shape and size of scales are made great use of as distinctive characters for classification. See Reptiles. The scales of a Serpent are held together by their epidermic investment in such a way that it and they are cast off as one whole each time the animal effects that process known as changing its skin. In the Rattle­snakes curiously modified thickenings of epidermis surrounding the end of the tail are not cast off but continue partially adherent ; as growth proceeds and successive castings of the skin take place, these ring-like thickenings become numerous, and so knock one against the other, when the end of the tail is vibrated, as to pro­duce a singular sound—the so-called rattling of the system of rings or “rattle.”

*Hairs* form the characteristic clothing of the class *Mammalia,* though certain Mammals, such as Whales and Porpoises in their adult condition, are naked. Man is quite exceptional in having the ventral surface of the body more hairy than its dorsum. Long hair on the head, and whiskers and beard, are variable human characters, also possessed by some Apes ; and many animals—as the Lion, the Horse, the Aardvark, &c.—have long hair in one or other region of the body. Some hairs may be especially thickened and serve as feelers, as in the “vibrissæ” or “whiskers” of the Cat tribe. But the maximum of development is shown in such creatures as the Hedgehog and the Porcupine, where hairs become dense and solid spines.

*Nails* do not exist in the class of Fishes and rarely in that of Batrachians. They first make their appearance in the most simple form—that is, in the form of slight thickenings of the epidermis— at the ends of the digits in certain Toads and of one kind of Eft. A nail is at its maximum of development when it quite surrounds and encloses the last or end bone of the digit which bears it. Such nails exist in Horses, Oxen, &c., and are called hoofs. A nail when produced into a sharp point is called a claw,—as in the familiar case of the Cat, and also in Birds. Nails may, how­ever, be much reduced in size and not nearly extend to the end of the digits which support them, as in the Sea Bears. They may be altogether wanting, even in Mammals, as in the Porpoise, or attain a prodigious relative size, so that the body can be suspended by them in progression, as in the Sloth.

Nail-like structures may be developed from the side of the hand, as in certain Birds (*e*.*g*., *Palamedea),* which are said to be “spur-winged,” and in a Mammal (*Ornithorhynchus)* a hollow horny spur grows upon each ankle.

In the Rhinoceros we meet with a horn, or two horns, which grow up from the dorsum of the muzzle like a great blunt nail, long dermal papillæ extending into it and answering to the dermal ridges beneath a true nail. In Owen’s Chameleon no less than three long horns are developed—one from the nose and a sym­metrical pair from the front of the head.

Other horns which do possess bony cores are developed from the head in pairs on the so-called hollow-horned Ruminants, *i.e.,* the Oxen, Antelopes, Goats, and Sheep ; and only in one anomalous form, the Prongbok (*Antilocapra),* are these horny structures shed at intervals ; in the rest they persist throughout life. Normally there is never more than one pair amidst existing Ruminants, with the exception of the Four-horned Antelope, which has two pairs. Such horns may be straight or curved or spirally twisted, but they are never branched, with the single exception of the Prongbok.

Sharp-edged, overlapping, horny plates (each of which is com­parable with a nail) may be developed beneath the proximal part of the tail, as in the curious Rodent *Anomalurus.* Such plates may clothe the entire body, head, limbs, and tail, as in the scaly Manis or Pangolin.

The epidermis and epithelium which respectively line the out­side and inside of the jaws may both be converted into horn, forming a small beak which may be composed of a number of close-set processes and may be temporary, as in the Tadpole, or permanent, as in the Siren. Larger and denser structures of a similar kind form the beak of Birds and of the Turtle and of that most exceptional Mammal, the Ornithorhynchus.

The epithelium within the mouth may be locally cornified, forming horny teeth which have, as before mentioned, rather the nature of scales—as in the suctorial mouth of the Lamprey.

In certain Beasts, as the Cow and the Sheep, the front edentulous part of the upper jaw is invested by a horny epithelial pad against which the teeth of the front of the lower jaw bite. A much more developed structure is met with in the Dugong. The front of both jaws is furnished with a dense horny plate formed like the horn of the Rhinoceros, though of course widely different in shape. But the maximum development of this kind of structure is found in the Whalebone Whales. The upper jaw in these is furnished with very numerous horny plates, termed *baleen,* which hang down from the palate along each side of the mouth. They thus form two longitudinal series, each plate of which is placed transversely to the long axis of the body, and all are very close together. The outer edge of each plate is entire, but its inner edge gives forth numerous hair-like processes. These are some of the constituent fibres of the horny plates which thus, as it were, fray

out and line the sides of the buccal cavity with a network of countless fibres formed by the inner edges of the two series of plates. This network acts as a sort of sieve, allowing water to escape between the plates but retaining in the mouth the small creatures on which the whale feeds.

Cornifications of the tongue may exist. Thus in some Birds, as in Woodpeckers, the structure of its apical portion becomes so dense that it serves as a dart or spear. Its surface may be more or less cornified in Beasts. Thus it may be furnished all round with backwardly-pointing spines, as in the Lesser Anteater (*Tamandua*)*.* There may be a large horny papilla on each side of it, as in the Manatee or Ornithorhynchus, or there may be horny plates on the tongue, as in the Java Porcupine.

Horny structures also exist which cannot be considered as either epiblastic or mesoblastic, but must be hypoblastic in origin. Such are the horny linings of the stomachs or gizzards of Birds, and the similar lining of the stomach of the Great Anteater, *Myrme- cophaga jubata.*

*Feathers* are the universal and peculiar cutaneous appendages of Birds, and generally differ much in size in different parts of the body, long and strong feathers constituting the most conspicuous part of the wings and so-called “tails” of Birds. Feathers are implanted on the body neither in an irregular nor in a uniform manner, but are aggregated together in different modes in different groups of Birds—each definite patch of implanted feathers being called a feather tract. The arrangement of these tracts in a bird is called its “ pterylosis, ” and serves amongst other characters to distinguish different groups of Birds one from another.

*Exemplifications of Dermal Skeletal Parts.*

*Scutes.—*True dermal ossifications are met with in some kinds of Mammals. Thus the Armadillos possess a very complete external *dermal* skeleton formed of small many-sided bony scutes, the margins of which are adjusted together, and which are differently aggregated—into transverse bands or into larger inflexible masses —in different species. In the extinct *Glyptodon,* the body was invested, from the neck to the root of the tail, with one such solid case.

In the Armadillos a horny *epidermal* skeleton is so adjusted to the bony case that the former is divisible into small scales corre­sponding with the several scutes. Amongst Reptiles, we find in the Tortoises and Turtles (*e.g.*, *Emys, Testudo)* a solid exoskeleton, the dorsal part of which is called the “carapace,” while the ventral portion is named the “plastron.” The former consists of a median series of scutes, to each side of which is annexed a series of lateral scutes which are more elongated transversely to the long axis of the animal’s body, and these three series are intimately united with subjacent portions of the internal skeleton. The carapace is completed by a series of smaller scutes, which surround it and are therefore called “ marginal ” scutes. The plastron consists of eight pairs of scutes and one azygous scute. In the Box-Tortoises the ends of this plastron are movable, and (the head and limbs of the animal being drawn in within the shell) can be applied to tlιe, ends of the carapace, so that all the soft parts can be completely enclosed within the dense exoskeleton. As in the Armadillos, the bony scutes are covered by epidermal scales, some of which have been already referred to as constituting “tortoise shell.” Unlike the Armadillos, however, the segments of the epidermal and dermal skeletons do not correspond. The dorsal scales are much larger and less numerous than are the scutes, but, while the scutes of the ]dastron are but nine in number, it has twelve horny plates or large scales.

Amongst the *Amphibia* certain Frogs (*e.g*., *Ephippifer* and *Ceratophrys)* develop dorsal osseous scutes, and these, as in the Tortoises, are more or less united with parts of the subjacent internal skeleton.

A solid skeleton of juxtaposed osseous scutes may exist in Fishes, as in the Bony Pike *Lepidosteus,* where the scutes are enamelled and united by a peg-and-socket articulation. *Polypterus* also has an investment of bony scutes, and in the extinct fish *Pterichthys* they were developed into large plates on both the dorsal and ventral surfaces of the body. The Sharks and Rays may have their scutes thickly distributed over the surface of the body, but quite small. A skin so furnished is called “shagreen.” They may also be larger and fewer, and placed far apart, with elegant patterns on their exposed surfaces; or they may take the form of strong defensive spines. In the Sturgeon the scutes are arranged in rows along the body, separated from each other by softer portions of integument.

In the ordinary bony Fishes, or *Teleostei,* the scutes (commonly but erroneously called “ scales ”) are differently calcified from the scutes of Sharks, and may have their free projecting margin smooth, when they are described as *cycloid,* or in toothed-like processes, when they are termed *clenoid*; or they may be inter­mediate between these two types of form. The Teleostean scutes are generally separate, but they may coalesce to form a connected