still incorrect) from a drawing received from Ferrerius, and suggested that from the size of its beak the bird should be called *Burhynchus* or *Ramphestes.* This figure, with a copy of Thevet’s and a detailed description, was repeated in the posthumous edition (1585) of his larger work (pp. 800, 801). By r579 Ambroise Paré *(Œuvres,* ed. Malgaigne, iii. 783) had dissected a toucan that belonged to Charles IX. of France, and about the same time Léry *(Voyage fait en la terre du Brésil,* ch. xi.), whose chief object seems to have been to confute Thevet, confirmed that writer’s account of this bird in most respects. In 1599 Aldrovandus *(Ornithologia,* i. 801-803), always ready to profit by Gesner’s information, and generally without acknow- ledgment, again described and repeated the former figures of the bird; but he corrupted his predecessor’s *Ramphestes* into *Ramphastos,* and in this incorrect form the name, which should certainly be *Rhamphestes* or *Rhamphastas,* was subsequently adopted by Linnaeus and has since been recognized by system- atists. Into the rest of the early history of the toucan’s discovery it is needless to go.@@1 Additional particulars were supplied by many succeeding writers, until in 1834 J. Gould completed his *Monograph* of the family@@2 (with an anatomical appendix by R. Owen), to which, in 1835, he added some supplementary plates; and in 1854 he finished a second and much improved edition. The most complete compendium on toucans is J. Cassin’s “ Study of the Ramphastidae,” in the *Proceedings* of the Philadelphia Academy for 1867 (pp. 100-124).

By recent systematists 5 genera and from 50 to 60 species of the family are recognized; but the characters of the former have never been satisfactorily defined, much less those of numerous subdivisions which it has pleased some writers to invent. There can be little doubt that the bird first figured and described by the earliest authors above named is the *R. toco* of nearly all ornithologists, and as such is property regarded as the type of the genus and therefore of the family. It is one of the largest, measuring 2 ft. in length, and has a wide range throughout Guiana and a great part of Brazil. The huge beak, looking like the great claw of a lobster, more than 8 in. long and 3 high at the base, is of a deep orange colour, with a large black oval spot near the tip. The eye, with its double iris of green and yellow, has a broad blue orbit, and is surrounded by a bare space of deep orange skin. The plumage generally is black, but the throat is white, tinged with yellow and commonly edged beneath with red; the upper tail-coverts are white, and the lower scarlet. In other species of the genus, 14 to 17 in number, the bill is mostly particoloured—green, yellow, red, chestnut, blue and black variously combining so as often to form a ready diagnosis; but some of these tints are very fleeting and often leave little or no trace after death. Alternations of the brighter colours are also displayed in the feathers of the throat, breast and tail-coverts, so as to be in like manner characteristic of the species, and in several the bare space round the eye is yellow, green, blue or lilac. The sexes are alike in coloration, the mates being largest. The tail is nearly square or moderately rounded. In the genus *Pteroglossus,* the “ Aracaris ” (pronounced Arassari), the sexes more or less differ in appearance, and the tail is graduated. The species are smaller in size, and nearly all are banded on the belly, which is generally yellow, with black and scarlet, while except in two the throat of the males at least is black. One of the most remarkable and beautiful is *P. beauharnaisi,* by some authors placed in a distinct genus and called *Beauharnaisius ulocornus.* In this the feathers of the top of the head are very singular, looking like glossy curled shavings of black horn or whalebone, the effect being due to the dilatation of the shaft and its coalescence with the consolidated barbs. Some of the feathers of the straw-coloured throat and cheeks partake of the same structure, but in a less degree, while the subterminal part of the *lamina* is of a lustrous pearly-white@@.3 The beak is richly coloured,

being green and crimson above and lemon below. The upper plumage generally is dark green, but the mantle and rump are crimson, as are a broad abdominal belt, the flanks and many crescentic markings on the otherwise yellow lower parts.@@4 The group or genus *Seleηoderα,* proposed by J. Gould in 1837 *(Icones avium,* pt. 1), contains some 6 or 7 species, having the beak, which is mostly transversely striped, and tail shorter than in *Pteroglossus.* Here the sexes also differ in coloration, the males having the head and breast black, and the females the same parts chestnut; but all have a yellow nuchal crescent (whence the name of the group). The so-called hill-toucans have been separated as another genus, *Andigena,* and consist of some 5 or 6 species chiefly frequenting the slopes of the Andes and reaching an elevation of 10,000 ft., though one, often placed among them, but perhaps belonging rather to *Ptero­glossus,* the *A. bailtoni,* remarkable for its yellow-orange head, neck and lower parts, inhabits the lowlands of southern Brazil. Another very singular form is *A. laminirostris,* which has affixed on either side of the maxilla, near the base, a quadrangular ivory-like plate, forming a feature unique in this or almost in any family of birds. The group *Aulacorhamphus,* or “ groove-bills,” with a considerable but rather uncertain number of species, contains the rest of the toucans.

The monstrous serrated bill that so many toucans possess was by G. L. L. Buffon accounted a grave defect of nature, and it must be confessed that no one has given what seems to be a satisfactory explanation of its precise use, though on evolutionary principles none will now doubt its fitness to the bird's requirements. Solid as it looks, its weight is inconsiderable, and the perfect hinge by which the maxilla is articulated adds to its efficiency as an instrument of prehension. W. Swainson *(Classif. Birds,* ii. 138) imagined it merely “ to contain an infinity of nerves, disposed like net-work, all of which lead immediately to the nostrils,” and add to the olfactory faculty. This notion seems to be borrowed from J. W. H. Trail *(Trans. Linn. Society,* xi. 289), who admittedly had it from Waterton, and stated that it was “ an admirable contrivance of nature to increase the delicacy of the organ of smell;” but R. Owen’s description showed this view to be groundless, and he attributed the extraordinary development of the toucan’s beak to the need of compensating, by the additional power of mastication thus given, for the absence of any of the grinding structures that are so characteristic of the intestinal tract of vegetable-eating birds—its digestive organs possessing a general simplicity of formation. The nostrils are placed so as to be in most forms invisible until sought, being obscured by the frontal feathers or the backward prolongation of the horny sheath of the beak. The wings are somewhat feeble, and the legs have the toes placed in pairs, two before and two behind. The tail is capable of free vertical motion, and controlled by strong muscles, so that, at least in the true toucans, when the bird is preparing to sleep it is reverted and lies almost flat on the back, on which also the huge bill reposes, pointing in the opposite direction.

The toucans are limited to the new world, and by far the greater number inhabit the north of South America, especially Guiana and the valley of the Amazons. Some three species occur in Mexico, and several in Central America. One, *R. vitellinus,* which has its head- quarters on the mainland, is said to be common in Trinidad, but none are found in the Antilles proper. They compose the family Rham- phastidae of Coraciiform birds, and are associated with the wood- peckers (Picidae) and puff-birds and jacamars (Galbulidae) ; their nearest allies perhaps exist among the Capitonidae, but none of these is believed to have the long feather-like tongue which is so charac­teristic of the toucans, and is, so far as known, possessed besides only by the Momotidae (see Motmot). But of these last there is no reason to deem the toucans close relatives, and according to W. Swainson, who had opportunities of observing both, the alleged resemblance in their habits has no existence. Toucans in confinement feed mainly on fruit, but little seems amiss to them, and they swallow grubs, reptiles and small birds with avidity. They nest in hollow trees, and lay white eggs. (A. N.)

**TOUCH** (derived through Fr. *toucher* from a common Teu- tonic and Indo-Germanic root, cf. “ tug,” “ tuck,” O. H. Ger. *zucchen,* to twitch or draw), in physiology, a sense of pressure, referred usually to the surface of the body. It is often understood as a sensation of contact as distinguished from pressure, but it is evident that, however gentle be the contact, a certain amount of pressure always exists between the sensitive surface and the body touched. Mere contact in such circumstances is gentle pressure; a greater amount of force causes a feeling of resistance or of pressure referred to the skin; a still greater amount causes a feeling of muscular resistance, as when a weight is supported on the palm of the hand; whilst, finally, the pressure may be so great as to cause a feeling of pain. The force may not be exerted

@@@1 One point of some interest may, however, be noticed. In 1705 Plot *(N.H. Oxfordshire,* p. 182) recorded a toucan found within two miles of Oxford in 1644, the body of which was given to the repository in the medical school of that university, where, he said, “ it is still to be seen.” Already in 1700 Leigh in his *Lancashire* (i. 195, Birds, tab. 1, fig. 2) had figured another which had been found dead on the coast of that county about two years before. The bird is easily kept in captivity, and no doubt from early times many were brought alive to Europe. Besides the one dissected by Paré, as above mentioned, Joh. Faber, in his additions to Hernandez’s work on the Natural History of Mexico (1651), figures (p. 697) one seen and described by Puteus (Dal Pozzo) at Fontainebleau.

@@@2 Of this the brothers Sturm in 1841 published at Nuremberg a German version.

@@@3 This curious peculiarity naturally attracted the notice of the first discoverer of the species, Poeppig, who briefly described it in a letter published in Froriep’s *Notizen* (xxxii. 146) for December 1831.

@@@4 Readers of F. Bates’s *Naturalist on the River Amazons* will recollect the account (ii. 344) and illustration there given of his encounter with a flock of this species of toucan. His remarks on the other species with which he met are also excellent.