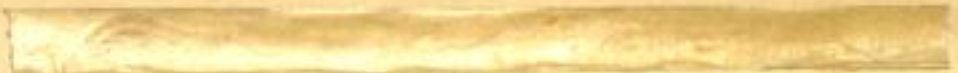


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ILLUSTRATIONS

OF THE

B O T A N Y

AND

OTHER BRANCHES OF THE NATURAL HISTORY

OF THE

HIMALAYAN MOUNTAINS,

AND OF THE

FLORA OF CASHMERE.

VOL. I.

By **J. FORBES ROYLE, M.D., V.P.R.S.,**

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1839.

These hills have, however, in the last few years, attained great celebrity, from their containing one of the most extensive deposits of Fossil remains, which has any where been discovered, and which have been made public by several officers of the Bengal Army, whom I am proud to call my friends: as Dr. Falconer, my successor at Saharunpore; Capt. Cautley, Superintendent of the Doab Canal; Lieuts. Baker and Durand, of the Bengal Engineers, in a series of excellent Papers in the Researches and Journal of the Asiatic Society of Calcutta, and in the Transactions of the Geological Society of London. To the two former, this Society, the fountain of Geological honours, awarded two Wollaston Medals, in Feb. 1837, for their discoveries in Fossil Zoology, especially as displayed in their description of the *Sivatherium giganteum*, a huge Ruminant, which, they conceive, serves to fill up the blank which has always intervened between Ruminant and Pachydermatous quadrupeds, for it combines the teeth and horns of the former with the lip, face, and probably proboscis, of the latter. Lieuts. Baker and Durand are entitled to hardly less credit, for their Papers on the Fossil Horse, Hyæna, Bear, &c., and for having had the skill to detect, and for being the first to have the boldness to publish, in their Paper in the Journal of the Asiatic Society of Calcutta for November 1836, the discovery of Fossil Quadrumana. This was two months previous to the presentation, on the 16th January 1837, to the Academy of Sciences at Paris, of a Memoir, by M. Lartet, respecting the discovery of the lower jaw of an ape, in the tertiary fresh water formation of Simorre, Sansan, &c. in the department of Gers, in the south of France, and at the foot of the Pyrenees, and which in its genera so closely resembles that of the fossil Sewalik Hills, found, it is curious, in the district of Sirmore. These dates are adduced, because Dr. Buckland, in the Supplementary Notes to his Bridgewater Treatise, has announced M. Lartet as the first discoverer of Fossil Quadrumana. It is highly creditable to the Bengal Army that the only four officers in that part of the country should each and all have so highly distinguished themselves, in a science foreign to the pursuits upon which they are employed by the Indian Government, but which they have treated so as to merit the applause even of those who have made Fossil Zoology the business of their lives, v. Mr. Lyell's Address to the Geological Society in 1837.

The discovery of Fossils in the Sewaliks is recent, and its history easily traced; but it is difficult to ascertain who first discovered them in any part of the Himalayas. The Gunduck has long been known to bring down Fossil Ammonites, which are called *Saligrammi*, and are much esteemed by the Hindoos. The Fossils represented in the upper part of Plate 3, from the elevated land on the N.E. of the line of Snowy peaks, have also been long known in India by the name of *Bijli ke har*, or *Lightning Bones*, being employed by the natives in medicine. Capt. Webb and Mr. Traill were probably the first to bring them to the notice of the public; the specimens figured are from the collection of the Geological Society, having been presented by Mr. Colebrooke, to whom they had been sent by those gentlemen. The fossil shells figured in the lower part of the same Plate, are due to the researches of the late Dr. Gerard, who, I believe, first discovered them in the elevated valley of the Spiti, N.W. of Kunawur, though the date when, is not well ascertained; several, however, were figured at Calcutta in the Gleanings of Science for September 1831, where Capt. Herbert's paper on the Geology and Fossils of the Himalayas is published.

These fossils are all from the northern face, beyond what may be considered the true Himalayas. Nothing had then been discovered on the southern aspect of the mountains, with the exception of some at Caribari, in the small state of Cooch Behar, on the banks of the Brahmaputra, which were noticed by Mr. Colebrooke, in his account of the Geology of the N.E. border of Bengal. But this point was so remote from the parts of the Himalayas usually visited, that it was long before it was discovered that they formed a true clue to the nature of the formations at the base of these mountains. The Author also, in December 1831, discovered some fossil fragments on the banks of the Jumna, which, though at first doubted, were afterwards proved to be such by chemical analysis, v. J.A.S., p. 457. Abundance of

fossils have since been discovered there by the engineers employed in improving the navigation of the Jumna : v. papers by Capt. E. Smith, and by Mr. Dean, J. A.S. ii., p. 622, iii., p. 302, iv., p. 261.

Dr. Govan, in September 1831, discovered some Himalayan limestone which bore the impression either of a reptile or of one of the crustacea, which has not yet been described, but with this exception, nothing had been found on the southern face of the Himalayas, or from the Plains to the Snowy Peaks, and yet diligent search had been made for fossils in the Sewaliks themselves, but chiefly from the Kheree Pass to Hurdwar, by Capt. Herbert, and by Mons. Jacquemont at Nahun and in the Kheree Pass, as professed geologists ; by Capt. Cautley and the author in their occasional visits to the latter and to Hurdwar. Capt. De Bude of the Engineers, when cutting down the rock at Hurdwar, and the shingly summit of the Kheree Pass, had been requested to look out for any appearance of fossil remains ; and one of the officers of the Engineers, who has since distinguished himself in such discoveries, almost threw himself upon what he conceived to be a deposit of fossils, when the police officer who is stationed near the head of the Kheree Pass came up and informed the party that a camel had died there in the previous year. Lignite had been discovered here, and described by Capt. Herbert and Cautley. To this the author projected a visit, before leaving that part of India, with Dr. Falconer ; but, as time was wanting, the latter went alone, and "returned loaded, not only with lignite, but with noble fossils of the monsters of the deep ; bones of crocodilidæ, fragments of the shell of large turtles, and a fragment of a bivalve shell as large as an oyster."—Journ. As. Soc., i. p. 97,—as announced by the author in some notes read to the Asiatic Society in February 1832, when he was led to inquire whether those fossils did not probably belong to the same formation as those discovered by Dr. Wallich and Mr. Crawford on the Irawady. No further progress seems to have been made until April 1834, when Dr. Falconer picked up the shell of a fossil tortoise in the Timly Pass ; Capt. Cautley immediately proceeded to the Kaloowala Pass, where he had discovered the lignite in 1827, when Dr. F. recognized a bone, and in the course of the digging, they found teeth of crocodiles ; shells of tortoises ; teeth, apparently of squalus ; and bones and teeth of a pachydermatous animal, apparently Anthracotherium, v. Plate 3, fig. 4 to 15. The lignite lies between two beds of marl, or clay conglomerate ; and in the upper of them the remains were found. Lieut. Durand, in September 1834, met with this marl, or clay conglomerate, on the north face of Nahun, with tortoise, Saurian, mammal, and fish remains.

But this discovery was eclipsed by that of the more extensive and important deposit of remains of fossil mammalia on the same range of hills to the westward of the Jumna, to which the duties of the Canal officers often led them. Attention was directed to this by Lieut. Baker having had given him, by the Nahun rajah, the fossil tooth of an elephant (*Elephas primigenius*) which had been picked up at Sumro-tee, near the Pinjore valley. Lieut. B. proceeded to the Ambwalla Pass, on the western side of the Jumna, and found a large bone of some huge animal ; Capt. Cautley, with his characteristic zeal, immediately joined Lieuts. Baker and Durand ; when they carefully examined the ravine and slip, and brought away from the *upper strata of sandstone* seven fragments of bone, some of very large elephants, and the tibia, apparently, of a camel. A thin bed of blue clay, or blue marl, underlying the sandstone, and dipping at an angle of 20° to 30°, was found full of fresh water shells, as of *Planorbis* and of *Paludina*, v. Journ. As. Soc., iii. p. 393.* Specimens were also procured from other parts of the range, proving that from the Jumna to the Pinjore valley these mountains abound in fossils ; and, in March 1837, Dr. Falconer announced the discovery of a few of the same fossils near Hurdwar, and in large quantities to the eastward of the Ganges in the low hills which skirt the province of Kemaon. Since then, the progress of discovery has

* Though the Author refers to the Journal of the Asiatic Society, &c. as showing the publication of the information, yet he quotes chiefly from letters addressed to him by Capt. Cautley, and which are those referred to by Mr. Lyell in his address in presenting the Wollaston medal, in 1837, to the Author, to be forwarded to Capt. Cautley and Dr. Falconer.

has been rapid, and is fully recorded in the works quoted. A more particular account of the localities, with sections of the mountains, is given by Capt. Cautley, in his paper read to the Geological Society (9th March 1836), and published in the Transactions, 2d Series, vol. v., p. 267, to which I gladly refer, and have only to give a brief enumeration of the genera and some of the species which have been discovered in the Sewalik hills. Capt. C. states particularly, that to the westward of the Jumna these hills are less abrupt; gravel beds are less frequent and abundant, and they are composed of varieties of clay-slate, and quartz, which can be traced to the neighbouring and nearest mountains. He distinguishes the lower marl strata from the upper sandstone beds; the fossils of the former are figured in the middle of Plate 3, and those of the latter in Plate 6.

List of Fossils found in the SEWALIK RANGE, by MESSRS. FALCONER, CAUTLEY, COLVIN, BAKER, and DURAND.

QUADRUMANA.

Three species of *Quadrumana*, v. Messrs. Baker and Durand, Jour. Asiatic Soc. Calcutta, Nov. 1836, Tab. 6, fig. 2; Messrs. Falconer and Cautley, J.A.S., May 1837. One allied to *Sennopithecus*.

PACHYDERMATA.

<i>Elephas primigenius</i> .	<i>Mastodon elephantoides</i> { <i>M. latidens</i> , Clift. — <i>Elephantoides</i> , Clift.
	————— <i>angustidens</i>
<i>Hippopotamus sivalensis</i> , F. & C., v. Tab. 6, fig. a. b.	<i>Rhinoceros sivalensis</i> , F. & C., v. Tab. 6, fig. 4, a. b.
————— <i>dissimilis</i> , F. & C.	<i>Anthracotherium silistrense</i> , v. Tab. 3, fig. 12—15.
<i>Anoplotherium posterogenium</i> , F. & C.	<i>Chærotherium</i> , F. & C., <i>sivalense</i> , F. & C.
<i>Rhinoceros angustistrictus</i> , F. & C.	<i>Sus</i> , (sp. undetermined).

RUMINANTIA.

<i>Sivatherium</i> , F. & C.	<i>Cervus</i> , (sp. undetermined: numerous).
————— <i>giganteum</i> , F. & C., v. Tab. 6, fig. 1,	<i>Antilope</i> , (sp. undetermined: numerous).
a., b., c., d.	<i>Bos</i> , (sp. undetermined: 1 new section in the genus),
<i>Camelus</i> (sp. undetermined: two undoubted).	v. Tab. 6, fig. 5, a. b., and fig. 6, a. b.

SOLIPEDA.

Equus Sivalensis, F. & C., v. Tab. 6, fig. a., b., c.

CARNIVORA.

<i>Felis</i> , (number, and character of species, undetermined).	<i>Hyæna</i> , (species undetermined).
Cats.	<i>Amyxodon</i> , F. & C.
<i>Canis</i> , (species undetermined).	————— <i>sivalensis</i> , F. & C.
Bears.	

Indications of other Genera.

RODENTIA.

<i>Hystrix</i> , one, (sp. undetermined).	<i>Castor</i> .
<i>Mus</i> , (species undetermined).	<i>Lutra</i> .

in the British Museum exhibits the structure too obviously to have otherwise escaped the notice of that accurate Zoologist. The vibrissæ of *L. Roylii* are nearly as long as the head and ears together, and of a uniform brown colour. The arms and fore-arms, and, I presume, the thighs and legs, for, as I have already observed, the posterior members are wanting in the specimen, are covered with fur of the same colour and quality as that on the body, only shorter; but the whole upper face of the carpus, and probably also of the tarsus, is covered with short adpressed hair of a bright reddish yellow colour. The soles of the fore feet present four naked tubercles, corresponding to the extremities of the toes, and a fifth, considerably farther back, which represents the heel, and is separated from the others by a space covered with very short brown hair. The thumb is situated behind the other toes, and, like them, has a small sharp claw of a dusky horn colour.

Dr. Royle obtained his specimen on the Choor Mountain. I take it to be this animal which Captain Mundy* met with during his interesting tour recently published, and which he describes as something between a hare and a guinea-pig; and it is probably, also, the tailless rat which Turner† observed in Thibet, where the banks of a lake were everywhere perforated by its burrows.‡

EDENTATA.

Of this family, the only species known to inhabit the Continent of Asia, the short-tailed Manis, or Scaly Anteater of authors (*Manis pentadactyla* of Linnæus, *M. macroura* of Desmarest) is found in the lower and less elevated parts of the central regions: but all the *Edentata* are essentially inhabitants of the warmer parts of the earth, more especially of tropical America, and we cannot therefore expect to find their forms reproduced in the Himalayas. Mr. Hodgson has described the Manis of Nepal as a new species, under the name of *M. auritus*,§ on the supposition of its being distinct from the common species of the plains of Upper India, the *Badjarkita* of the Bengalese (*M. macroura*), which has been known ever since the expedition of Alexander the Great, and is mentioned by Ælian under the name of *Φαρραγης*; but Mr. Hodgson in this, as in many other instances, has been misled by Griffith's Translation of the *Regne Animal*, a compilation which has obtained a much greater authority in India than its merits entitle it to, or than it enjoys at home.

PACHYDERMATA.

The great Saul Forest, which extends for many hundred miles along the bases of the Himalayan Mountains, affords shelter to vast multitudes of animals, of which it is probable that many species still remain undescribed. Among other genera, the large *Pachydermata* abound in these situations; the Elephant and Rhinoceros (*Elephas indicus* and *Rhinoceros unicornis*), are extremely numerous; and in the rainy season, or in times of scarcity, make frequent inroads into the lower hills, and commit great depredations among the crops of the natives. The Indian Rhinoceros affords a remarkable instance of the obstructions which the progress of knowledge may suffer, and the gross absurdities which not unfrequently result from the wrong application of a name. This animal, to whose horn the superstition of the Persians and Arabs has in all ages attributed peculiar virtues, became known to the Greeks through the description of Ctesias, a credulous physician of that nation, who appears to have resided at the court of Persia in the time of the younger Cyrus, about 400 years before the birth of Christ. His account, though mixed up with great deal of credulous absurdity, contains a very tolerable and perfectly recognizable description of the Rhinoceros, under the ridiculous name, however, of the *Indian Ass*;

* Tour in India, II., 196.

† Journey to Thibet, 211.

‡ I have since seen perfect specimens of this animal, but have nothing to add to the description here given.

§ Journ. As. Soc. V. 234.

Ass; and as he attributed to it a whole hoof, like the horse, and a single horn in the forehead, speculation required but one step further to produce the fabulous Unicorn, such as it appears in the royal arms of England, and such as it has retained its hold on popular credulity for the last two thousand years. The works of Ctesias have perished, but this curious passage is preserved by Phocius;* Aristotle† adopted his statements regarding the *Indian Ass*, from Ctesias; and no other passage of his writings has given rise to a tenth part of the commentaries, discussions, and speculations which have originated in this. Religion was, as usual, pressed into the discussion, and as the Septuagint had used the word *Monoceros*, it was at one time next to rank heresy to doubt the existence of the Unicorn, and might have brought the imprudent sceptic to the stake. But it is not my intention to renew this fruitless and childish discussion; my only wish is to point out the perfect applicability of Ctesias's description to the Indian Rhinoceros, as it is now well known to naturalists; those who wish to pursue a subject of considerable interest in the history of human knowledge, will find many curious details in the writings of the learned Bochart,‡ in Scaliger, Hardouin, Sivry, and others of the older commentators on Aristotle and Pliny.

Wild Hogs, but of a smaller variety than those of Bengal, are extremely numerous in all the wooded parts of the mountains; they do not appear to be specifically different from the common wild boar of Europe. Horses do not breed on the southern face of the mountains, but are imported from Thibet.§ A valuable and sure-footed variety, called Tangun, is described by Turner.|| The Ass does not appear to have been introduced into any part of the mountains, at least neither Dr. Hamilton nor Mr. Hodgson makes any allusion to its being found in Nepal,¶ and Mr. Traill expressly states that it does not exist in Kemaon.** The Dziggetai, however, (*Equus hemionus*), is found on the plains of Thibet and Tartary, and is called *Kiang* by the natives.

RUMINANTIA.

The Ruminantia of the Himalayas, as composed of the larger four-footed game most commonly followed by sportsmen, are probably better known than any other department of Hill Mammalogy. Yet even here much still remains to be done to make us thoroughly acquainted with all the different species or varieties which have been mentioned by Mr. Hodgson†† and other writers; the nomenclature, in particular, is extremely confused, and there is strong reason to believe that the number of species, particularly among the deer tribe, has been greatly increased by the variety of names given to the same animal in the ever varying dialects of the hill tribes. I have, however, only mentioned those of which the existence is known with some degree of certainty.

The Musk (*Moschus moschiferus*), called Kastooree, is not uncommon in the higher hills. It is said to derive its peculiar odoriferous secretion from feeding on the Kastooree plant, a kind of ground nut, which is strongly impregnated with the same pungent scent, and which the animal digs up with its long tusk. Mr. Hodgson, in a recent number of the *Journal of the Asiatic Society*,‡‡ expresses his belief in the existence of three different species of this animal among the Himalayas, and even assigns them distinct names; but the characters are founded entirely on the difference of colour, which is too variable to be depended on for the purpose of specific distinction; and, in fact, Lieut. Smith assures me that the colours vary with the age of the animal; a remark on which I am disposed to place the greater reliance from its agreeing with my own observations, made on many individuals preserved in the museums of this country and the Continent. Whether the "Second species of Musk," mentioned by Dr. Falconer as having been discovered during his recent journey into Cashmere and Little Thibet, be founded on more

important

* Photii Biblioth. cod., 72, p. 91.

† Hist., lib. ii., c. 1.

‡ Hierozoï, lib. iii., c. 26.

§ Mundy's Tour, ii., 75.

¶ Fraser's Journey, p. 351.

¶ Hamilton's Nepal, 79.

** Journey, 21.

†† Asiat. Res., xvi., 351.

‡‡ New Series, I., 202.