DESCRIPTIVE CATALOGUE

OF

THE OSTEOLOGICAL SERIES

CONTAINED IN

THE MUSEUM

OF

London,

THE ROYAL COLLEGE OF SURGEONS OF ENGLAND.

VOLUME I.

PISCES, REPTILIA, AVES, MARSUPIALIA.

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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 AVES.

Order NATATORES.

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 ex-occipital 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 pôssessed 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 pleur-apophyses, 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 support-

ing 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 ex-

panded 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.*