spines; in Echidna it is divided into four rounded, perforated extremities, beset with small tubercles.

The *Bone of the penis*, which principally belongs to the glans, is met with in many animals, namely, in the Apes, Cheiroptera, Carnivora (even in the Seal and Walrus), many Rodentia, and some Cetacea, as in the Whales (though its existence has been disputed by other writers), but not in the Pachydermata and Ruminantia. In Man, to wit, in the Negro race, where the penis is very largely developed, there frequently occurs a small prismatic cartilage from one to two lines in length, as a rudiment of this bone. The bone usually arises at the end of the fibrous septum, and advances toward the glans, the tendinous fibres of the septum being attached internally to its periosteum. Among the Apes, where the bone of the penis is often very large, it appears to be entirely wanting in the Orangs. In the Fox and in the Dog-kind it is large, and hollowed out inferiorly in the form of a groove; it is very small and thin in the Cat, curved in the shape of a hook anteriorly in Mustela, and bent in the form of the letter S in the Rackoon; it is terminated anteriorly by two rounded bodies in the Otter, has a small but broad shovel-shaped extremity in the Squirrel, and is deeply slit in the Marsupiata. This bone serves obviously to increase the rigidity of the penis during the act of copulation, which, as is known, is in many animals a painful operation. The penis has the usual muscles (*m. m. ischio-cavernosi and bulbo-cavernosi*), and in many animals where the penis is situated in the direction backward, there is found a pair of muscles often thick-bellied (*m. pubo-cavernosi*) arising from the pubis, the tendons of which are attached to the dorsum of the penis, and seem to be instrumental, during copulation, in giving the penis an anterior direction.

The same diversity, which is observed in the Mammalia in reference to the form of the internal and external sexual organs, is met with in the fœtal envelopes, *e. g.* in the allantois, the umbilical vesicle and placenta. The latter exhibits great diversities, which are frequently characteristic of whole genera and families. Thus, the true Carnivora, such as the Cats, Dogs, Seals, &c., have a girdle or band-shaped placenta, so that the membranes of the ovum are free at both of its ends or poles. On the border of this annular placenta, there often appear, as in the Dog, beautiful green pigmentary deposites. In the Ruminantia the placenta is divided into a great number of distinct round or button-shaped cotyledons, which are distributed over the whole ovum

and uterus, being separated by considerable intervals. In many Rodentia, a single rounded placenta is indeed present, but it is divided into several lobes, as occurs occasionally also in Man. In the Apes the placenta consists of two adjacent divisions. In the Hog the whole surface of the chorion performs the function of a placenta. There is no vestige of a placenta in the Marsupiata, which is probably the case also in the Monotremata.

In Birds and Amphibia, there is found what is called the cloaca, or the termination in a common opening of the urinary and sexual organs. In the Mammalia this structure occurs only in the Marsupiata and Monotremata. The closest relation of the cloaca to that of Birds is presented by the latter order, where it is provided, as in them, with powerful muscles.

REFERENCES

TO

WORKS UPON THE ANATOMY OF THE MAMMALIA, WHICH MAY BE MOST ADVANTAGEOUSLY CONSULTED IN THE PERUSAL OF THE TEXT.

General Works upon Comparative Anatomy.

Cuvier, Leçons d'Anatomie Comparée, 2nde edit. 1835, et seq.

The treatises upon the Anatomy of the several Orders of Mammalia, in Todd's Cyclopædia.

Meckel, System der vergleichenden Anatomie, 1821, translated into French by MM. Riester and Sanson, 1828.

Carus, Introduction to Comparative Anatomy, translated from the German by R. T. Gore, 1827.

Blumenbach, Manual of Comparative Anatomy, translated by W. Lawrence, 1827.

Gurlt, Handbuch der vergleichenden Anatomie der Haussaügethiere, 2 Aufl. Berlin. 1833.

Schreber's Saügethiere, continued by J. A. Wagner, Professor in Munich, 1839.

Jones, Animal Kingdom, 1841.

Grant, Outlines of Comparative Anatomy, 1835.

R. Wagner's Icones Zootomicæ, 1841, and Carus and Otto's Erlaüterungstafeln, 1826.

Tegumentary System.

Flourens, Anatomie Generale de la Peau, Archives du Muséum, tom. 3, 1843.

Eble, die Lehre von den Haaren, Wien, 1831.

Heusinger, System der Histologie, Eisenach, 1824, 2tes Heft. 4to.

Erdl, Ueber den feineren Ban der Haare, in den Abhandlungen der mathematisch-physikalisch Klasse der Akademie der Wissenschaften zu München, Band 3.

Gurlt, Op. Cit. und Hertwig's Magazin für die gesammte Thierheilkunde, Band. 1, S. 194, Tab. II. III. (Upon the Sudoriparous Glands.)

Osseous System.

Blainville's Osteographie Comparée, Par. fol. (not yet completed).

Pander und D'Alton, Vergleichende Osteologie, 96 Tafeln, Bonn, 1821—31.

Cuvier, Recherches sur les Ossemens Fossiles, Par. 1834.

Hallman, Vergleichende Osteologie des Schläfebeins, Hannov. 1837.

Leuckart, Untersuchungen über das Zwischenkieferbein, Stuttg. 1840.

Owen, Upon the Osteology of the Orang, Transactions of Zoological Society, vols. 1, 2.

Spix, Cephalogenesis, München, 1842. (Beautiful Plates of the Skulls of different Animals.)

Oken, Ueber die Bedeutung der Schädelknochen, 1807.

Vrolick, Ueber den Bau des Schimpanzee, Amsterdam, 1842.

Owen, Osteology of Marsupiata, with Plates, Transactions of Zoological Society, vol. 2, p. 379.

Muscular System.

Wagner's Supplementband zu Schreber's Naturgeschichte der Saügethiere, 1840, contains an interesting comparison of the muscular system of the Apes with that of Man.

The Myology of the Apes is treated of by Ernst Burdach in the 9ten Berichte der Anatomischen Anstalt zu Könisberg, 1839.

Ilg's Monographe der Sehnenrollen, Prag. 1824,

Rapp, Die Cetaceen zoologisch-anatomisch dargestellt, 1837, contains a description of the muscular system of the Cetacea, particularly of Delphinus phocæna. Consult also Stannius, Erster Bericht des zootomisch-physiologischen Instituts in Rostock, 1840.

S. Meckel, Ornithorynchi paradoxi descriptio anatomica, Lips. 1826, fol.

Nervous System.

Tiedemann, Icones Cerebri simiarum et quorundam animalium rariorum, Heidelb. 1821.

Tiedemann, Das Hirn des Negers mit dem des Europäers und Orang-Utangs verglichen, Heidelb. 1837, 4to.

Leuret, Anatomie Comparée du Système Nerveux, Paris, 1829, an. atlas in folio,

Vrolik, Recherches Anatomiques sur le Chimpanzee.

Swan, Illustrations of Comparative Anatomy of Nervous System, 1835-6.

Longet, Anat. et Phys. du Système Nerveux de l'Homme et des Animaux Vertebrés, Paris, 1842.

Rapp, Die verrichtungen des fünften Nervenpaars, Leipz. 1832, 4to.

Organs of the Senses.

Soemmerring, De oculorum sectione horizontale, Gotting. 1818, fol. contains excellent illustrations of sections of the eyes of Mammalia.

Bendz, Die Orbitalhaut bey den Haussaügethieren, Müller's Archiv. 1841.

Hyrtl, Ueber das Knöcherne Labyrinth der Säugethiere in den medicinischen Jahrbuchern des östereichischen Staates, 1843. (52 genera investigated.)

Hagenbach, Die Paukenhöhle der Saügethiere, Leipz. 1835, 4to.

Berthold in Müller's Archiv 1838 (upon the ossicle in the stapedius muscle of many Mammalia).

Hannover, De cartilaginibus, musculis, nervis auris externæ atque de nexu nervi vagi et facialis, Havniæ, 1839, 4to (numerous details relative to the external ear).

V. Baer, Isis, 1826 (upon the spouting apparatus of the Dolphin).

Jacobson and Cuvier in Ann. du Muséum d'Hist. Nat. vol. 18, p. 412.

Organs of Digestion.

Mulder in van der Hoeven's Tijdschrift voor naturlijke geschiedenis en physiologie, Band 2 (interesting details relative to the teeth of the Narwhal).

Owen's Odontography, or a Treatise on the Comparative Anatomy of the Teeth, Part I. Lond. 1840.

Erdl, Untersuchungen über den Bau der Zahne bei den Wirbelthieren, insbesondre den Nagern, Abhandl. der physikal Klasse der Akademie de Wissenschaft in München, Band 3.

Retzius, Mikroskopiska undersökningar öfver Tandernes, etc. in K. V. A. Handlingar for 1836, translated in Müller's Archiv f. 1837.

Fr. Cuvier, Des dents des Mammiferes, Paris, 1825; and Blainville, Ostéographie Comparée.

Rapp, Ueber die Tohsillen der Thiere, Muller's Archiv 1839.

Grundler in A. Wagner's Continuation von Schreber's Saügethiern, Band 5, S. 1728 (detailed description of bursa faucium).

Retzius in Müller's Archiv f. 1841 (upon the structure of the stomach in the Lemming and Field-mouse).

Leuckart in Müller's Archiv f. 1843, uber den Mangel des dritten Magens bei Moschus Javanicus.

Hennecke, de functionibus omentorum, Gotting. 1836, 4to.

Duvernoy in Ann. des Sciences Naturelles, 1835 (upon the lobes of the liver in Mammalia).

H. F. Jaeger, Anatomische Untersuchungen des Orycteropus capensis, Stuttgart, 1837, 4to.

Organs of Circulation.

Burow, Gefäss-system der Robben in Müller's Archiv f. 1838.

Breschet, Histoire Anatomique et Physiologique d'un organe de nature vasculaire découvert dans les Cetacés, Paris, 1836, 4to.

Von Baer in den Nov. Act. Phys. Med. Acad. Leopoldin, tom. 17, Tab. XXXIX. (description, with beautiful figures, of the iliac plexus of the Cetacea).

Mandl, Anatomie Microscopique, Paris, 1838—43.

R. Wagner, Beiträge zur vergleichenden Physiologie, Heft. 2, Tab. I.

Gulliver in appendix to Gerber's General Anatomy, 1842 (elaborate researches on the blood).

Organs of Voice and Respiration.

Wolff, De organo vocis mammalium. Berol, 1812, 4to.

Brandt, Obs. Anat. de mammalium quorundam præsertim quadrumanorum vocis instrumento, Berol, 1826, 4to.

Joh. Müller's Schrift über die Compensation der physischen Kräfte am menschlichen Stimmorgan. Berlin, 1839, fig. 23, 24.

Organs of Secretion.

Joh. Müller, De Glandularum secernentium structurâ penitiori, Lips. 1829, fol.

Rapp, in Müller's Archiv f. 1839.

Brandt und Ratzeburg, Medicinische Zoologie, Band 1, Tab. II. IV. VIII. (figures and descriptions of the pouches of Musk-deer, Civet, and Beaver).

Organs of Generation.

Wharton Jones, on the Ovum of Man and Mammifera, 1843.

R. Wagner's Ic. Physiol. Tab. II. fig. 9. Tab. VI. fig. 1, and Elements of Physiology, Part I., translated by Robert Willis, M.D. 1841.

Fugger, Diss. de singulari clitoridis in simüs generis Atelis magnitudine, Berol, 1835, 4to.

Morgan in Linnæan Transactions, vol. 16, upon the structure of the pouch in the Kangaroo.

Treviranus, Beobachtungen aus der Zootomie und Physiologie, Heft 1, 1839.

CLASS II. AVES.—BIRDS.*

TEGUMENTARY SYSTEM.

As the body of the Mammalia is very generally covered with hair so that of Birds is clothed with feathers, which belong, like it to the epidermic structures. The skin of the Mammalia is much stronger than that of Birds, for although the larger Wading, Aquatic Birds and the Ostriches, have a thick hide, yet the corium is in general throughout the class thin, transparent, and very highly vascular, from the large follicles of the feathers which penetrate into the subcutaneous cellular tissue being supplied by numerous vessels. The epidermis is exceedingly delicate upon those parts of the body where feathers are met with, but dry and constantly desquamating. In featherless parts, as upon the head and neck of many Birds, it becomes very much thickened, and forms callosities, wattles, and combs, in which, in addition to the cellular, what are called the erectile and elastic tissues are often developed, while at the same time red and blue pigmentary cells occur beneath the epithelium. Beneath the integument are found, as in Man, the subcutaneous mucous crypts, which are particularly conspicuous, as in Aquatic birds, upon the joints of the posterior extremities. Upon the toes and feet there occur plates and scales of horny tissue, and both the toes and beak are invested by laminiform horny sheaths, which may be completely detached from the bony

* Class AVES.

Order I. Accipitrinæ s. Rapaces { Diurnæ.—Ex. *Eagle, Falcon, Vulture.* Nocturnæ.—Ex. *Owls.*

II. Passerinæ. { Ex. All true *singing Birds* and those which, having no song, yet possess a complicated inferior larynx, as the *Sparrow, Rook, Shrike, &c.*

III. Scansores. { Ex. *Woodpecker, Cuckoo, Parrot, Toucan,* with those genera which, though related by external characters to the singing Birds, are devoid of a muscular vocal apparatus, viz., *Alcedo, Upupa, Merops, Cypselus, Trochilus, &c.,* and constitute the subdivision Picariæ.

IV. Gallinæ.—Ex. *Pheasant, Turkey, Partridge, Pigeon.*

V. Brevipennes or Struthionidæ. { Ex. *Ostrich, Cassawary, Emeu, Apteryx.*

VI. Grallæ.—Ex. *Bustard, Heron, Snipe, Flamingo.*

VII. Palmipedes.—Ex. *Divers, Albatross, Pelican, Goose.*