

One of the most striking of the physical features of the Amazon is the *igaripe*. The rise and fall of the tide, and still more the flooding of the river in the rainy seasons, when it rises some forty feet, convert vast forest areas into swamps and lakes, so that canoes can be navigated for miles amidst trees standing out of the water, and over ground that at other seasons is perfectly dry. But besides these conditions there are other and more permanent ones. Channels frequently branch off from the Amazon, make a *détour* through the forest of varying length, and either return to the main stream or join one of its tributary rivers. Every traveller is struck with the remarkable features of these "*igaripes*," as they are called. They are regions of gloom and desolation. Fallen trees and bushes frequently cross the water, and in the narrower parts impede the progress of the canoe.

Mrs. Agassiz thus describes one of these gloomy river defiles :—

"A ragged drapery of long faded grass hung from the lower branches of the trees, marking the height of the last rise of the river to some eighteen or twenty feet above its present level. Here and there a white heron stood on the shore, his snowy plumage glittering in the sunlight, and numbers of *cicognas*, the pheasants of the Amazon, clustered in the bushes. Once a pair of large king-vultures rested for a moment within gunshot, but flew out of sight as our canoe approached, and now an alligator showed his head above water."—*Ibid.* p. 254.

In various localities these river passages open out into wider lake-like areas, where new pictures are unveiled to the eye of the naturalist. These forest pools are frequently surrounded by sloping banks covered with soft green grass, the upper margin of which defines the extent to which the waters rise in the season of flood. Such retreats, especially if some of the surrounding trees have been felled by the hand of man, display the natural riches of the country more than any other, since in such places flowers are more abundant, as well as more within reach than in the loftier and denser forests; these attract gay butterflies, whilst white egrets, herons, and storks stand solemn and thoughtful around the margin of the lake. Parrots and macaws abound amongst the loftier trees. Golden-green jacamars and trogons sit immovable on the lower branches, two or three together, until some passing insect tempts one to leave its perch, to which, however, it quickly returns after it has secured its prey. In the bushes yet nearer to the ground, numbers of small finches and fly-catchers sport through the days of their perennial summer,

whilst on dead branches, high in air, sit some of the hawks and eagles so abundant on the Amazon, watching their opportunity to make a raid upon the feathered swarms that surround the pool. It is in such situations that the *Victoria Regina* spreads its broad leaves upon the waters—the noblest but not the most lovely of aquatic flowers—since we agree with Mr. Wallace that, beautiful as it is, it will not bear comparison with the pure holiness of our own white water-lily. It is here too that we find a wading bird, well known to every naturalist—the spur-winged jacana—whose immensely long toes and claws enable it to course lightly over the treacherous surface of floating leaves, where a bird less fitted by nature for the task would surely sink.

The sketches which we have attempted picture some of the scenes common on the Lower Amazon, but not all. Whilst a large portion of the Amazonian plain is covered with wood and water, there are extensive “campos” or dry grassy districts where the vegetation and the fauna are alike different from those of the forest. This is especially the case on the northern bank of the lower river. The forest may be regarded as commencing in the western half of the island of Marajo, crossing the southern arm of the river to include the Para district, whence it continues almost unbroken nearly to the summit of the Peruvian Andes. But on the north side extensive grassy plains range for some five hundred miles westward from Caviano Island, at the mouth of the river; the virgin woods first presenting their unbroken front opposite to Santarem and the mouth of the river Tapajos. These “campos” are, as we have observed, arid grassy plains, dotted here and there with clusters of myrtles, cashews, and other trees. Large clumps of wild pine-apples are frequent in the thickets. Immense masses of gigantic cacti, compared by every traveller to huge branching candelabra, tower thirty feet into the air, whilst passion-flowers, convulvi and bignonias contribute their share to the floral carpet. But we must not identify these grassy “campos” with the meadows and pastures of our own land. Humboldt long ago pointed out the difference. Their vegetation is usually coarse and rank, and though flowers are far from rare, their taller and more irregular growth produces an effect altogether different from, and far inferior to, that of our own field flowers. Whilst referring to this subject, we may point out how inferior the tropics are in floral displays, both in the eastern and western hemispheres, to temperate regions. This is not only told us by reliable travellers from the West;

but Mr. Wallace confirms his previous statements, derived from his Amazonian experiences, by what he found amongst the Malaccas and other islands of the Malay archipelago during his recent visit to the East. The vegetation of the tropics is beyond all description gorgeous, and suggestive of irrepressible fertility. But it is a wealth of *forms* and of varying shades of green, and not of brighter hues. Here and there clusters of the lovely plants with which we store our conservatories, are met with; plants far surpassing the finest of our northern ferns; but these, being isolated and their flowers often fugitive, make little or no impression upon the general physiognomy of the scene. Mr. Wallace declares most emphatically that he has nowhere found in the tropics anything equalling in beauty our heather-clad moors, our downs with their glowing raiment of broom and gorse, our meadows with their daisies and buttercups, or our hedgerows, with their hawthorns and crab-apples, their wood-bines and wild roses. This is cheering intelligence for such of us as may have felt occasional cravings after tropical life; making us thankful that we are permitted to enjoy a beauty without monotony, which the tropics cannot rival, and yet free from all the irritating drawbacks that so often render tropical life one of physical misery.

As a rule these undulating "campos" are much less productive of animal life than the open glades of the forest, especially in the dry season. Mr. Bates never saw a mammal on the "campos" of Santarem, though tracks of the jaguar, the tiger-cat, a deer, and an opossum were occasionally met with. Flocks of ground-doves run over the stony hillocks. Swarms of finches frequent the dry grass; humming-birds and parroquets are not unfrequent in the scattered trees and bushes, whilst the black anus (*crotophaga*) also congregate in large numbers. The insects, especially the butterflies, are, as might be expected, often peculiar. The conical hillocks of the termites, or white ants, cover the plain. As evening approaches, when the small lizards so abundant throughout Amazonia retire to their holes, large mygales, or "bird-catching" spiders, come forth. Toads of immense bulk appear on the pathways, whilst swarms of goat-suckers chase the night-flying insects through the air. Here, too, Mr. Wallace found to his sorrow that the mosquitoes were in all *their* glory; but the reader shall see the traveller's own sketch, one which somewhat chills our yearnings after tropical life.

"We were warned that the mosquitoes were here very annoying, and we soon found them so, for immediately after sunset they poured

in upon us in swarms, so that we found them unbearable, and were obliged to rush into our sleeping-rooms, which we had kept carefully closed. Here we had some respite for a time, but they soon found them more tormenting than ever, rendering it quite impossible for us to sit down to read or write after sunset. The people here all use cow dung burnt at their doors to keep away the 'praga,' or plague, as they very truly call them, being the only thing that has any effect. Having just now got an Indian to cook for us, we every afternoon sent him to gather a basket of this necessary article, and just before sunset we lighted an old earthen pan full of it at our bedroom door, in the verandah, so as to get as much smoke as possible, by means of which we could by walking about pass an hour pretty comfortably."—*Ibid.* p. 145.

Stinging insects are the great torment of the traveller on most of these plains near the river level. Humboldt experienced their full power on some parts of the Oroonoko, where they are even worse than on the Amazon, since successive parts of the day bring the attacks of three distinct classes of bloodthirsty swarms, each one having its time of appearance and departure. Then in addition there is the chegoe flea, which penetrates beneath the skin of the feet, where it creates an irritating, and, if the insect is not soon picked out with a needle, a serious wound. At Villa Nuova, Mr. Bates had an hour's occupation, after each diurnal ramble, in picking off from his skin and clothes the "carapatos," a species of tick, which mount the blades of grass, and, like the celebrated leeches of Ceylon, attach themselves to the passer, bleeding him at their leisure by means of a long proboscis, which if not cautiously removed, remains in the wound and causes an irritable sore. On the Upper Amazon a minute two-winged fly forms an addition to this list of small irritants. Taking the place of the mosquitoes at sunrise, it is described by Mr. Bates as accompanying canoes in such dense swarms as to resemble thin clouds of smoke. It appears probable that this is identical with the "mosquito," which Humboldt speaks of as relieving the Zancudo at sunrise, after the latter had amused itself with depleting the traveller on the Upper Oroonoko through the dark hours of the night.

The upper part of the Amazon, above the point at which it receives the brown waters of the Rio Negro, is known by the name of the Solimoens, and is regarded by many as a distinct river. The mere name given to it is of little importance. But on passing the Rio Negro the traveller enters upon a new region. The seasons are different from those which succeed each other lower down. The vast "campos" have disappeared,

dragging young birds out of their nests in the holes and crevices of trees. But there appears to be no doubt that these birds are vegetable feeders, living upon the ripe fruits of the forest. Mr. Bates thinks he has found a reason for the size and shape of the bill in the mode in which these birds collect their food ; but the explanation is unsatisfactory, inasmuch as other birds feed on the same fruits without being furnished with this peculiar beak. It appears to us that the members of the Darwinian school, to which Messrs. Bates and Wallace equally belong, err in their endeavours to demonstrate the exact teleological reason for everything they see. They overlook what has apparently been a primary design in creation, viz. the production of an almost boundless diversity. It seems as if the Creator, having determined (applying imperfect human phraseology to such a theme) upon the creation of some special type of organisation, sought to throw it into every variety of form of which the type was capable, for no other reason, apparently, than that of giving to nature that diversity which constitutes one of her richest charms, as well as to reveal that boundless prodigality of resource and creative power which characterises the Divine Being. Of course so long as men believe, with Lamarck, that these diversities have resulted from blind instincts and cravings, from which have sprung new wants to be supplied by the development of new forms of organs, they are laid under the necessity of pointing out what those wants were and how they have been met. But such explanations are in the highest degree arbitrary. Yet they abound in the writings both of Mr. Wallace and Mr. Bates, constituting almost the only blemishes in some of the most charming volumes that have appeared since the publication of Darwin's celebrated *Journal*.

In reference to this subject we would particularly refer to the supposed "mimetic" production of insects, where species of very different genera imitate each other so closely that Mr. Bates "cannot help concluding these imitations to be intentional, and that nature has some motive in their production." So long as this merely means that "nature" has produced nothing in vain, we agree with it. But in the Darwinian philosophy it signifies something more. Mr. Bates gives the clue to this when he says, "When an insect, instead of a dead or inorganic substance, mimics another species of its own order, and does not prey, or is not parasitic, may it not be inferred that the mimicker is subject to a persecution by insectivorous animals from which its model is free?"

It is this baseless inference to which we object, as being unscientific and contrary to philosophical induction. It is an arbitrary deduction made for the purpose of propping up an hypothesis. Taken in connection with the Darwinian philosophy, it means that the mimicking insect A has been produced subsequently to the one mimicked, B; that the former has been originally one of a variable brood, preserved from destruction by its resemblance to the latter, and that the same resemblance has continued to favour all individuals like it, all unlike ones gradually perishing, until the type A alone remained. Now we have here an elaborate life history built upon a foundation of the vaguest kind, viz., the fact of a casual though curious resemblance. But we have other such resemblances where the "mimetic" explanation is impossible. Agassiz has pointed out the case of Amazonian freshwater shells (*unios*) mimicking sea-shells,* and yet we think even Mr. Bates would scarcely contend for the application of his favourite hypothesis to this instance; the vegetable world, especially the orchidean section of it, exhibits a parallel to this "mimicking" of insects in a marvellous manner. Pinnated fern-leaves "mimic" those of the robinia, and these again copy the types common amongst the acacias and the vetches. But who believes in the mimicry in these instances? It is the accidental juxta-position, the dwelling in friendly companionship, of the agrias and the callitheas of the Amazon, that has given the bias to Mr. Bates' judgment. Had these agrias and callitheas happened to live a hundred miles apart we might have been struck by their mutual resemblances, but we should have heard nothing of "mimickry."

Humming-birds are less abundant on the Amazon, especially in the low flat regions, than in some other parts of South America, but they are found throughout the district from Peru to the Andes. They often make their appearance in a locality suddenly when some favourite tree bursts into bloom, disappearing again when the blossoms fade. The orange-trees are especially frequented by them. A yet more remarkable bird, the rock manakin, or cock of the rock, belongs to the upper region, where its flame-coloured plumage renders it one of the most conspicuous of its class. It is not found on the plains, but frequents the range of granitic peaks which cross the Rio Negro above the falls, amongst the rocks of which it builds its nest. These granite mountains cross the head waters of the Oronoko and the Rio Negro in a

* *Brazil*, p. 240.

curving line, from the Andes to Guiana, and the bird occurs along the entire range, a striking example of the occasional dependence of the feathered tribe upon the geological structure of the country which it inhabits. In the upper part of the Rio Negro, Mr. Wallace found abundance of the stately curassaw, a bird with plumage of raven blackness, half turkey, half pheasant, frequenting the lofty trees of the forest. Mr. Bates found another species of the same genus abundant in the woods of the Cupari, one of the tributaries of the Lower Amazon.

We have hitherto said little about one of the insect tribes which more than any other constitutes a marked feature of tropical America, viz., that of the ants. When Humboldt visited the Cassiquiare, he found these pests so destructive that the natives and missionaries could only raise a few culinary vegetables by filling an old boat with soil and lifting it up into the air, suspended by cords or raised upon a scaffold. One species which is frequently met with in the forest, long trains of them marching in single file, is an inch and a quarter in length; but here magnitude is no indication of power. This huge creature apparently does neither good nor harm to the colonist. But this cannot be said of another species—the Sauba ant, which is common over a very wide area. The traveller passing through the forest frequently meets with huge mounds some two feet in height, and often forty yards in circumference. Large as these earth-masses are, they are but the outworks of a vast system of subterranean tunnels in which the Sauba ants dwell. How extensive these excavations are is shown by the fact that near Rio Janeiro this ant has excavated a tunnel under the Rio Parahiba, at a spot where the river is as broad as the Thames at London Bridge, and Mr. Bates relates that when a gardener tried to extirpate them from the Botanic Gardens at Para, by forcing the fumes of sulphur down their galleries, he saw the smoke issuing from one outlet seventy yards distant from the point of operations. It would be well if their operations were limited to tunnelling—but such, unfortunately, is not the case. In order to keep the rain from entering their abodes they thatch the earthen domes that protect the various entrances with leaves, preferring those of cultivated plants, such as the orange, coffee and cocoa trees, to those of the native forest. It would still seem incredible that creatures so small could do permanent mischief, but their numbers are such that, locust-like, they carry desolation wherever they go. They march in columns of amazing length and breadth, rarely turning aside for any object not absolutely impassable. If dwellings stand in their way,

they pass through them, making them for the time being untenable; when they reach their destination, usually a plantation of coffee or cocoa trees, the work of destruction begins.

“They mount the tree in multitudes, the individuals being all working miners. Each one places itself on the surface of a leaf, and cuts with its sharp scissor-like jaws a nearly semicircular incision on the upper side; it then takes the edge between its jaws, and by a sharp jerk detaches the piece. Sometimes they let the leaf drop to the ground, where a little heap accumulates until carried off by another relay of workers; but, generally, each marches off with the piece it has operated upon—and as they all take the same road to their colony, the path they follow becomes in a short time smooth and bare, looking like the impression of a cart-wheel through the herbage.”—*The Naturalist on the Amazon*, vol. i. p. 26.

Similar scenes are described, only with the difference that the interiors of the dwellings are the theatres of the midnight raid. Here the coarse meal, the common substitute for bread on the Amazon, is usually the object of attack. The animals carry this off grain by grain, removing serious quantities during a single night. In one instance Mr. Bates found an assault of this kind made upon his dwelling, and he and his companions tried to destroy the hostile host by crushing them under foot, but to no avail. The swarm returned the next night as fresh as ever. The travellers only overcame them by laying trains of gunpowder along their line of march and blowing them into the air. This plan perseveringly followed out at length drove them in some other direction.

The late visit of Professor Agassiz to the Amazon has attracted much attention. Edwards, Bates, and Wallace went thither with unaided resources, and with no stimulus but the love of nature to sustain them. The distinguished professor was supported by a wealthy citizen, who supplied the financial necessaries. He was accompanied by his wife and a small army of enthusiastic assistants, and entered the district with the imperial ægis of Brazil protecting him, and with a national steamer placed at his disposal whilst on the river. Naturalists rarely have the chance of visiting such a district in such royal fashion. The result has been an immense addition to our knowledge of the fishes of the river and its tributaries; such vast numbers of new species have been discovered as have astonished even those whom Mr. Wallace had already made aware of the riches of this river-basin, where the most trivial barrier seems sufficient to separate one ichthyological area from another. The fishes above and

below a waterfall are often distinct. Those on opposite banks of a stream frequently differ. The result is that in no part of the world are so many species of fresh-water fishes aggregated within an equal geographical area. To allude to the various classes alone would be a long and tedious task. One remarkable fact is already stated by the learned professor, viz.: that throughout the vast network of Amazonian tributaries he has met with no representative of our English salmon. The chief food of the people dwelling near the river is the piracucu, a large species, some eight feet in length. One of the most interesting of the fish is the well-known gymnotus, or electric eel, of which Humboldt first gave copious accounts to the world. It abounds in the rivers and pools of the Upper Amazon.

The books enumerated at the head of this article have each their respective merits as valuable contributions to our knowledge of the Amazon. Had the volume in which Mrs. Agassiz records her husband's movements contained fewer intimations of what he wrote to the Brazilian Emperor and what the Emperor said to him, it would have lost nothing in a scientific point of view, whilst it would have been more in harmony with Louis Agassiz, who was cradled in one republic and adopted into another. The volumes of Messrs. Bates and Wallace are worthy of their indefatigable authors, being rich in information which is recorded in good clear English. We cannot leave the subject without congratulating the latter gentleman upon his safe return from his Malayan expedition, laden with the spoils of the Eastern archipelago. A fire at sea consumed all his Amazonian collections. His recent success will in some measure compensate for his previous misfortune, and we trust encourage him again to try his practised hand in "pastures new."
