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the day, thus "some palms flourish luxuriantly far inland, on the tops of mountains 14,000 feet high, and in the immediate neighbourhood of perpetual snow."*

Organic bodies of all kinds furnish subjects for microscopic investigation, and it is hoped that this brief sketch of some of the more important properties of heat will assist the beginner in his pursuit. It is very important to note the physical conditions under which organisms are developed and thrive, and if we can succeed in starting our friends in studies of this nature they will experience a two-fold pleasure from their investigations, and readily find in scientific treatises a larger body of information than we could attempt to give.

THE RHINOCEROS IN BHOTAN (*RHINOCEROS INDICUS*, Cuv.).

BY E. C. BEAVAN, LIEUT. BENGAL SURVEY.

OF all the large game in India the rhinoceros has gradually become the rarest, and has been driven by the progress of civilization further and further from the haunts of men, until now it is to be found only in the dense untrodden jungles which skirt the bases of the Eastern Himalayas, and the branches of that chain which penetrate Assam.

The range of the Indian rhinoceros formerly extended to the Ganges, and within the memory of man an occasional straggler has been seen in the dense vegetation which in places borders that mighty river; but their present stronghold, shared also by the wild elephant, is that belt of country called the Terai, which extends along the base of the Himalayas from Nepal to the valley of the Burrampooter in Assam.

Unlike the African, the Indian rhinoceros has but one horn, which is seldom seen of more than 12 to 16 inches in length, and its body is well protected by a coat of mail, whilst its size in its native wilds far exceeds that of specimens seen in captivity.

Far remote from human habitations, it frequents during the day the densest reed covers, and passes the time either in sleep or in wallowing in the swamps, the tracks it leaves behind it being often as large as if elephants had been there. They generally live in families of four or five together, and are considered by those acquainted with their habits the most dangerous to attack of all Indian wild beasts. Leaving their

* Berthold Seemann's *Popular History of Palms*, p. 32.

coverts at nightfall, they issue into the surrounding savannahs, to crop the herbage, and have frequently been known to oust the herds of semi-tame buffaloes from their pastures, to the no small alarm of the half-wild herdsmen.

When provoked, the rage of the Indian rhinoceros is almost beyond conception; it charges blindly with great violence, and combining as it does enormous weight with an almost bullet-proof hide, its onset is much dreaded by even the staunchest in the line of elephants engaged in beating, and as often as not the majority turn tail and bolt in fine style. Many a good elephant will stand repeated charges from a furious tiger with unconcern, but proves itself to be an arrant coward when opposed to an Indian rhinoceros.

This animal must not be confounded with other species* of the same family, also called *Indian* rhinoceroses, which frequent the forests of Burmah and the Malayan peninsula, but which in size or strength are far inferior to it.

Bhotan, one of the localities in which it is found, is a large independent state on the north-east frontier of Bengal, most of it a *terra incognita* to Europeans, owing to the strictly exclusive Indo-Chinese policy exercised by its rulers.

The author was for some months stationed at the little out of the way village of Julpigorie, an outpost on this frontier, and situated on the banks of the river Teesta, which, after leaving the Sikkim Himalaya, forms the boundary between the British district of Rungpore, and the country of the Bhotanese.

By gentle means, *i. e.*, occasional requests, invariably accompanied by sundry bottles of rum or other spirit, the Soubah or head man of the district immediately opposite the station was frequently wheedled into granting permission to a few officers of the native regiment stationed there to cross the frontier into his territory for a day's shooting; but as the leave thus obtained expired at nightfall, it being contrary to the laws of the land for an Englishman to pass the night in their domain, the distance one could penetrate into the interior was necessarily limited to twenty or thirty miles. Within this radius, however, during the hot weather, when water was scarce, plenty of game was to be found, and the officers of the —th Bengal Native Infantry were not slow to avail themselves of these advantages.

Three of us started one fine morning in May, the hottest month in these parts, with eight elephants as beaters, making, with those that carried us, eleven in all. We had to proceed a few miles up the river Teesta before it could be forded, for

* *Rh. Sondaicus* (S. Muller) of the Indo-Chinese region, and *Rh. Sumatranus* (F. Cuv.) of Burmah.

though in many places apparently shallow, the quicksands which frequently occur rendered this preliminary operation dangerous in the extreme for elephants. At last fairly across, we enter a dry, grassy-looking country, with occasional patches of cultivation, and here and there a few huts are clustered together under the shadow of a clump of bamboos or plantains.

In the background, especially after rain, are seen the clear outlines of the Himalaya Mountains : many of the peaks tipped with snow contrast strongly against the dark masses of the lower ranges, and produce a very fine effect. The lowest range from Julpigorie is only forty or fifty miles distant.

Moving onwards, we occasionally come across a high bamboo fort belonging to the Bhotanese, who, by nature mountaineers, are kept in small parties, scattered over this plain portion of their country, to hold in check their Bengalee slaves, who are inured to the heat, and till the land for their masters. This flat portion of Bhotan grows nearly all the rice and corn produce for the mountainous district, and is in fact the richest part of the whole kingdom. Were the British to occupy this, as they did in the case of its neighbour Sikkim, it would inflict a heavy blow on this turbulent nation, who are always quarrelling, either amongst themselves or with their neighbours, and have on various occasions laid themselves open by indiscriminate slave-stealing, to war with the British Government.

But "to return to our muttons." The belt of cultivation near the river is soon passed, and we come to a stunted tree jungle, chiefly sálwood (*Shorea robusta*), the best timbers of which have long been cut up, and floated down the river to Calcutta for railway sleepers. This wood is considered the best for that purpose, being so hard that it is the only one capable of standing for any length of time the ravages of the white ant; and cutting it up forms the principal occupation of a tribe of woodcutters, who eke out a miserable existence in this district during the rainy season, which floods the river, floats their timbers, and makes this tract of country the very hot-bed of fever and malaria.

After leaving the sál forests, we reach a vast plain, covered with large patches of high reeds alternating with grass savannahs. The tallest and greenest of the reeds indicate the existence of some half-dried-up pool of water, and in beating up several of these patches, we put up plenty of, to us, *small game*, which is allowed to pass unmolested, though to a "griff" the temptation to fire into a sounder of hog, or at a perverse hog deer (*Hyelaphus porcinus*), which gets up just in front of the elephant, can scarcely be controlled.

Many a fine florikan (*Otis houbara*, bustard), partridge,* or peafowl, rises within tempting shot,† deer of different species, pigs, and hares, are seen at every step; but unless a tiger turns up, to waste powder on anything smaller, at the risk of alarming the rhinoceros, which are known to be in the vicinity, is strictly forbidden.

At length, when in the middle of a thicker jungle than usual, a terrific crashing is heard, accompanied with an occasional loud expression of anger, half snort, half grunt, and the line of elephants show symptoms of wavering, which quickly resolve into a general pell-mell flight, as two enormous rhinoceroses are seen to charge down on the line. The howdah elephants alone are, by dint of repeated and energetic applications of the goad, kept by their mahouts from turning, but shake to that extent that clinging to the sides of the howdah is as much as one can do to prevent one's-self from being shot clean out. The idea of firing is out of the question until the animal gets steadier, when an ineffectual volley of heavy steel-tipped four-ounce conical projectiles is hurled at the game, but only has the effect of increasing their anger, for the largest of them having by this time overtaken one of the retreating elephants, wounds it severely in the flank, by a thrust with its horn. After breaking the line the rhinoceroses leave their cover, and debouch into the plain, which they cross at a pace which leaves the chance of overtaking them at once out of the question, and soon disappear in a low reedy ravine about half a mile distant. Though apparently an unwieldy animal, the rhinoceros at the top of its speed would require a good horse to beat it in a short distance. We proceeded to follow them up leisurely, to give time for the elephants to be reorganized, for three of them on first taking to flight had bolted some distance before their mahouts could turn them. When at last we reached the ravine, which by its numerous wallowing pits was evidently a favourite resort of the game, we proceeded to beat it with the greatest care, but had not gone far before a cry of alarm from the middle of the line caused a general inquiry as to what it was. On nearing the spot a curious spectacle presented itself, one of the elephants had inadvertently stepped into a quagmire, and immediately began to sink, and in a few minutes no portion of its huge carcass remained visible, excepting the head, trunk, and upper part of the back. We immediately proceeded to hew down the branches from the trees in the neighbourhood

* *Francolinus vulgaris*, St., black partridge, and *Perdix gularis*, Tem., Khaier partridge.

† 1. *Axis maculatus*, Gray, spotted deer; 2. *A. porcinus*, hog deer; 3. *Rucervus Duvancellii*, Cuv, the barasingha; 4. *Rusa Aristotelis*, the sambar; 5. Black buck antelope (rare).

to throw to the beast, and we gave it also the straw-stuffed pad off its own back, which materials it placed under its body, and after some time raised itself up sufficiently to allow the other elephants to help it out with ropes. After this delay, as the day was far spent, we determined to beat back homewards, and by great good luck, in a small patch of reeds near a swamp, came across a herd of from seven to eight rhinoceroses. R., who happened to be near them when they broke cover, fired right and left, and to our intense astonishment, down dropped two of the huge beasts. Had we not seen it ourselves, it would have appeared a veritable Munchausen's tale, for it is a well-known fact that one of these animals will frequently carry off ten or twenty heavy bullets in its body without ceremony.

In the whole course of the experience of our veteran leader, Colonel M., such a thing had before never been done; but here was the fact, in both the animals the bullets had pierced the vertebræ of the neck, and R.'s feat was, as may well be supposed, the theme for conversation for many a day after.

As it was now dusk, we had to leave the spoil where it fell, but sent a couple of elephants and a few natives with axes next day to bring in the trophies, their heads, horns, and armour-plates, and part of the flesh, which some experimented on, cooked like a steak, but, though eatable, it was found uncommonly tough.

The hide of the animal is made by the Bhotanese into small round shields with brass bosses let in, and are considered by them to be bullet-proof. We reached home well shaken and tired about ten p.m., but thoroughly satisfied with the day's sport.

IRISH VOLCANOES.

BY PROFESSOR D. T. ANSTED, F.R.S.

THE title of this article will most probably suggest to the reader a disquisition, more or less political, concerning certain familiar but very troublesome questions that arise from time to time both in and out of Parliament, and of which religion, education, tenant-right, etc., are the catch words. Each of these subjects is indeed in Ireland a smouldering fire, liable to break out at any time, and, after disturbing the tranquillity of a district by moral earthquakes, may burst into flames that are mischievous, in proportion as they spread more or less widely. But it is not the history of such fires that we propose to discuss. There are in the green island of Erin certain visible and tangible remains of volcanoes, such as exist in Iceland and