tactile sensibility is highly developed ; in terrestrial *Gasteropoda* the antennæ have on their end plates a number of club-shaped cells with rods, which are held to be olfactory, and recently in the same class Sprengel has shown that an organ “which was supposed to be a rudimentary gill, and is innervated from the supra-intestinal ganglion,” has an olfactory function. In *Ascidians* the olfactory region is believed to be a depression on the wall of the pharynx, situated in front of the ganglion, and lined with ciliated epithelium.

In *Fishes* the olfactory organs consist of a membrane (the pitui­tary membrane) lining one or two pits, to which the olfactory or first pair of cranial nerves are distributed. This highly vascular membrane is usually thrown into numerous folds, so as to admit of an extensive surface being packed into small space, and it is covered by ciliated epithelium. In the lowest vertebrate, *Amphi­oxus,* the olfactory organ is a simple unsymmetrical pit at the anterior end of the nervous system. In the hag fishes (*Myxinidse)* the olfactory pit has a posterior opening which pierces the palate and can be closed by a valvular apparatus. In the lampreys (*Petromyzon)* the flask-shaped nasal sac opens on the top of the head, and from this a tube descends which expands into a blind sac towards the base of the skull. In all other fishes the olfactory organs are double and have no communication with the mouth. In osseous fishes the olfactory capsules or sacs are covered with skin which is usually pierced by two openings for each sac. Some, such as the wrasses, have a single nasal opening ; and where there are two the anterior can be closed by a valve. The olfactory region may be extensive owing to the pituitary membrane being thrown into plaits or folds, and it may be divided into two portions, one quite smooth and the other plicated. The smooth portion, prob­ably acting as a reservoir, may be large, extending down to the palate, as in the mackerel, or to the back part of the palate, as in the wolf-fish (Owen). The nasal cavities exist below the snout in sharks, near the angles of the mouth in the rays, and beneath the fore part of the head, behind the base of the rostrum, in the saw­fish. In such fishes the olfactory organ is guarded by valves, con­taining cartilaginous plates moved by muscles, and we may there­fore conclude with Owen “that these fishes scent as well as smell, *i. e.,* actively search for odoriferous impressions by rapidly changing the current of water through the olfactory sac.”

The olfactory organs of *Amphibia* are always paired cavities, opening internally either anteriorly within the lips or further back, as in the batrachians and salamandrines. In the *Perennibranchiates* (Siren, Proteus, Axolotl) there are no outward signs of olfactory organs, and the thick upper lip must be raised to bring the plicated sac with its two remote orifices into view (Owen). In the *Tritonidæ* (newts) and *Salamandrinæ* (salamanders) the olfac­tory membrane is smooth and lines an oval bag having an external nostril, guarded by a valvular fold of skin, and a palatal opening. Frogs and toads (*Batrachia)* have also an external nostril with a flap of skin, and the palatal opening is wide and near the fore part of the mouth. The skulls of extinct saurians of marine habits (*Ichthyosaumιs* and *Plesiosaurus)* show that the external nostrils opened near the orbits at a distance from the muzzle. In snakes (*Ophidia)* the external nostrils are double, and the internal nostril is single and in the median line. In water snakes the external orifices can be closed by valves.

In *Chelonia* (turtles, tortoises) and in *Crocodilia* the external nasal opening is single and near the end of the snout ; but in *Chelonia* the nostrils are really distinct, although their external apertures coincide. In the turtle the nasal cavity is large and contains a twisted shell-like cartilage, so as to give extent of surface to the darkly pigmented and highly vascular pituitary membrane. In the crocodiles and alligators the nostrils can be closed by a valvular lobe, and in the gavials (*Rhamphostoma gangeticum* and *Rhynchosuchus schlegelii)* the integument can be raised round the nostril in the form of a tube so as to bring the orifice to the surface of the water without exposing the other parts of the head (Owen). In all *Crocodilia* the nasal cavity is of great length, commencing at the fore part of the muzzle and ending beneath the occiput by a single aperture, and the surface of this long olfactory meatus is increased by the meatus communicating with large cells or sinuses. In snakes and lizards a second olfactory organ is found embedded between the turbinals and the vomer and is known as “Jacobson’s organ.” It has the form of a cup or depression round a cartilaginous papilla and is supplied by a nerve which arises from the end of the olfactory lobe.

The olfactory organs of *Birds* are somewhat similar to those of the cold-blooded reptiles and amphibians in that “the external nostrils are simple perforations, having no movable cartilages or muscles provided for dilating or contracting their apertures, as in mammalia” (Owen). The extent of the olfactory surface is in­creased by projections and folds of turbinated bones and not by large accessory cavities. With the exception of the apteryx and dinornis, the olfactory nerve passes out of the skull by a single foramen. The external nostrils are in the majority of birds placed at the sides of the upper mandible ; but in some cases, as in the toucans, they are found at the base of the bill, and in the apteryx they open at the extremity of the long upper mandible. In herons

the apertures are so small as scarcely to admit the point of a pin ; and in the pelicans they are wanting, and odours get access to the olfactory organ from the palate. The *Rasores* (scratching birds) have the nostrils defended by a scale, and the crows (*Corvidae)* have a bunch of stiff feathers for the same purpose. The septum or partition between the nostrils is usually complete and is formed of bone and cartilage. The outer wall of each nasal passage is furnished with three turbinal or twisted shell-like bones, of which the middle is the largest, thus affording a considerable extent of olfactory surface. In most birds there are two posterior nasal apertures communicating with the palate ; but in some, as in the cormorant and gannet, the passages unite and there is only one opening. In birds the upper part of the nasal passage is more especially devoted to the sense of smell, whilst the lower part may be regarded as the beginning of the respiratory tract. This is in­dicated by the arrangement of the nerves, the olfactory nerve being distributed to the membrane covering the septum and the superior and middle turbinated bones, whilst the lower portion and lower turbinals are supplied by the fifth nerve,—a nerve of general sensi­bility. The upper turbinals reach their greatest development in the apteryx, where they are attached, according to Owen, to the whole outer part of the prefrontals. This bird has amongst birds the largest olfactory nerves in proportion to its size, and it would appear to be guided by the sense of smell to the worms that form its food. A contrast as regards the anatomical arrangements for the olfactory sense is well seen on comparing the turkey with the vulture. In the turkey the olfactory nerve is small, about one- fifth the size of that in the vulture, and is distributed over a small middle turbinal, there being no extension over a superior turbinal. The vulture, on the other hand, has a large nerve and the olfactory region is extensive, owing to the largely developed superior turbinal bone. There can be no doubt that the carrion - eating vulture is guided from great distances to its food by the sense of smell, although it will be assisted by its powerful sense of vision.

The sense of smell reaches its highest development in *Mammalia.* The anatomical surface is enormously extended in many cases, not only by the complication of the ethmoidal labyrinth, but also by the nasal passages communicating with spaces in the neighbouring cranial and facial bones. The olfactory nerves also are very numer­ous and arise from a special encephalic centre. They pass out of the skull by numerous holes in the cribriform or sieve-like plate of the prefrontal bone, which, on account of this peculiarity, is called the ethmoid bone. These nerves ramify on the olfactory membrane, covering the upper or ethmo-turbinal bones. The cavity contain­ing the organ of smell is bounded by the prefrontal, vomerine, nasal, sphenoid, pterygoid, palatine, maxillary, and premaxillary bones, and it is usually in connexion with air-cavities or sinuses in many or all of the bones of the skull. The median partition by which the two nostrils are formed consists of bone and cartilage and is built up by processes of the prefrontals, the vomer, and by the ridges of the nasals, palatines, maxillaries, and premaxillaries with which the vomer articulates. Each passage thus formed is the beginning of the respiratory tract, and is continued forwards into a more or less mobile part called a nose, snout, or proboscis, whilst posteriorly it communicates with the upper part of the pharynx, into which opens the windpipe. On the outer wall there are three turbinal bones—superior, middle, and inferior—dividing partially the nasal cavity into three meatuses or passages. The superior meatus is between the superior and middle turbinated bones, the middle meatus between the middle and inferior turbinated bones, and the inferior meatus between the inferior turbinated bones and the floor of the nose (see Anatomy, vol. i. p. 823, fig. 7 ; also vol. i. pl. XIX. fig. 2). Many of the lower mammals have in addition a process from the frontal and nasal bones, sometimes called the superior spongy bone, which is not the same as the superior turbinated, as described in the anatomy of the human being. The extent of olfactory surface is enormously increased by numerous plicæ or processes of bone which to a great extent mask the comparatively simple arrangement above described. In *Ornithorhynchus* there is a single olfactory nerve escaping through an aperture in the prefrontal bone ; in *Echidna,* the other member of the *Monotremata,* there are numerous olfactory nerves and a large development of ethmo-turbinals. In many *Marsupials* the sense of smell is largely developed, and in some (*Osphranter)* the turbinated bones are so large as to cause a lateral bulging of the nasal cavity, forming a marked feature of the skull. In *Rodents* the ethmo-turbinals may be subdivided into lamellæ so as to increase the olfactory surface ; such is the case in the common hare. In the porcupine the sinuses developed from the olfactory cavity are of large size, forming a spongy mass surrounding the cavity of the skull in which the anterior portion of the brain lies. In *Insectivora* the olfactory surface is very large. Thus in the mole the ethmo-tur­binal has not fewer than eight lamellæ or plates and the external nose is developed into a snout capable of considerable movement. Such a snout is very large and mobile in the elephant shrews. Armadillos and ant-eaters (*Edentata)* have a strong sense of smell. Thus in *Dasypus* the nasal portion of the skull is about equal in