sutures between the superoccipital and exoccipitals remain. The carotids perforate the basisphenoid. The bones are numbered on coloured labels according to the TABLE OF SYNONYMS.

1796. The mutilated skull, wanting the lower jaw, of a Wombat (*Phascolomys Vombatus*).

Although the mature dentition and full size are acquired, the sutures of the occipital elements remain. The right exoccipital has been removed, and the tympanic and mastoid elements of the temporal of the same side have been detached from the equally distinct petrosal and squamous elements. The pterygoids have likewise been removed.

Presented by Prof. Owen, F.R.S.

1797. The detached teeth of the same Wombat. *Presented by Prof. Owen, F.R.S.*

The following parts of the skeleton of a Wombat (*Phascolomys Vombatus*) were

Presented by H. Everett, Esq.

1798. The skull.

1799. The lower jaw.

The inflection of the angle, characteristic of the Marsupialia generally, is here carried to excess.

1800. The neurapophyses of the atlas.

They are wide apart below, in consequence of the absence of the usual hypapophysis or wedge-bone of this vertebra.

1801. The odontoid vertebra.

A fissure of the median portion separates the centrum of the atlas, now forming the odontoid process, from the true centrum of the second cervical.

1802. The third cervical vertebra. 1803. The fourth cervical vertebra.

1804. The fifth cervical vertebra. 1805. The sixth cervical vertebra.

1806. The seventh cervical vertebra.

The upper transverse process is long and strong; the lower one is a small projection only, between which and the former the passage of the vertebral artery is indicated by a notch.

1807. The dorsal vertebræ.

They are numbered consecutively from 1 to 15.

1808. The ribs of the right side.

They are numbered consecutively from 1 to 15.

1809. The ribs of the left side.

They are numbered consecutively from 1 to 15.

1810. The first lumbar vertebra.

The sutures of the pleurapophysial parts of the transverse processes are not wholly obliterated.

1811. The second lumbar vertebra.

1812. The third lumbar vertebra.

1813. The fourth lumbar vertebra.

1814. The five next succeeding vertebræ of the same Wombat.

Their transverse processes have coalesced, and their centrums are united to form a sacrum. The abutment of the ilia is formed by the transverse processes of the two anterior of these coalesced vertebræ.

1815. The first caudal vertebra.

1816. The second caudal vertebra.

1817. The last five caudal vertebræ.

1818. The right scapula.

1819. The left scapula.

1820. The right clavicle.

1821. The left clavicle.

1822. The right humerus.

1823. The left humerus.

1824. The right radius.

1825. The right ulna.

1826. The left radius.

1827. The left ulna.

1828. The right carpal bones.

1829. The right os innominatum, with its marsupial bone artificially attached, in order to show the glenoid cavity at its base articulated to the condyle on the os pubis.

1830. The left os innominatum. 1831. The left marsupial bone.

1832. The right femur. 1833. The left femur.

1834. The right tibia. 1835. The right fibula.

1836. The left tibia. 1837. The left fibula.

1838. The right tarsal and metatarsal bones.

1839. The left tarsal and metatarsal bones. 1840. Phalangeal bones.

1841. The skull of a Wombat (*Phascolomys platyrhinus*).

It differs from the *Phascolomys Vombatus* in its superior size, in the greater relative breadth of the nasal bones, and in the larger and deeper excavation above the tympanic bone. The lower jaw and the molar teeth are wanting.

From Australia.

Presented by Dr. Hobson.

1842. The skull of the same species of Wombat (*Phascolomys platyrhinus*).

The teeth are remarkable for the unequal manner in which they have been worn.

Presented by Dr. Hobson.

1843. The skull of a Wombat (*Phascolomys latifrons*).

This is a well-marked species, characterized by the great development of the postorbital angles; the great and sudden expansion of the anterior half of the frontal bones; the superior breadth of the strip of the maxillary bone ascending in front of the malar and lacrymal bones to join the nasal bones; and the enormous depth of the supratympanic fossa.

From South Australia.

Presented by Governor Sir George Grey, C.B.

Tribe Carpophaga.

Genus *Phascolarctos.*

1844. The skull of the Koala (*Phascolarctos fuscus*).

It is remarkable for the unusual length of the exoccipital processes, the short mastoids abutting against the outer side of their base. The sphenoidal bullæ are excessively developed. A bristle is passed through the left *canalis caroticus*, in the side of the basisphenoid, and part of the calvarium is removed, showing the entry of the canal into the shallow sella turcica. The petrosal is impressed by a deep cerebellar pit. The base of the zygomatic process is inflated by an air-cell communicating with the tympanum, and is perforated by a venous canal. The zygomatic arches are long and strong: the pterygoids are distinct deep plates. The lacrymal foramen is extraorbital. The angle of the jaw is bent upwards and very slightly inwards.

Dental formula:—$i\,\frac{3-3}{1-1}$, $c\,\frac{1-1}{0-0}$, $p\,\frac{1-1}{1-1}$, $m\,\frac{4-4}{4-4}=30$. The true molars are larger in proportion than in the Phalangers; each is beset with four three-sided pyramids, the cusps of which wear down in age, the outer series in the upper teeth being the first to give way; those of the lower jaw are narrower than those of the upper. The spurious molars are compressed, and terminate in a cutting edge; in those of the upper jaw there is a small parallel ridge along the inner side of the base. The canines slightly exceed in size the posterior incisors; they terminate in an oblique cutting edge rather than a point; their fang is closed at the extremity; they are situated, as in the Phalangers, close to the intermaxillary suture. The lateral incisors of the upper jaw are small and obtuse; the two anterior or middle incisors are twice as long, broad and thick as the posterior incisors; they are conical, slightly curved, subcompressed, bevelled off obliquely to an anterior cutting edge, but differing essentially from the *dentes scalprarii* of the *Rodentia*, in being closed at the extremity of the fang. The two incisors of the lower jaw resemble those of the upper, but are larger and more compressed; they are also formed by a temporary pulp, and its absorption is accompanied by a closure of the aperture of the pulp-cavity, as in the upper incisors. The Koala, therefore, in regard to the number, kind, and conformation of its teeth, closely resembles the Phalangers, with which it also agrees in its long cæcum and the general conformation of its digestive organs.

Presented by Sir Everard Home, Bart., V.P.R.S.

1845. The skull of a young Koala (*Phascolarctos fuscus*).

In this Marsupial the permanent premolar comes into place before either the third or the fourth true molars have cut the gum: the canines are just appearing. The tympanic bone is removed from the right side.

Presented by Sir Everard Home, Bart., V.P.R.S.

1846. The disarticulated bones of the head of a young Koala (*Phascolarctos fuscus*).

The state of the dentition corresponds with that of the preceding specimen. The bones are numbered on coloured labels according to the Table of Synonyms. The posterior angles of the basisphenoid are produced backwards, and the carotid enters between this angle and the alisphenoid bulla, and pierces the basisphenoid obliquely: the internal apertures are separated by a space equal to both their diameters, and open on the posterior third of the basisphenoid, which rises anterior to them to form the chiasmal platform.

Presented by Sir Everard Home, Bart., V.P.R.S.

1847. The atlas, axis, and third cervical vertebra of a Koala (*Phascolarctos fuscus*).

The body of the atlas is anchylosed, as the odontoid process, to the axis; the hypapophysis is not ossified; part of its dried ligamentous remains are preserved. Ossification has extended from the neurapophyses into the under part of the capsule of the primitive notochord, and this part of the atlas developes a low tubercle on each side, representing the parapophysis. The diapophysis is short, broad, depressed, with a constricted base. The vertebral artery has notched both the hind and the fore part of this base, in winding round to perforate the neural arch above the anterior articular cavity. The parapophysis and diapophysis of the two succeeding vertebræ being united by a coalesced rudimental rib, present the usual perforated character.

Presented by Sir Everard Home, Bart., V.P.R.S.

1848. The left humerus of the Koala (*Phascolarctos fuscus*).

The deltoid ridge extends along its proximal half. The long and broad supinator ridge terminates above in an unciform process; the inner condyle is widely perforated: the olecranal depression is very feebly marked.

Presented by Sir Everard Home, Bart., V.P.R.S.

Genus *Petaurus*.

1849. The skeleton of the Long-tailed Petaurist (*Petaurus macrourus*).

The inner condyle of the humerus is perforated. The ribs are thicker and broader than usual. The 7 cervical vertebræ have their transverse processes all perforated on the left side, but on the right the last is only notched: 12 vertebræ are dorsal, 7 are lumbar, 3 are sacral, and 26 are caudal: of these only the fifth, sixth and seventh have small rudiments of hæmapophyses.

Mus. Brookes.

1850. The skeleton of the Sciurine Petaurist, or Flying Opossum (*Petaurus sciuræus*).

The inner condyle of the humerus is not perforated. The marsupial bones are wanting in this skeleton. There are 7 cervical vertebræ, and the transverse process of the sixth is first pierced by the vertebral artery. The dorsal vertebræ are 12 in number, the lumbar 7, the sacral 2, the caudal 19: in these the hæmapophyses, if present, have not been preserved.

The species of the genus *Petaurus* are limited to Australia, and closely resemble, or are identical with, the true Phalangers in their dental characters and the structure of the feet.

They, however, present an external character so easily recognizable, and influencing so materially the locomotive faculties, as to claim for it more consideration than the modifications of the digits or premolars. A fold of the skin is extended on each side of the body between the fore and hind legs, which, when outstretched, forms a lateral wing or parachute, but which, when the legs are in the position for ordinary support or progression, is drawn close to the side of the animal by the elasticity of the subcutaneous cellular membrane, and there forms a mere tegumentary ridge. These delicate and beautiful Marsupials have been separated generically from the Phalangers under the name of *Petaurus*: they further differ from the Phalangers in wanting the prehensile character of the tail, which, in some Petaurists, has a general clothing of long and soft hairs, whilst in others the hairs are arranged in two lateral series.

There is as little constancy in the exact formula of the dentition in the Petaurists, as among the Phalangers. The largest species of Petaurist (*Pet. taguanoides*), for example, is almost identical in this respect with the *Phalangista Cookii*, which M. Fr. Cuvier has therefore classed with the *Petauri*. Those teeth of *Pet. taguanoides* which are sufficiently developed, and so equal in length, as to exercise the function of grinders,—or, in other words, the functional series of molars,—consist of six teeth on each side of the upper jaw, and five teeth on each side of the lower jaw. The four posterior molars in each row are true, and bear four pyramidal cusps, excepting the last tooth in the upper jaw, which, as in *Ph. Cookii*, has only three cusps. In the upper jaw the space between the functional false molars and the incisors is occupied by two simple rudimentary teeth, the anterior representing the canine; but being relatively smaller than in *Ph. Cookii*, the crowns of the two anterior incisors are relatively larger. In the lower jaw the sloping alveolar surface between the functional molars and large procumbent incisors is occupied by two rudimentary minute teeth.

Purchased.

Genus *Phalangista.*

1851. The skeleton of the Vulpine Phalanger (*Phalangista vulpina*).

The spinous processes of the third to the sixth cervicals inclusive are almost obsolete. The inner condyle of the humerus is perforated. The patella has not been ossified. The second and third toes are extremely slender, and in the recent animal are inclosed in a common sheath of integument as far as the claws,—a structure which has suggested the name of the genus. The transverse processes of the 7 cervicals are perforated: 13 vertebræ are dorsal, 6 lumbar, and 2 sacral: 22 caudal vertebræ are preserved, and of these the second to the eighteenth inclusive bear hæmapophyses.

Mus. Brookes.

1852. The skull of the Vulpine Phalanger (*Phalangista vulpina*).

A small detached premolar is preserved on the right side of the upper jaw, and there are two rudimental canines in the lower jaw: in other respects the dental formula is the same as in the *Koala* and *Hypsiprymnus*.

Presented by Henry Cline, Esq.

1853. The skull of a Vulpine Phalanger (*Phalangista vulpina*).

There is a small detached premolar on each side of the upper jaw, implanted by a partially divided base.

Presented by H. Everett, Esq.

1854. The skull of a Vulpine Phalanger (*Phalangista vulpina*).

This formed part of the original Hunterian Collection, and the name "Wha-tapoa-roo" was attached to it, indicating it to have been of the same species as the *Phalangista vulpina*, originally described by Hunter under the above native name in White's 'Journal of a Voyage to New South Wales,' 4to, p. 278, 1790.

Hunterian.

1855. The skull of a Vulpine Phalanger (*Phalangista vulpina*).

Its dentition agrees with that of the preceding specimen, but it has belonged to an older individual. The cranium is bisected vertically and transversely, through the cellular bases of the zygomata and the tympanic cavities, exposing the otosteals. The falx extends from the roof to the floor of the prosencephalic chamber of the cranium, but has two perforations. The tentorium is exposed in the hinder moiety of the cranium.

Presented by Dr. Hobson.

1856. The vertically and longitudinally bisected skull of a Vulpine Phalanger (*Phalangista vulpina*).

The numbers indicate the names of the bones according to the Table of Synonyms. The detached premolar is wanting on the right side. The carotid perforates the hinder end of the junction between the basi- and ali-sphenoid, and terminates above the hinder third of the basisphenoid.

Presented by Dr. Hobson.

1857. The skull, wanting the lower jaw, of a Phalanger (*Phalangista vulpina*).

The occipital segment of the cranium is detached, together with the petrosal, mastoid, and tympanic bones of the right side: and the cellular structure of the expanded base of the squamosal is shown.

Presented by Henry Everett, Esq.

1858. The last lumbar vertebra, the sacrum, and the first three caudal vertebræ, with the ossa innominata and marsupial bones, of a Vulpine Phalanger (*Phalangista vulpina*).

The specimen is marked "Wha-tapoa-roo." The rudimental hæmapophyses are shown between the second and third caudal vertebræ.

Hunterian.

1859. The pelvic bones, with two caudal vertebræ, of a Vulpine Phalanger (*Phalangista vulpina*). *Presented by Henry Cline, Esq.*

1860. The skull of a small variety or female of the Vulpine Phalanger (*Phalangista vulpina*).

The small detached premolar is present on both sides of the upper jaw.

From the Murray River, South Australia.

Presented by Dr. Hobson.

1861. The skull of the same variety of Vulpine Phalanger (*Phalangista vulpina*).

Presented by Dr. Hobson.

1862. The skull of the Short-eared Phalanger (*Phalangista canina*).

From the Scrub-districts, New South Wales.

Mus. Gould.

1863. The skeleton of Cook's Phalanger (*Phalangista Cookii*).

The spines of the last five cervical vertebræ are obsolete. The inner condyle is perforated. The fibula is much expanded at its proximal end, and supports a sesamoid bone. The transverse process of the sixth cervical is pierced first by the vertebral artery: 7 vertebræ are cervical, 13 are dorsal, 6 lumbar, 2 sacral, and 25 caudal: the fourth to the seventh of these last have hæmapophyses.

Presented by H. Everett, Esq.

1864. The skull of Cook's Phalanger (*Phalangista Cookii*).

The dental formula is: $i\,\frac{3-3}{1-1}$, $c\,\frac{1-1}{1-1}$, $p\,\frac{3-3}{3-3}$, $m\,\frac{4-4}{4-4}=40$. In the upper jaw p 4 and p 3 are close together, and form part of the same continuous series with the true molars: p 2 is detached, and is very minute. In the lower jaw p 4 is the only fully developed premolar: there are the sockets of two rudimental premolars, besides that of the minute canine, on the right side.

Presented by H. Everett, Esq.

1865. The skull of Cook's Phalanger (*Phalangista Cookii*).

The dentition of the upper jaw agrees with that of the preceding specimen: there is only one minute premolar between the p 4 and the minute canine.

Presented by Ronald Gunn, Esq.

1866. The skull of Cook's Phalanger (*Phalangista Cookii*), in vertical longitudinal section.

In this species of Phalanger there are, both in the upper and lower jaws, four true molars on each side, each beset with four three-sided pyramidal sharp-pointed cusps: thus these essential and most constant teeth correspond in number with those of the Opossum; but in the upper jaw they differ in the absence of the internal cusp, which gives a triangular figure to the grinding surface of the molars in the Opossum, and the anterior single cusp is wanting in the true molars of the lower jaw. Anterior to the upper grinders in this Phalanger there are two premolars of similar shape and proportions to those in the Opossum; then a third premolar, too small to be of much functional importance, separated also, like the corresponding anterior premolar in the Opossum, by a short interval from those behind.

The canine tooth but slightly exceeds in size the above premolar, and consequently here occurs the first great difference between the Phalangers and Opossums; it is, however, but a difference in degree of development, and in the Ursine and other Phalangers, as well as in the Petaurists, the corresponding tooth presents more of the proportions and form of a true canine.

The incisors, which are most variable in number in the Carnivorous section of the order, are here three instead of five on each side of the upper jaw; but their size, especially that of the first, compensates for their fewness. The lower jaw has but two large procumbent incisors, as in all the vegetable-eating Marsupials.

In the lower jaw there is the same number of molars and functional premolars as in the Opossums; the two very minute and functionless molars, which form part of the same continuous series, represent the small premolars of the upper jaw; and anterior to these there is one very small canine and one very large and procumbent incisor on each side.

The interspace between the functionally developed incisors and molars in both jaws always contains in the Phalangers teeth of small size and little functional importance, and variable not only in their proportions but their number.

The constant teeth in the Phalangers are the $\frac{4-4}{4-4}$ true molars, and the $\frac{3-3}{1-1}$ incisors.

The canines are constant in regard to their presence, but variable in size; they are always very small in the lower jaw.

With respect to the functional premolars $\frac{1-1}{1-1}$, these are always in contact with the molars, and their crowns reach to the same grinding level; sometimes a second premolar is similarly developed in the upper jaw, as in the *Ph. Cookii*, and as in the great flying Phalangers (*Pet. Taguanoides*), but it is commonly absent, or replaced by a very minute tooth, shaped like a canine; so that in the upper jaw, between the posterior or functional premolar and the incisors, we may find three teeth, of which the posterior is the largest, as in *Ph. Cookii*, or the smallest, as in *Ph. cavifrons*; or there may be only two teeth, as in *Ph. ursina* and *Ph. vulpina*, and the species, whatever that may be, which M. Fr. Cuvier has selected as the type of the dentition of the genus.

In the lower jaw similar varieties occur in these small and unimportant teeth; *e. g.* there may be between the procumbent incisors and the posterior premolar, either three teeth, as in *Ph. Cookii* and *Ph. cavifrons*, or two, as in *Ph. ursina*, *Ph. maculata*, and *Ph. chrysorrhoos*; or, finally, one, as in *Ph. vulpina* and *Ph. fuliginosa*. The most important modification is presented by the little *Ph. gliriformis* of Bell, which has only three true molars on each side of each jaw. As these modifications of the teeth are unaccompanied by any change of general structure or of habit, whilst those teeth which most influence the diet are constant, it is obvious that these differences of dentition are unimportant, and afford no just grounds for subgeneric distinctions.

The Phalangers, being provided with hinder hands and prehensile tails, are strictly arboreal animals, and have a close external resemblance to the Opossums, by which name they are generally known in Australia and the islands of the Indian Archipelago, where alone they have hitherto been found. They differ from the Opossums chiefly in their dentition; and in accordance with this difference their diet is more decidedly of a vegetable kind. The Australian Phalangers feed chiefly on the tender buds and the leaves of *Eucalypti*; but according to Temminck, the Indian Phalangers are omnivorous, and combine insects with fruits and leaves.

Presented by Ronald Gunn, Esq.

Tribe ENTOMOPHAGA.

Genus *Didelphis*.

1867. The skeleton of the Virginian Opossum (*Didelphis Virginiana*).

The median crest of the cranium is developed from the frontal, parietal and superoccipital bones, and is of unusual height: the transverse superoccipital crest is also strongly developed. The second to the fifth cervical vertebræ are remarkable for the large size of their spinous processes, which form a thick four-sided mass of bone. The inner condyle of the humerus is perforated. The marsupial bones are strongly developed: an ossified patella is preserved in the right leg. The transverse processes of six cervicals are perforated; those of the seventh are notched. 13 vertebræ are dorsal, 6 lumbar, 1 sacral, and 17 caudal, of which last the third to the eleventh inclusive bear hæmapophyses.

Mus. Brookes.

1868. The skull of a Virginian Opossum (*Didelphis Virginiana*), prepared to exhibit the teeth.

The dental formula of the genus *Didelphis* is: $i\,\frac{5-5}{4-4},\ c\,\frac{1-1}{1-1},\ p\,\frac{3-3}{3-3},\ m\,\frac{4-4}{4-4} = 50$. The Opossums resemble, in their dentition, the Bandicoots more than the Dasyures; but they closely resemble the latter in the tuberculous structure of the molars. The two middle incisors of the upper jaw are more produced than the others, from which they are also separated by a short interspace. The canines are well developed; the upper being always stronger than the lower. The false molars are simply conical, but are more compressed than in the carnivorous Marsupials. The posterior false molar is the largest in the upper jaw: the middle one is the largest in the lower jaw: the anterior one is the smallest in both jaws. The true molars are beset with sharp cusps, which wear down into tubercles as the animal advances in age. The crowns of the upper molars present a triangular horizontal section: the base of the triangle is turned forward in the posterior molar; and obliquely inwards and outwards in the rest. In the lower jaw the true molars are narrower and of more equal size than in the upper jaw: there are five tubercles on each, four placed in two transverse pairs, the anterior being the highest, and a fifth forming the anterior and internal angle of the tooth: the anterior and external angle seems as if it were vertically cut off.

The smaller species of *Didelphis*, which are the most numerous, fulfil in South America the office of the insectivorous Shrews of the old continent. Their external resemblance is so close, that some have been described as species of *Sorex*, but no true representative of this placental genus has hitherto been discovered in South America. The larger Opossums resemble in their habits, as in their dentition, the carnivorous Dasyures, and prey upon the smaller quadrupeds and birds; but they have a more omnivorous diet, feeding on reptiles and insects, and even fruit. One large species (*D. cancrivora*) prowls about the sea-shore, and lives, as its name implies, on crabs and other crustaceous animals. Another species, the Yapock, frequents the fresh waters, and preys almost exclusively on fish.

Hunterian.

1869. The skull of a Virginian Opossum (*Didelphis Virginiana*). *Hunterian.*

1870. The separated bones of the head of a young Opossum (*Didelphis Virginiana*).

The carotid enters between the basi- and ali-sphenoid, in advance of the hinder end of the latter bone, and opens above at the hinder fourth of the basisphenoid, separated from its fellow by an interval of twice the diameter of the canal, at the sides of the depressed sella turcica.

Hunterian.

1871. The axis vertebra of the Virginian Opossum (*Didelphis Virginiana*).

It is chiefly remarkable for the thickness as well as height, and antero-posterior extent of the spine, and for the hypapophysial ridge of the centrum.

Hunterian.

1872. The third cervical vertebra of the same Opossum.

The hypapophysial ridge is here also developed, but the vertebra is chiefly remarkable for the thick four-sided column of bone formed by the neural spine.

Hunterian.

Genus *Perameles*.

1873. The skeleton of the Perameles or Bandicoot Opossum (*Perameles nasuta*).

The anterior dorsal and the lumbar vertebræ are remarkable for the length and slenderness of their spinous processes, which incline towards each other. The marsupial bones are long and slender. The inner condyle of the humerus is perforated. The first and fifth digits of the hand are almost obsolete; the fourth is short and weak; the second and third are of equal length; the third is the strongest. The ungual phalanges are cleft in the foot: the fourth toe is the longest and strongest. The ungual phalanx of this and of the fifth toe are cleft. The second and third toes are extremely short and slender, reduced to the function of cleansing the fur. The innermost toe is still shorter, has but one phalanx, and no claw. The transverse processes of six of the seven cervicals are perforated. 13 vertebræ are dorsal, 6 lumbar, 2 sacral, and 16 caudal, of which last the second to the tenth inclusive bear hæmapophyses. The dental formula is: $i\,\frac{5-5}{3-3}$, $c\,\frac{1-1}{1-1}$, $p\,\frac{3-3}{3-3}$, $m\,\frac{4-4}{4-4}=48$.

Presented by Dr. Hobson.

1874. The skull of a Bandicoot (*Perameles obesula*).

Presented by Gov. Sir Geo. Grey, C.B.

1875. The skull of a Bandicoot (*Perameles obesula?*), from Port Philip.

Presented by Dr. Hobson.

1876. The skull of the Large-banded Bandicoot (*Perameles fasciata*). *Mus. Gould.*

1877. The skull of the Saddle-backed Bandicoot (*Perameles myosurus*).

Mus. Gould.

1878. The skull of the Striped Bandicoot (*Perameles striata*).

Presented by Dr. Hobson.

1879. The mutilated skull of a Bandicoot (*Perameles*).

Presented by H. Everett, Esq.

1880. The partially disarticulated skeleton of the Rabbit-eared Perameles (*Perameles Lagotis*).

In the skull may be observed the large bulla ossea formed by the alisphenoid, and behind this the smaller bulla formed by the petrosal. The bony roof of the mouth is perforated by a wide oval space extending from the second premolars to the penultimate molars, exposing to view the vomer and the convolutions of the inferior spongy bones in the nasal cavity. Behind this space there are six small perforations, two in a transverse line midway between the great vacancy and the posterior margin of the bony palate, and four in a transverse line close to that margin. There are 7 cervical, 13 dorsal, 6 lumbar, and 2 sacral vertebræ: 17 caudal vertebræ are preserved, beneath a few of which the hæmapophyses have been preserved. The metapophyses begin to be developed on the ninth dorsal, and rapidly increase in the succeeding ones: the diapophyses remarkably increase in length in the tenth, eleventh and twelfth dorsals, suddenly diminish in the thirteenth, and reappear in the first lumbar with a change of direction. Eight pairs of ribs join the sternum, which has six bones. The humerus is perforated between the condyles and above the inner condyle. There is no ossified patella. The fibula is immoveably fixed to the lower half of the tibia.

Purchased.

1881. The mutilated skull of the *Perameles Lagotis*, exhibiting the dentition.

The carotid enters the fissure between the back-part of the basi- and ali-sphenoid, and pierces the upper half of the side of the hinder fourth of the basisphenoid obliquely inwards and upwards, scarcely inclining forwards: the two inner orifices are divided by a slender bar of bone.

Presented by the Zoological Society of London.

Genus *Myrmecobius*.

1882. The skeleton of the Banded Myrmecobius (*Myrmecobius fasciatus*).

This genus is remarkable for the small size, the great number, and separate implantation of the teeth; the dental formula being:—$i\,\frac{4-4}{3-3}$, $c\,\frac{1-1}{1-1}$, $p\,\frac{3-3}{3-3}$, $m\,\frac{6-6}{6-6}=54$. From this formula it will be seen that the number of molars, eighteen in both jaws, exceeds that of any other known existing Marsupial, and nearly approaches the peculiar dental formula of the extinct *Thylacotherium*, and that which characterizes some of the existing Armadillos. The resemblance to the genus *Dasypus* is further carried out in the small size of the molar teeth, their separation from each other by slight interspaces, and their implantation in sockets, which are not formed upon a well-developed alveolar ridge or process. The molars, however, present a distinct multicuspidate structure, and both the true and false ones possess two or more separate fangs, as in other Marsupials. The inferior molars are directed obliquely inwards, and the whole dental series describes a slight sigmoid curve. The false molars present the usual compressed triangular form with the apex slightly recurved, and the base more or less obscurely notched before and behind. The canines are very little longer than the false molars: the incisors are minute, slightly compressed and pointed; they are separated from each other and the canines by wide intervals.

The inner condyle of the humerus is perforated. There is a sesamoid behind the outer condyle of each femur. The inner toe is reduced to a rudimental metacarpal. The transverse processes of the seventh as well as those of the other six cervical vertebræ are pierced by the vertebral artery. 13 vertebræ are dorsal, 6 lumbar, 3 sacral, and 22 caudal, the fourth to the ninth of which last have hæmapophyses.

The Myrmecobians are insectivorous, and shelter themselves in the hollows of trees, frequenting most, it is said, those situations where the Port-Jackson willow abounds. In the structure and proportions of the hind feet they resemble the Dasyurine family; in the slightly developed canines, the smooth external surface of the skull, the breadth between the zygomata, and the absence of the interparietal ridges, as well as in its general external form and bushy tail, the present species offers an especial approximation to the genus *Phascogale*.

Mus. Gould.

1883. The skull of the *Myrmecobius fasciatus*.

It has been longitudinally and vertically bisected. The numbers on the bones refer to the Table of Synonyms.

Mus. Gould.

Tribe Sarcophaga.

Genus *Phascogale.*

1884. The skeleton of the Yellow-footed Phascogale (*Phascogale flavipes*).

The inner condyle of the humerus is perforated. Of the cervical vertebræ only the second, sixth and seventh have neural spines. The transverse process of the sixth cervical appears to be first pierced by the vertebral artery: 7 vertebræ are cervical, 13 dorsal, 6 lumbar, 3 sacral, and 23 caudal. All of these last appear to have hæmapophyses.

Dental formula:—$i\,\frac{4-4}{3-3}$, $c\,\frac{1-1}{1-1}$, $p\,\frac{3-3}{3-3}$, $m\,\frac{4-4}{4-4}=46$.

In the present dental formula may be discerned a step in the transition from the Dasyures to the Opossums, not only in the increased number of spurious molars, but also in the shape and proportions of the incisors. In the upper jaw the two middle incisors are longer than the rest, and separated from them by a brief interval; they are more curved and project more forward. The three lateral incisors diminish in size to the outermost. The middle incisors of the lower jaw also exceed the lateral ones in size, and project beyond them, but not in the same degree; nor are they separated from them by an interval, as in the upper jaw. The canines are relatively smaller than in the Dasyures. The spurious molars present a similar form, but the third in the lower jaw is smaller and simpler than the two preceding ones. The true molars resemble those of the Dasyures.

Mus. Gould.

1885. The mutilated skull of a Phascogale (*Phascogale calura*). *Mus. Gould.*

1886. The feet and tail of the same Phascogale. *Mus. Gould.*

Genus *Dasyurus.*

1887. The skeleton of the Long-tailed Dasyure (*Dasyurus macrourus*).

The inner condyle of the humerus is not perforated. The head of the fibula supports a large sesamoid (fabella). The transverse process of the sixth cervical is first pierced by the vertebral artery: 7 vertebræ are cervical, 13 dorsal, 6 lumbar, 2 sacral, and 20 caudal: the fourth to the twelfth inclusive of these last have hæmapophyses.

The dental formula is: $i\,\frac{4-4}{3-3}$, $c\,\frac{1-1}{1-1}$, $p\,\frac{2-2}{2-2}$, $m\,\frac{4-4}{4-4}=42$. The eight incisors of the upper jaw are of the same length and simple structure, and are arranged in a regular semicircle, without any median interval. The six incisors of the lower jaw are similarly arranged, but have thicker crowns than the upper ones. The canines present the same or even a greater relative development than in the Thylacine. The spurious molars have a pointed compressed triangular crown, with a rudimental tubercle at the anterior and posterior part of its base. The grinding surface of the true molars in the upper jaw is triangular: the first presents four sharp cusps; the second and third, each five; the fourth, which is the smallest, only three. In the lower jaw the last molar is nearly of equal size with the penultimate one, and is bristled with four cusps, the external one being the longest; the second and third molars have five cusps, three on the inner and two on the outer side; the first molar has four cusps: these are all sharply pointed in the young animal, in which the posterior tubercle of the posterior molar in the lower jaw is divided into two small cusps.

Presented by Dr. Hobson.

1888. The skull of a male Long-tailed Dasyure (*Dasyurus macrourus*).

Presented by H. Everett, Esq.

1889. The skull of a female Long-tailed Dasyure (*Dasyurus macrourus*).

Presented by H. Everett, Esq.

1890. The anterior part of a mutilated skull of the Long-tailed Dasyure (*Dasyurus macrourus*), exhibiting the teeth. *Presented by H. Everett, Esq.*

1891. The left humerus of a Long-tailed Dasyure: its inner condyle is imperforate.

Presented by H. Everett, Esq.

1892. The skull of the Viverrine Dasyure (*Dasyurus viverrinus*). *Hunterian.*

1893. The partially disarticulated skeleton of Mauge's Dasyure (*Dasyurus Maugei*).

Presented by Ronald Gunn, Esq.

1894. The skull of the *Dasyurus Maugei*. *Presented by Dr. Hobson.*

1895. The vertically and longitudinally bisected skull of the *Dasyurus Maugei*.

Presented by Dr. Hobson.

1896. The horizontally bisected skull of the *Dasyurus Maugei*.

Presented by H. Everett, Esq.

1897. The vertically and transversely bisected cranium of the *Dasyurus Maugei*.

Presented by Ronald Gunn, Esq.

1898. The skeleton of the Ursine Dasyure (*Dasyurus ursinus*).

The left humerus is perforated above the inner condyle, but not the right. The clavicles are relatively short and slender. The marsupial bones are proportionally large. The fibula supports a large sesamoid (fabella) at its proximal end. The inner digit of the hind foot is reduced to a rudimental metatarsal. The transverse processes of the atlas are unusually long.

The spines of the third to the seventh cervical are short and of equal length: in the *Dasyurus macrourus* the spines progressively increase in the last three cervicals. Besides the non-development of the hallux, the Ursine Dasyure differs from the smaller species of Dasyure in the massive character of the head and teeth, which has led to its separation as a distinct genus, under the name of *Sarcophilus*. The transverse processes of the sixth cervical vertebra are first pierced by the vertebral artery: 7 vertebræ are cervical, 13 are dorsal, 6 are lumbar, 3 are sacral, and 17 are caudal: of the last, the third to the tenth inclusive have hæmapophyses. Both anapophyses and metapophyses commence at the eleventh dorsal: the anapophyses increase to the second lumbar, diminish in the two following, and disappear in the fifth: they underlap the metapophyses of the first three lumbar vertebræ. The metapophyses are continued throughout the sacral and a great part of the caudal region, in which the zygapophyses cease to be developed at the eighth vertebra. The diapophyses are not obliterated in the last dorsal vertebra, which renders their serial homology distinctly traceable along the lumbar region.

Presented by Ronald Gunn, Esq.

1899. The skull of an Ursine Dasyure (*Dasyurus ursinus*).

Presented by H. Everett, Esq.

1900. The skull of the Ursine Dasyure, longitudinally and vertically bisected.

Presented by Prof. Owen, F.R.S.

1901. The mutilated skull of an Ursine Dasyure (*Dasyurus ursinus*).

Presented by Ronald Gunn, Esq.

1902. The greater part of the maxillary, premaxillary, and mandibular bones, with the teeth, of an Ursine Dasyure. The last upper molar tooth of the left side is wanting. *Presented by Ronald Gunn, Esq.*

Genus *Thylacinus*.

1903. The skeleton of a male Thylacine, or Pouched Hyæna of the Tasmanian Colonists (*Thylacinus cynocephalus*).

The atlas equals the occiput in breadth: the spines of the last four cervicals progressively increase. The convergence of those of the dorsal and lumbar vertebræ towards the tenth dorsal indicates that to have been the centre of motion in the trunk. There are no ossified marsupial bones in this genus. The inner condyle of the humerus is widely perforated. There is a large internal cuneiform bone, but no trace of the inner toe. Neither the patella nor fabellæ appear to have been ossified. The seventh (last) cervical vertebra is pierced by the vertebral artery: 13 vertebræ are dorsal, 6 are lumbar, 2 are sacral, and 23 are caudal; of these last, the fifth to the ninth inclusive have hæmapophyses. The dental formula is:— $i\,\frac{4-4}{3-3}$, $c\,\frac{1-1}{1-1}$, $p\,\frac{3-3}{3-3}$, $m\,\frac{4-4}{4-4}=46$. The incisors are of equal length, and regularly arranged in the segment of a circle, with an interspace in the middle of the series of both jaws. The external incisor on each side is the strongest. The laniary or canine teeth are long, strong, curved, and pointed, like those of the dog-tribe. The spurious molars in this as in all other Marsupials have two roots; their crown presents a simple, compressed, conical form, with a posterior tubercle which is most developed on the hindmost. The true molars in the upper jaw are unequally triangular, the last being much smaller than the rest: the exterior part of the crown is raised into one large pointed middle cusp and two lateral smaller cusps obscurely developed; a small strong obtuse cusp projects from the inner side of the crown. The molars of the lower jaw are compressed, tricuspidate, the middle cusp being the longest, especially in the last two molars, which resemble closely the sectorial teeth (*dents carnassiers*) of the dog and cat.

The fore feet are 5-digitate, the hind feet 4-digitate. On the fore foot the middle digit is the longest, the internal one or pollex the shortest, but the difference is slight. On the hind foot the two middle toes are of nearly equal length, and longer than the two lateral toes, which are equal. All the toes are armed with strong, blunt, and almost straight claws.

The only known species of this genus, the Thylacine (*Thylacinus Harrisii*, Temm., *Didelphys Cynocephalus*, Harris), is a native of Van Diemen's Land, and is called by the colonists the "Hyæna." It is the largest of the carnivorous Marsupials, equalling in size the shepherd's dog, but stands lower on its legs, with a head of disproportionate magnitude. The principal characteristic of its colour is the transverse black bands which traverse the back. It dwells in caverns and holes in the rocks, and seeks its prey by night, devouring the smaller native quadrupeds, and at the present day committing destructive ravages on the numerous flocks of sheep which have been introduced by the European settlers into the island. Even the spines of the Echidna seem to be no defence against the destructive and voracious propensities of the powerful Thylacine, for the partly digested remains of one of these monotremes have been found in its stomach.

Prepared from a specimen presented by Ronald Gunn, Esq.

1904. The skeleton of the female Thylacine (*Thylacinus cynocephalus*).

This shows well the characteristic inferiority of size of the female in the majority of the Marsupials. The marsupial bones are equally wanting in this sex. The seventh (last) cervical vertebra is first perforated by the vertebral artery: 13 vertebræ are dorsal, 6 are lumbar, 2 are sacral, and 23 are caudal: of these last the fifth to the ninth inclusive have hæmapophyses. The anapophysis appears first upon the ninth dorsal, as a pointed process projecting from the back of the diapophysis; it increases in size and ascends in position on the tenth; is large, obtuse, and underlaps the metapophysis of the succeeding vertebra in the last two dorsals; it progressively diminishes in the lumbar vertebræ, and disappears on the fourth of that series. The metapophysis is developed abruptly on the tenth dorsal external to the prozygapophysis, increases in size in the following dorsals, diminishes in the lumbar vertebræ, but is present throughout the series as a strong obtuse process: it is continued, also, through a great part of the caudal series, in which the zygapophyses become obsolete at the eighth vertebra. The scaphoid and lunar bones are distinct in the carpus.

Prepared from a specimen presented by Ronald Gunn, Esq.

1905. The skull of a Thylacine (*Thylacinus cynocephalus*).

A longitudinal and horizontal section has been made to exhibit the cranial cavity. This is much smaller than in the dog or other placental carnivore of equal size with the Thylacine. Neither falx nor tentorium is ossified. The petrosal is impressed by a deep and large cerebellar pit. A bristle is passed through the canals for the jugular and squamosal veins. The rhinencephalic division of the cranium is relatively large and well-defined : the sella turcica is indicated only by the internal orifices of the carotid canals. The lacrymal bone is perforated both within and without the orbit. The posterior palatal vacuities are wide, and expose the turbinal bones to view. The frontal sinuses are much expanded.

Presented by H. Everett, Esq.

1906. The skull of a female Thylacine (*Thylacinus cynocephalus*), vertically and longitudinally bisected.

A bristle is passed through the precondyloid and carotid canals.

Presented by Capt. Sir John Franklin, R.N.

1907. The partially disarticulated cranium of a male Thylacine (*Thylacinus cynocephalus*). *Presented by Capt. Sir John Franklin, R.N.*

1908. The disarticulated bones of the head of a full-grown Thylacine (*Thylacinus cynocephalus*).

The basioccipital has coalesced with the exoccipitals, which almost meet above the foramen magnum. The lateral sinus impresses the fore part of each exoccipital, and then sinks into a canal which communicates or opens into the precondyloid canal : from this another canal extends forwards through the side of the basioccipital. The superoccipital has coalesced with the parietals and interparietal. The basisphenoid has coalesced with the alisphenoids and the presphenoid, but not with the pterygoids : it has no 'sella' nor clinoid processes. The coalesced presphenoid rises into a convex prominence above ; it is perforated by the carotid at its back and outer angle : the canals converge forwards and slightly upwards, and terminate above the middle of the basisphenoid. The alisphenoids have the foramen ovale near their posterior borders : the foramen rotundum is a longer canal. The posterior angles of the alisphenoid expand into tympanic bullæ : ectopterygoid processes are sent off in advance of those which join both pterygoids and palatines. The parietals have coalesced with each other, with the frontal, with the interparietal, and the occipital. The orbitosphenoids are very small ; their coalesced bases arch backwards over the optic nerves and presphenoidal prolongation of the basisphenoid, as in the bird, and their under part is grooved (not perforated) by the optic nerves, which escape by the fissura lacera anterior.

The nasal portion of the coalesced frontals is more expanded than the cerebral part : the frontal sinuses extend to the coronal suture, and raise the outer far above the vitreous table : in this table the frontal and coronal sutures remain, but they are obliterated in the outer table.

The vomer is carinate below. The nasals are distinct from each other and from the frontals: they are grooved externally for the premaxillaries. The petromastoid, tympanic and temporal bones continue permanently separate, though confluent ossification proceeds to blend the occipital, parietal and frontal into one bone. The petrosal is small, its tentorial ridge or angle is sharp, and its cerebellar fossa very deep, though small: a branch of the lateral sinus perforates the petromastoid and the adjoining part of the temporal to open behind the root of the zygoma: the mastoid part is compressed and abuts against the outer side of the base of the paroccipital. The tympanic is a simple scoop-shaped bone, or half-cylinder, cut obliquely. The inferior turbinals are perforated like fine lace-work. The palatine process of the premaxillary is very deeply notched, and is excavated behind the outer incisor.

Presented by Ronald Gunn, Esq.

1909. The detached bones of the skull of the very young, or mammary fœtus of the Thylacine (*Thylacinus cynocephalus*). They are numbered in accordance with the TABLE OF SYNONYMS. *Presented by Ronald Gunn, Esq.*

1910. The upper jaw and most of the teeth of a young *Thylacinus cynocephalus.* The formative cell of the last molar is shown; the crown of the penultimate molar is protruding from the socket. *Presented by Ronald Gunn, Esq.*

1911. The atlas vertebra of a *Thylacinus cynocephalus.*

The bony circle is completed by the meeting of the neurapophyses below: the transverse process, as well as the neural arch, are perforated by the vertebral artery.

Presented by Ronald Gunn, Esq.

1912. The axis vertebra of the same Thylacine. *Presented by Ronald Gunn, Esq.*

1913. The remaining cervical vertebræ and first dorsal vertebra of the same Thylacine.

The parapophysial part of the transverse process is extended downwards in the last four cervicals, and in the seventh it does not join the diapophysial part: this contributes, with the diapophysis of the first dorsal, to form the articular cavity for the tubercle of the first rib.

Presented by Ronald Gunn, Esq.