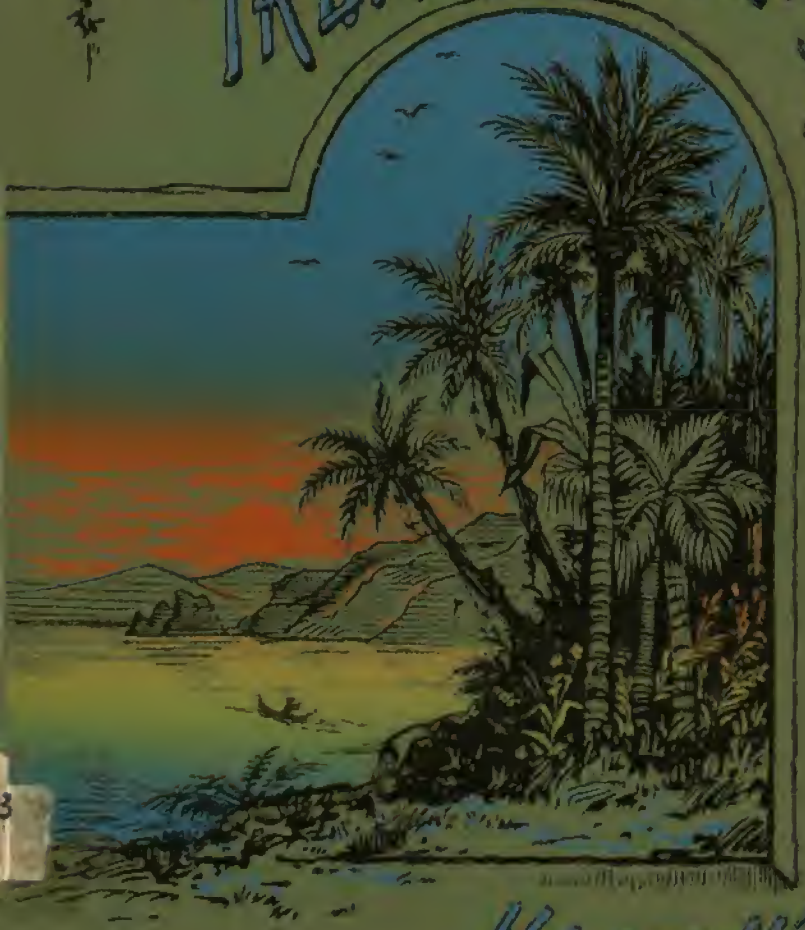
# WONDERS OF THE TROPICAL FORESTS



HARTWIG

# WONDERS OF THE TROPICAL FORESTS.

Ballantyne Press
BALLANTYNE, HANSON AND CO.
EDINBURGH AND LONDON

TROPICAL VEGETATION.

# WONDERS OF THE TROPICAL FORESTS

*FROM "THE TROPICAL WORLD"*

BY

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With 40 Illustrations

LONDON

LONGMANS, GREEN, AND CO.

AND NEW YORK: 15 EAST 16th STREET

1888

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# WONDERS OF THE TROPICAL FORESTS.

## CHAPTER I.

### *THE PRIMEVAL FORESTS OF TROPICAL AMERICA.*

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The peculiar charms of a tropical primeval forest are enhanced by the mystery of its impenetrable thickets; for however grand its lofty vaults, or lovely its ever-changing forms of leaf or blossom, fancy paints scenes still more beautiful beyond, where the eye cannot penetrate, and where, as yet, no wanderer has ever strayed. But imagination also peoples the forest with peculiar terrors; for man feels himself here surrounded by an alien, or even hostile, nature: the solitude and silence of the woods weigh heavily on his mind; in every rustling of the falling leaves a venomous snake seems ready to dart forth; and who knows what ravenous animal may not be lurking in the dense underwood that skirts the tangled path.

In Europe there is no room for such feelings; for in our part of the world there are no woods that may not

be visited, even in their deepest recesses: no thorny bush-ropes stretch their intricate cordage before the wanderer; no masses of matted shrubs block up his way. But it is very different in the boundless forests of tropical America. Here the jaguar sometimes loses himself in such impenetrable thickets that, unable to hunt upon the ground, he lives for a long time on the trees, a terror to the monkeys; here the *padres* of the mission-stations, which are not many miles apart in a direct line, often require more than a day's navigation to visit each other, following the windings of small rivulets in their courses, as the forest renders communication by land impossible.

Even the more open parts of the forest are full of mysteries. In our woods the summits of the highest trees are accessible; there is no blossom that we are not able to pluck—no plant that we are not able to examine, from its root to its topmost branches; but in the Brazilian forest, where the matted bush-ropes wind round the trunks like immense serpents waiting for their prey, or stretch like the rigging of a ship from one tree to another, and blossom at a giddy height, it is frequently as impossible to reach their flowers as it is to distinguish to which of the many interlacing stems they may belong.

If any one should be inclined to tax this description with exaggeration, let him try to pluck the flowers of the lianas, or to ascend by climbing their flexible cordage. The tiger-cat and the monkey, perhaps also the agile Indian, may be able to accomplish the feat; but it would be utterly hopeless for the European to undertake it. Nor is it possible to drag down these inaccessible creepers; for, owing to their strength and toughness, it would be easier to pull down the tree to which they attach themselves than to force them from their hold. Here two or three together twisting spirally round each other form a complete living cable, as if to bind securely the monarchs of the forest; there they form tangled festoons,

and, covered themselves with smaller creepers and parasitic plants, hide the parent stem from sight.

No botanist ever entered a primitive forest without envying the bird to whom no blossom is inaccessible, who, high above the loftiest trees, looks down upon the sea of verdure, and enjoys prospects whose beauty can hardly be imagined by man.

A majestic uniformity is the character of our woods, which often consists but of one species of tree, while in the tropical forests an immense variety of families strive for existence, and even in a small space one neighbour scarcely ever resembles the other. Even at a distance this difference becomes apparent in the irregular outlines of the forest, as here a dome-shaped crown, there a pointed pyramid, rises above the broad flat masses of green, in ever-varying succession. On approaching, the differences of colour are added to the irregularities of form; for while our forests are deprived of the ornament of flowers, many tropical trees have large blossoms, mixing in thick bunches with the leaves, and often entirely overpowering the verdure of the foliage by their gaudy tints. Thus splendid white, yellow, or red coloured crowns are mingled with those of darker or more humble hue. At length when, on entering the forest, the single leaves become distinguishable, even the last traces of harmony disappear. Here they are delicately feathered, there lobed—here narrow, there broad—here pointed, there obtuse—here lustrous and fleshy, as if in the full luxuriance of youth, there dark and arid, as if decayed with age. In many the inferior surface is covered with hair; and as the wind plays with the foliage, it appears now silvery, now dark green—now of a lively, now of a sombre hue. Thus the foliage exhibits an endless variety of form and colour; and where plants of the same species unite in a small group, they are mostly shoots from the roots of an old stem. This is chiefly the case with the palms; but the species of the larger trees are generally

so isolated in the wood, that one rarely sees two alike on the same spot. Each is surrounded by strangers that begrudge it the necessary space and air; and where so many thousand forms of equal pretensions vie for the possession of the soil, none is able to expand its crown or extend its branches at full liberty. Hence there is a universal tendency upwards; for it is only by overtopping its neighbours that each tree can attain the region of freedom and of light; and hence also the crowns borne aloft on those high columnar trunks are comparatively small. Shooting up straight and tall in this general struggle, they present no fantastic branches, no projecting limbs, like the sturdy oaks of our forests, and each, supported by the surrounding crowd, loses depth and tenacity of root. They may partly be compared to a body of military: the storm may rage, the lightning blast, the earthquake shake, and though many fall, the body at large scarcely feels the loss. Separate them and they will be found far inferior in power to the wild warrior, who, accustomed to stand alone, trusts to his own strength and dexterity to bear him through the worst storms of fate.

Among the trees the various kinds that have buttresses projecting around their base are the most striking and peculiar. Some of these buttresses are much longer than they are high, springing from a distance of eight or ten feet from the base, and reaching only four or five feet high on the trunk; while others rise to the height of twenty or thirty feet, and can even be distinguished as ribs on the stem to forty or fifty. They are complete wooden walls from six inches to a foot thick, sometimes branching into two or three, and extending straight out to such a distance as to afford room for a comfortable hut in the angle between them. Other trees again appear as if they were formed by a number of slender stems growing together. They are deeply furrowed for their whole height, like the pillars in a cathedral, and in places these furrows reach

quite through them, like windows in a narrow tower, yet they run up as high as their loftiest neighbours, with a straight stem of uniform diameter. Another most curious form is presented by those which have many of their roots high above the ground, appearing to stand on many legs, and often forming archways large enough for a man to walk beneath.

The stems of all these trees, and the climbers that wind or wave around them, support a multitude of dependants. Tillandsias and other Bromeliaceæ, resembling wild pine-apples, large climbing Arums, with their dark green, arrowhead-shaped leaves, peppers in great variety, and large-leaved ferns, shoot out at intervals all up the stem to the very topmost branches. Between these, creeping ferns and delicate little species like our Hymenophyllum abound, and in moist dark places the leaves of these are again covered with minute creeping mosses and Jungermannias, so that we have parasites on parasites, and on these parasites again. On looking upwards, the infinite variety of foliage, strongly defined against the clear sky, is a striking characteristic of the tropical forest, and the bright sunshine lighting up all above, while a sombre gloom reigns below, adds to the grandeur and solemnity of the scene.

As these vast woods occupy sites of a very different character,—here extending along low river-banks, there climbing the slopes of gigantic mountains,—here under the equator, there on the verge of the tropics, where many of the trees, annually casting their foliage, remind one of the winter of the temperate zone—it is of course quite impossible to embrace all their varieties of form and aspect in one general description.

On descending from the heights of the Andes to the plains of the Marañon, the eye is attracted, in the more elevated forests (the region of the quinquina trees), by a variety of fantastically flowering orchids—and of arborescent ferns, with their lacelike giant leaves—by wonder-

ful bignonias, banisterias, passifloras, and many other inextricably tangled bush-ropes and creepers. Farther downwards, though the lianas still appear in large numbers, the eye delights in palms of every variety of form, in terebinthinaceas, in leguminosas, whose sap is rich with many a costly balsam; in laurels, bearing an abundance of aromatic fruit; or it admires the broad-leaved heliconias, the large blossoms of the solaneas, and thousands of other flowers, remarkable for the beauty of their colour, the strangeness of their form, or their exquisite aroma.

In the deep lowlands the forest assumes a severe and dismal character: dense crowns of foliage form lofty vaults almost impenetrable to the light of day; no underwood thrives on the swampy ground; no parasite puts forth its delicate blossoms under the shade of the mighty trees, and only mushrooms sprout abundantly from the humid soil.

Nothing can equal the gloom of these forests during the rainy season. Thick fogs obscure the damp and sultry air, and clouds of mosquitoes whirl about in the mist. The trees are dripping with moisture; the flowers expand their petals only during the few dry hours of the day, and every animal seeks shelter in the thicket. No bird, no butterfly comes forth; the snorting of the capybaras, and the monotonous croaking of frogs and toads, are the only sounds that break the dull silence. Night darkens with increasing sadness over these dismal solitudes; no star is visible; the moon disappears behind thick clouds; and the roar of the jaguar, or the howling of the stentor-monkey, issue like notes of distress from the depth of the melancholy woods.

A hurricane bursting over the primeval forest is one of the most terrific scenes of nature. A hollow uproar in the higher regions of the air, as if the wild huntsman of the German legends were sweeping along with his whole pack of phantom hounds, precedes the explosion

PRIMITIVE FOREST.

of the storm, while the lower atmosphere still lies in deep repose. The roaring and rushing descend lower and lower; the higher branches of the trees strike wildly against each other; the forked lightning flashes through the night-like darkness; the thunder, repeated by a hundred echoes, rolls through the thicket; and trees, uprooted by the fury of the storm, fall with a loud crash, bearing down every stem of minor growth in their sweeping ruin. The howlings and wailings of terrified animals accompany the wild sounds of the tempest.

After the wet season the woods appear in their full beauty. Before the first showers, the long-continued drought had withered their leaves, and dried up many of the more delicate parasites, and during its continuance the torrents of rain despoiled them of all ornament; but when the clouds disperse, and the animals come forth from their retreats to stretch their stiffened limbs in the warm sunshine, then also the vegetable world awakens to new life; and where, a few days before, the eye met only with green in every variety of shade, it now revels in the luxuriance of beautiful flowers, which embalm the air with exquisite fragrance.

At this time of the year the banks of the rivers of Guiana winding through the primitive woods are of magical beauty. Through the underwood, which often overhangs wide spaces of the stream, the large white blossoms of the inga shine forth, along with the scarlet brushes of the magnificent combretia. Elegant palms, armed with a panoply of thorns, and bearing a profusion of red fruit, rise above this lovely foreground; and farther on, noble forest trees are seen festooned with creepers and parasites covered with flowers.

These fairy bowers are enlivened by birds of splendid plumage, particularly in the early morning, when the luscious green of the high palm-fronds or the burning yellow of the lofty leopoldinias, touched by the first rays of the sun, suddenly shines forth. Then hundreds of

FOREST SCENE IN CENTRAL AFRICA.

gaudy parrots fly across the river; numberless colibris dart like winged gems through the air; whole herds of cotingas flutter among the blossoms; ducks of brilliant plumage cackle on the branches of submerged trees; on the highest tree-tops the toucan yelps his loud pia-po-ko; while, peeping from his nest, the oriole endeavours to imitate the sound; and the scarlet ibis flies in troops to the coast, while the white egrette flutters along before the boat, rests, and then again rises for a new career.

Yet pick out even the loveliest of these privileged spots where the most gorgeous flowers of the tropics expand their glowing petals, and for every scene of this kind we may find another at home of equal beauty and with an equal amount of brilliant colour.

"Look at a field of buttercups and daisies," says Mr. Wallace, a very competent judge, "a hillside covered with gorse and broom, a mountain rich with purple heather, or a forest glade azure with a carpet of wild hyacinths, and they will bear a comparison with any scene the tropics can produce. I have never seen anything more glorious than an old crab-tree in full blossom, and the horse-chestnut, lilac, and laburnum will vie with the choicest tropical trees and shrubs. In the tropical waters are no more beautiful plants than our white and yellow water lilies, our irises and flowering rush, for I cannot consider the flower of the Victoria Regia more beautiful than that of the Nymphæ alba, though it may be larger, nor is it so abundant an ornament of the tropical waters as the latter is of ours."

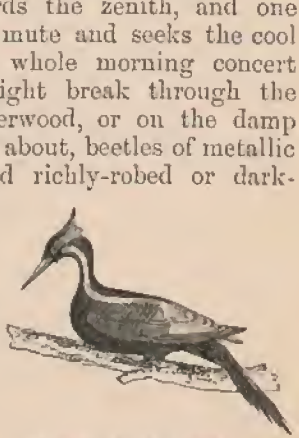
Let us, therefore, unseduced by the highly coloured statements of travellers, learn to be contented with the beauties which Nature has lavished on our woods and fields, nor deem that England—

> "Where lawns extend that scorn Arcadian pride,
> And brighter streams than famed Hydaspes glide"—

has received but a stepmotherly share in the distribution of her gifts.

Like the ocean, the forest has its voices, now swelling into uproar, now subsiding into silence; but while the wind and the breaker are the only musicians of the sea, the woods resound with animal voices.

In general, the morning hours are the loudest; for the creatures that delight in daylight, though not more numerous than the nocturnal species, have generally a louder voice. Their full concert, however, does not begin immediately after sunrise; for they are mostly so chilled by the colder night, that they need to be warmed for some time before awakening to the complete use of their faculties. First, single tones ring from the higher tree-crowns, and gradually thousands of voices join in various modulation — now approaching, now melting into distance. Pre-eminent in loudness is the roar of the howling monkeys, though without being able fully to stifle the discordant cries and chattering of the noisy parrots. But the sun rapidly ascends towards the zenith, and one musician after the other grows mute and seeks the cool forest shade, until finally the whole morning concert ceases. Where the rays of light break through the foliage and play upon the underwood, or on the damp ground, gaudy butterflies flutter about, beetles of metallic brilliancy warm themselves, and richly-robed or dark-vested snakes creep forth; for these indolent creatures are also fond of basking in the sun.



IVORY-BILLED WOODPECKER.

As the heat grows more intense, the stillness of the forest is only interrupted at intervals by single animal voices. Sometimes it is the note of the ivory-billed woodpecker, resounding like the distant axe of the forester, or the wail of the sloth breaking forth from the dense thicket. Sometimes human voices seem to issue from the depth of the forest, and the astonished huntsman

fancies himself close to his comrades of the chase, or in the more dangerous neighbourhood of a wild tribe of Indians. With deep attention he listens to the sounds, until he discovers them to be the melancholy cry of the wood-pigeon.

The deepest silence reigns at noon, when the sun becomes too powerful even for the children of the torrid zone; and many creatures, particularly the birds, sink into a profound sleep. Then all the warm-blooded animals seek the shade, and only the cold reptiles—alligators, lizards, salamanders—stretch themselves upon the glowing rocks in the bed of the forest streams, or on sunny slopes, and, with raised head and distended jaws, seem to inhale with delight the sultry air.

As the evening approaches, the noise of the morning begins to reawaken. With loud cries the parrots return from their distant feeding-grounds to the trees on which they are accustomed to rest at night; and, as the monkeys saluted the rising sun, so, chattering or howling, they now watch him sinking in the west.

With twilight a new world of animals—which, as long as the day lasted, remained concealed in the recesses of the forest—awakens from its midday torpor, and prepares to enjoy its nightly revels. Then bats of hideous size wing their noiseless flight through the wood, chasing the giant hawk-moths and beetles, which have also waited for the evening hour, while the felidæ quit their lairs, ready to spring on the red stag near some solitary pool, or on the unwieldy tapir, who, having slept during the heat of the day, seeks, as soon as evening approaches, the low-banked river, where he loves to wallow in the mud. Then also the shy opossum quits his nest in hollow trees, or under some arch-like vaulted root, to search for insects or fruits, and the cautious agouti sallies from the bush.

In our forests scarcely a single tone is heard after sunset; but in the tropical zone many loud voices celebrate

the night, where for hours after the sun has disappeared, the cicadæ, toads, frogs, owls, and goatsuckers chirrup, cry, croak, howl, and wail. The quietest hours are from midnight until about three in the morning. Complete silence, however, occurs only during very short intervals; for there is always some cause or other that prompts some animal to break the stillness. Sometimes the din grows so loud that one might fancy a legion of evil spirits were celebrating their orgies in the darkness of the forest. The howling of the aluates, the whine of the little sapajous, the snarl of the duruculi, the roaring of the jaguar, the grunt of the pecari, the cry of the sloth, and the shrill voices of birds, join in dreadful discord. Humboldt supposes the first cause of these tumults to be a conflict among animals, which, arising by chance, gradually swells to larger dimensions. The jaguar pursues a herd of pecaris or tapirs, which break wildly through the bushes. Terrified by the noise, the monkeys howl, awakening parrots and toucans from their slumber; and thus the din spreads through the wood. A long time passes before the forest returns to its stillness. Towards the approach of day the owls, the goatsuckers, the toads, the frogs, howl, groan, and croak for the last time; and as soon as the first beams of morning purple the sky, the shrill notes of the cicadæ mix with their expiring cries.

## CHAPTER II.

### *GIANT TREES AND CHARACTERISTIC FORMS OF TROPICAL VEGETATION.*

General remarks—The Baobab—Used as a vegetable cistern—Arborescent Euphorbias—The Dracæna of Orotava—The Sycamore—The Banyan—The Sacred Bo-tree of Anarajapoora—The Teak Tree—The Saul—The Sandal Tree—The Satinwood Tree—The Ceiba—The Mahogany Tree—The Mora—Bamboos—The Guadua—Beauty and multifarious uses of these Colossal Grasses—Firing the jungle—The Aloes—The Agave Americana—The Bromelias—The Cactuses—The Mimosas—Bush-ropes—Climbing trees—Emblems of ingratitude—Marriage of the Fig-tree and the Palm—Epiphytes—Water plants—Singularly-shaped Trees—The Barrigudo—The Bottle Tree—Trees with buttresses and fantastical roots—The Mangroves—Their importance in furthering the growth of Land-Animal Life among the Mangroves—"Jumping Johnny"—Insalubrity of the Mangrove Swamps—The Lum Trees with formidable spines.

WHEREVER in the tropical regions periodical rains saturate the earth, vegetable life expands in a wonderful variety of forms. In the higher latitudes of the frozen north, a rapidly evanescent summer produces but few and rare flowers in sheltered situations, soon again to disappear under the winter's snow; in the temperate zones, the number, beauty, and variety of plants increase with the warmth of a genial sky; but it is only where the vertical rays of an equatorial sun awaken and foster life on humid grounds that ever-youthful Flora appears in the full exuberance of her creative power. It is only there we find the majestic palms, the elegant mimosas, the large-leafed bananas, and so many other beautiful forms of vegetation alien to our cold and variable clime. While our trees are

but sparingly clad with scanty lichens and mosses, they are there covered with stately bromelias and wondrous orchids. Sweet-smelling vanillas and passifloras wind round the giants of the forest, and large flowers break forth from their rough bark, or even from their very roots.

The number of known plants is estimated at about 200,000, and the greater part of this vast multitude of species belongs to the torrid zone. But if we consider how very imperfectly these sunny regions have as yet been explored—that in South America enormous forest lands and river basins have never yet been visited by a naturalist—that the vegetation of the greater part of Central Africa is still completely hidden in mystery—that no botanist has ever yet penetrated into the interior of Madagascar, Borneo, New Guinea, South-Western China, and Ultra-Gangetic India—and that, moreover, many of the countries visited by travellers have been but very superficially examined—we may well doubt whether even one-fourth part of the tropical plants is actually known to science.

After these general remarks on the variety and exuberance of tropical vegetation, I shall now briefly notice those plants which, by their enormous size, their singularity of form, or their frequency in the landscape, chiefly characterise the various regions of the torrid zone.

The African Baobab, or monkey-bread tree, may justly be called the elephant of the vegetable world. Near the village Gumer, in Fassokl, Russegger saw a baobab thirty feet in diameter and ninety-five in circumference; the horizontally outstretched branches were so large that the negroes could comfortably sleep upon them. The Venetian traveller Cadamosto (1454) found, near the mouths of the Senegal, baobabs measuring more than a hundred feet in circumference. As these vegetable giants are generally hollow, like our ancient willows, they are frequently made use of as dwellings or stables; and Dr.

Livingstone mentions one in which twenty or thirty men could lie down and sleep, as in a hut. In the village of Grand Galarques, in Senegambia, the negroes have decorated the entrance into the cavity of a monstrous baobab with rude sculptures cut into the living wood, and make use of the interior as a kind of assembly room, where they meet to deliberate on the interests of their small community, "reminding one," says Humboldt, "of the celebrated plantain in Lycia, in whose hollow trunk the Roman consul, Lucinius Mutianus, once dined with a

BAOBAB TREES AT MANAAR.

party of twenty-one." As the baobab begins to decay in the part where the trunk divides into the larger branches, and the process of destruction thence continues downwards, the hollow space fills, during the rainy season, with water, which keeps a long time, from its being protected against the rays of the sun. The baobab thus forms a *vegetable cistern*, whose water the neighbouring villagers sell to travellers. In Kordofan the Arabs climb up the tree, fill the water in leathern buckets, and let it down from above; but the people in Congo more

ingeniously bore a hole in the trunk, which they stop, after having tapped as much as they require.

The height of the baobab does not correspond to its amazing bulk, as it seldom exceeds sixty feet. As it is of very rapid growth, it acquires a diameter of three or four feet and its full altitude in about thirty years, and then continues to grow in circumference. The larger beam-like branches, almost as thick at their extremity as at their origin, are abruptly rounded, and then send forth smaller branches, with large, light green, palmated leaves. The bark is smooth and greyish. The oval fruits, which are of the size of large cucumbers, and brownish-yellow when ripe, hang from long twisted spongy stalks, and contain a white farinaceous substance, of an agreeable acidulated taste, enveloping the dark brown seeds. They are a favourite food of the monkeys, whence the tree has derived one of its names.

From the depth of the incrustations formed on the marks which the Portuguese navigators of the fifteenth century used to cut in the large baobabs which they found growing on the African coast, and by comparing the relative dimensions of several trunks of a known age, Adanson concluded that a baobab of thirty feet in diameter must have lived at least five thousand years; but a more careful investigation of the rapid growth of the spongy wood has reduced the age of the giant tree to more moderate limits, and proved that, even in comparative youth, it attains the hoary aspect of extreme senility.

The baobab, which belongs to the same family as the mallow or the hollyhock, and is, like them, emollient and mucilaginous in all its parts, ranges over a wide extent of Africa, particularly in the parts where the summer rains fall in abundance, as in Senegambia, in Soudan, and in Nubia. Dr. Livingstone admired its colossal proportions on the banks of the Zouga and the Zambesi. It forms a conspicuous feature in the landscape at Manaar

in Ceylon, where it has mostly likely been introduced by early mariners, perhaps even by the Phœnicians, as the prodigious dimensions of the trees are altogether inconsistent with the popular conjecture of a Portuguese origin.

Another tree very characteristic of Africa, and frequently seen along with the baobab, is the large arborescent Euphorbia, surmounted at the top with stiff leaves, branching out like the arms of a huge candelabra. It adds greatly to the strange wildness of the landscape, and seems quite in character with the aspect of the unwieldy rhinoceros and the long-necked giraffe.

Dracænas, or dragon-trees, are found growing on the west coast of Africa and in the Cape Colony, in Bourbon, and in China; but it is only in the Canary Islands, in Madeira, and Porto Santo that they attain such gigantic dimensions as to entitle them to rank among the vegetable wonders of the world.

DRAGON-TREE OF OROTAVA.

Unfortunately, the venerable dragon-tree of Orotava, in Teneriffe, which was already reverenced for its age by the extirpated nation of the Guanches, and which the adventurous Bethencourts, the conquerors of the Canaries, found hardly less colossal and cavernous in 1402 than Humboldt, who visited it in 1799, was destroyed by a storm in 1871. Above the roots the illustrious traveller measured a circumference of forty-five feet; and according to Sir George Staunton, the trunk had still a diameter of four yards,

at an elevation of ten feet above the ground. The whole height of the tree was not much above sixty-five feet. The trunk divided in numerous upright branches, terminating in tufts of evergreen leaves, resembling those of the pine-apple.

Next to the baobab and the dracæna, the Sycamore

SYCAMORE.

holds a conspicuous rank among the giant trees of Africa. It attains a height of only forty or fifty feet, but in the course of many centuries its trunk swells to a colossal size, and its vast crown covers a large space of ground with an impenetrable shade. Its leaves are about four inches long and as many broad, and its figs have an excellent flavour. In Egypt it is almost the only grove-

forming tree; and most of the mummy coffins are made of its incorruptible wood.

No baobab rears its monstrous trunk on the banks of the Ganges; no dragon-tree of patriarchal age here reminds the wanderer of centuries long past; but the beautiful and stately Banyan gives him but little reason to regret their absence. Each tree is in itself a grove, and some of them are of an astonishing size, as they are continually increasing, and, contrary to most other animal and vegetable productions, seem to be exempted from decay; for every branch from the main body throws out its own roots, at first in small tender fibres, several yards from the ground, which continually grow thicker, until, by a gradual descent, they reach its surface, where, striking in, they increase to a large trunk and become a parent-tree, throwing out new branches from the top. These in time suspend their roots, and, receiving nourishment from the earth, swell into trunks and send forth other branches, thus continuing in a state of progression so long as the first parent of them all supplies her sustenance.

> "The bended twigs take root, and daughters grow
> About the mother-tree; a pillar'd shade
> High overarch'd, and echoing walks between.
> There oft the Indian herdsman, shunning heat,
> Shelters in cool, and tends his pasturing herds
> At loopholes cut through thickest shade."

These beautiful lines of Milton are by no means overdrawn; as a banyan tree, with many trunks, forms the most beautiful walks and cool recesses that can be imagined. The leaves are large, soft, and of a lively green; the fruit is a small fig (when ripe of a bright scarlet), affording sustenance to monkeys, squirrels, peacocks, and birds of various kinds, which dwell among the branches.

The Hindoos are peculiarly fond of this tree; they consider its long duration, its outstretching arms, and

BANYAN TREE.

overshadowing beneficence, as emblems of the Deity; they plant it near their temples; and in those villages where there is no structure for public worship they place an image under a banyan, and there perform a morning and evening sacrifice.

Many of these beautiful trees have acquired an historic celebrity; and the famous Cubbeer-burr, on the banks of the Nerbuddah, thus called by the Hindoos in memory of a favourite saint, is supposed to be the same as that described by Nearchus, the admiral of Alexander the Great, as being able to shelter an army under its far-spreading shade. "High floods have at various times swept away a considerable part of this extraordinary tree, but what still remains is nearly 2000 feet in circumference, measured round the principal stems; the overhanging branches not yet struck down cover a much larger space; and under it grow a number of custard-apple and other fruit trees. The large trunks of this single colossus amount to a greater number than the days of the year, and the smaller ones exceed 3000, each constantly sending forth branches and hanging roots to form other trunks and become the parents of a future progeny.

"About a century ago a neighbouring rajah, who was extremely fond of field diversions, used to encamp under it in a magnificent style, having a saloon, drawing-room, dining-room, bed-chamber, bath, kitchen, and every other accommodation, all in separate tents; yet the noble tree not only covered the whole, together with his carriages, horses, camels, guards, and attendants, but also afforded with its spreading branches shady spots for the tents of his friends, with their servants and cattle. And in the march of an army it has been known to shelter 7000 men." Such is the banyan—more wonderful than all the temples and palaces which the pride of the Moguls has ever reared!

The nearly related Pippul of India, or Bo-tree, which differs from the banyan by sending down no roots from

its branches, is reverenced by the Buddhists as the sacred plant, under whose shade Gautma, the founder of their religion, reclined when he underwent his divine transfiguration. Its heart-shaped leaves, which, like those of the aspen, appear in the profoundest calm to be ever in motion, are supposed to tremble in recollection of that mysterious scene.

The sacred Pippul at Anarajapoora, the fallen capital of the ancient kings of Ceylon, is probably the oldest *historical tree* in the world; as it was planted 288 years before Christ, and hence is now 2150 years old. The enormous age of the Baobabs of Senegal, and of the wondrous Wellingtonias of California, can only be conjectured; but the antiquity of the Bo-tree is matter of record, as its preservation has been an object of solicitude to successive dynasties; and the story of its fortunes has been preserved in a series of continuous chronicles amongst the most authentic that have been handed down by mankind.

"Compared with it, the Oak of Ellerslie is but a sapling, and the Conqueror's Oak in Windsor Forest barely numbers half its years. The yew trees of Fountains Abbey are believed to have flourished there 1200 years ago; the olives in the Garden of Gethsemane were full-grown when the Saracens were expelled from Jerusalem, and the cypress of Somma in Lombardy is said to have been a tree in the time of Julius Cæsar. Yet the Bo-tree is older than the oldest of these by a century, and would almost seem to verify the prophecy pronounced when it was planted, that it would 'flourish and be green for ever.'"

Although far inferior to these wonders of the vegetable world in amplitude of growth, yet the Teak tree, or Indian oak, far surpasses them in value, as the ship-worm in the water, and the termite on land, equally refrain from attacking its close-grained strongly scented wood; and no timber equals it for shipbuilding purposes.

It grows wild over a great part of British India; in the mountainous districts along the Malabar coast, in Guzerat, the valley of the Nerbuddah, in Tenasserim and Pegu. Unlike the oak and fir forests of Europe, where large spaces of ground are covered by a single species, the teak forests of India are composed of a great variety of trees, among which the teak itself does not even predominate. After a long neglect, which, in some parts, had almost caused its total extirpation, Government has at length taken steps for its more effectual protection, and appointed experienced foresters to watch over this invaluable tree. Since 1843, millions of young plants have been raised from seeds, but unfortunately the teak is of as slow growth as our oak, and many years will still be necessary to repair the ruinous improvidence of the past.

On turning our attention to America we find that Nature, delighting in infinite varieties of development, and disdaining a servile copy of what she had elsewhere formed, covers the earth with new and no less remarkable forms of vegetation. Thus, while in Africa the baobab attracts the traveller's attention by its colossal size and peculiarity of growth, the gigantic Ceiba, belonging to the same family of plants, raises his astonishment in the forests of Yucatan. Like the baobab, this noble tree rises only to a moderate height of sixty feet, but its trunk swells to such dimensions that fifteen men are hardly able to span it, while a thousand may easily screen themselves under its canopy from the scorching sun. The leaves fall off in January; and then at the end of every branch bunches of large, glossy, purple-red flowers make their appearance, affording, as one may well imagine, a magnificent sight.

In British Honduras the Mahogany tree is found scattered in the forest, attracting the woodman's attention from a distance by its light-coloured foliage and its magnificent growth. Such are its dimensions, and such is the value of peculiarly fine specimens, that in October

THE SACRED BO-TREE OF ANARAJAPOORA.

1823 a tree was felled which weighed more than seven tons, and at Liverpool was sold for £525. The expense of sawing amounted to £750 more: so that the wood of this single tree, before passing into the hands of the cabinet-maker, was worth as much as a moderately sized farm.

"Heedless and bankrupt in all curiosity must he be," says Waterton, "who can journey through the forests of Guiana without stopping to take a view of the towering Mora. Its topmost branch, when naked with age, or dried by accident, is the favourite resort of the toucan. Many a time has this singular bird felt the shot faintly strike him from the gun of the fowler beneath, and owed his life to the distance betwixt them. The wild fig-tree, as large as a common English apple-tree, often rears itself from one of the thick branches at the top of the mora; and when its fruit is ripe, to it the birds resort for nourishment. It was to an indigested seed passing through the body of this bird, which had perched on the mora, that the fig-tree first owed its elevated station there. The sap of the mora raised it into full bearing; but now, in its turn, it is doomed to contribute a portion of its own sap and juices towards the growth of different species of vines, the seeds of which also the birds deposited on its branches. These soon vegetate and bear fruit in great quantities; so, what with their usurpation of the resources of the fig-tree, and the fig-tree of the mora, the mora, unable to support a charge which Nature never intended it should, languishes and dies under its burden; and then the fig-tree and its usurping progeny of vines, receiving no more succour from their late foster-parent, droop and perish in their turn."

Our stateliest oaks would look like pygmies near this "chieftain of the forests," who raises his dark green cupola over all the neighbouring trees, and deceives the traveller, who fancies that a verdant hill is rising before him. Its wood is much firmer than that of the fir, and is,

or will be, of great importance to the shipbuilder. On the Upper Barima alone, a river of Guiana hardly even known by name in Europe, Schomburgk found the giant tree growing in such profusion that it could easily afford sufficient timber for the proudest fleet that ever rode the ocean.

The graceful tapering form of the *Graminæ*, or grasses, belongs to every zone; but it is only in the warmer regions of the globe that we find the colossal *Bambusaceæ* (Bamboos), rivalling in grandeur the loftiest trees of the primeval forest.

In New Grenada and Quito the Guadua, one of these giant grasses, ranks next to the sugar-cane and maize as the plant most indispensable to man. It forms dense jungles, not only in the lower regions of the country, but in the valleys of the Andes, 5000 feet above the level of the sea. The culms attain a thickness of six inches, the single joints are twenty inches long, and the leaves are of indescribable beauty. A whole hut can be built and thatched with the guadua, while the single joints are extensively used as water-vessels and drinking-cups.

India, South China, and the Eastern Archipelago are the seats of the real bamboos, which grow in a variety of genera and species, as well on the banks of lakes and rivers in low marshy grounds, as in the more elevated mountainous regions. They chiefly form the impenetrable jungles, the seat of the tiger and the python. Sometimes a hundred culms spring from a single root, not seldom as thick as a man, and towering to a height of eighty or a hundred feet. Fancy the grace of our meadow grasses, united with the lordly growth of the Italian poplar, and you will have a faint idea of the beauty of a clump of bamboos.

The variety of purposes to which these colossal reeds can be applied almost rivals the multifarious uses of the cocoa-nut palm itself. Splitting the culm in its whole

length into very thin pieces, the industrious Chinese then twist them together into strong ropes, for hauling their vessels along their numerous rivers and canals. The sails of their junks, as well as their cables and rigging, are made of bamboo; and in the southern province of Sechuen, not only nearly every house is built solely of this strong cane, but almost every article of furniture which it contains—mats, screens, chairs, tables, bedsteads, bedding—is of the same material. From the young shoots they also fabricate their fine writing-paper, which is so superior to the produce of our own manufactories. Although the bamboo grows spontaneously and most profusely in nearly all the southern portion of their vast empire, they do not entirely rely on the beneficence of Nature, but cultivate it with the greatest care. They have treatises devoted solely to this subject, laying down rules derived from experience, and showing the proper soils, the best kinds of water, and the seasons for planting and transplanting the bamboos, whose use is scarcely less extensive throughout the whole East Indian world.

At one season of the year the bamboos are easily destroyed by fire; and as the great stem-joints burst from the expansion of the air confined within, the report almost rivals the roar of cannon. In Sikkim firing the jungle is a frequent practice, and Dr. Hooker, who often witnessed the spectacle, describes the effect by night as exceedingly grand. "Heavy clouds canopy the mountains above, and, stretching across the valleys, shut out the sky; the air is a dead calm, as usual in the deep gorges; and the fires, invisible by day, are seen raging all around, appearing to an inexperienced eye in all but dangerous proximity. The voices of birds and insects being hushed, nothing is audible but the harsh roar of the rivers, and occasionally rising far above it, that of the forest fires. At night we were literally surrounded by them; some smouldering like the shale-heaps at a

colliery, others fitfully bursting forth, whilst others again stalked along with a steadily increasing and enlarging flame, shooting out great tongues of fire, which spared nothing as they advanced with irresistible might. At Darjiling the blaze is visible, and the deadened reports of the bamboos bursting is heard throughout the night; but in the valley, and within a mile of the scene of destruction, the effect is the most grand, being heightened by the glare reflected from the masses of mist which hover above."

The aloes form the strongest contrast to the airy lightness of the grasses, by the stately repose and strength of their thick, fleshy, and inflexible leaves. They generally stand solitary in the parched plains, and impart a peculiarly austere or melancholy character to the landscape. The real aloes are chiefly African, but the American yuccas and agaves have a similar physiognomical character. The *Agave americana*, the usual ornament of our hothouses, bears on a short and massive stem a tuft of fleshy leaves, sometimes no less than ten feet long, fifteen inches wide, and eight inches thick! After many years a flower-stalk twenty feet high shoots forth in a few weeks from the heart of the plant, expanding like a rich candelabrum, and clustered with several thousands of greenish-yellow aromatic flowers. But a rapid decline succeeds this brilliant efflorescence, for it is soon followed by the death of the exhausted plant.

In Mexico, where the agave is indigenous, and whence it has found its way to Spain and Italy, it is reckoned one of the most valuable productions of Nature. At the time when the flower-stalk is beginning to sprout, the heart of the plant is cut out, and the juice, which otherwise would have nourished the blossom, collects in the hollow. About three pounds exude daily, during a period of two or three months. After standing for a short time, the sweet juice undergoes a vinous fermentation, and the stranger, when once accustomed to its disagreeable odour,

prefers the *pulque* to all other wines, and joins in the enthusiastic praises of the Mexican.

The American bromelias likewise resemble the aloes of torrid Africa by the form and arrangement of their leaves. To this useful family belongs the pine-apple, which grows

AN AGAVE PLANTATION, MEXICO.

best and largest in Brazil, where it is so common that the pigs fatten on the fruit. Formerly confined in our country to the tables of the wealthier classes as long as it was only supplied by our hothouses, it can now be enjoyed at a very moderate expense, since thousands are imported by every West Indian steamer.

The leaves of several species of bromelia furnish excellent twine for ropes. The inhabitants of the banks of the river San Francisco, in Brazil, weave their fishing-nets with the fibres of the Caroa, and the filaments of the Cravata de rede furnish a cordage of amazing strength and durability.

The foliage of the screw-pines, so widely extended over the East Indian and South Sea Isles, where they form a prominent feature in the landscape, closely resembles that of the bromelias, while the stem (round which the serrated leaves ascend in spiral convolutions, till they terminate in a pendulous crown), the aërial roots, and the fruit, remind one of the palms, the mangroves, and the coniferæ.

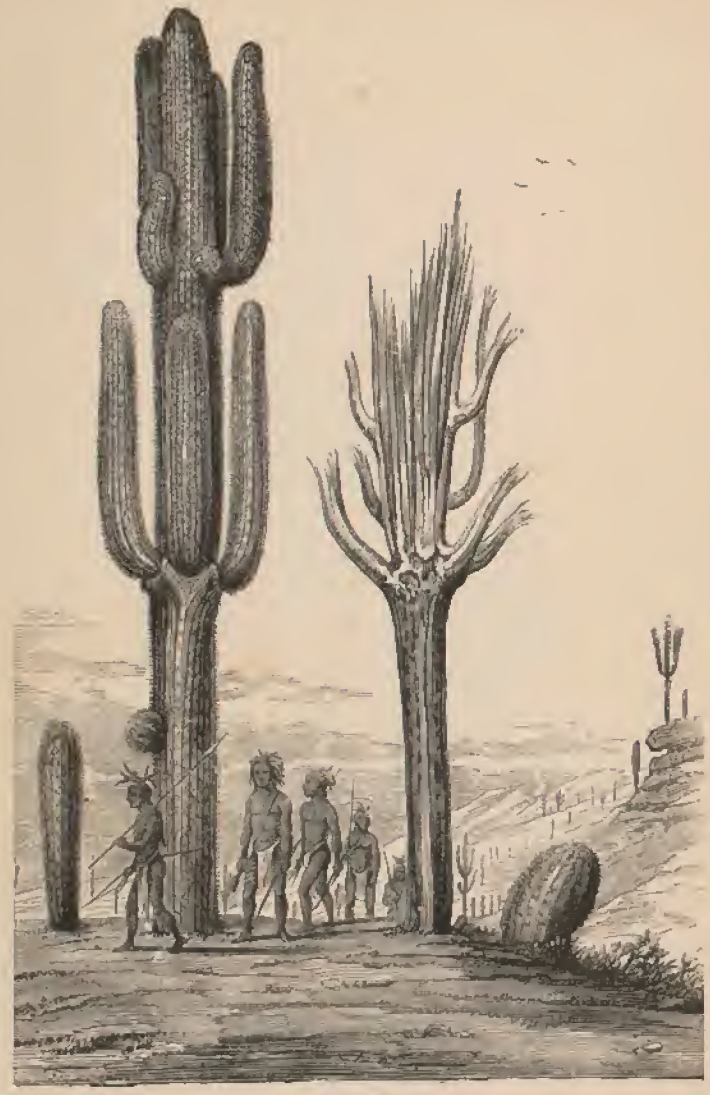
The sweet-smelling screw-pine, whose fruits, when perfectly mature, resemble large rich coloured pine-apples, plays an important part in the household economy of the coral-islanders of the South Seas. The inhabitants of the Mulgrave Archipelago, where the cocoa-nut is rare, live almost exclusively on the juicy pulp and the pleasant kernels of the fruit. The dried leaves serve to thatch their cottages, or are made use of as a material for mats and raiment. The wood is hard and durable. They string together the beautiful red and yellow-coloured nuts for ornaments, and wear the flowers as garlands. When the tree is in full blossom, the air around is impregnated with a delicious odour.

The grotesque forms of the Cactuses possess the stiff rigidity of the aloes. Their fleshy stems, covered with a grey-green coriaceous rind, generally exhibit bunches of hair and thorns instead of leaves. The angular columns of the Cerei, or torch-cactuses, rise to the height of sixty feet —generally branchless, sometimes strangely ramified, as candelabras, while others creep like ropes upon the ground, or hang, snake-like, from the trees, on which they are parasitically rooted. The opuntias are unsymmetrically constructed of thick flat joints springing one from the other,

while the melon-shaped Echinocacti and Mammillariæ, longitudinally ribbed or covered with warts, remain attached to the soil. The dimensions of these monstrous plants are exceedingly variable. One of the Mexican echinocacti measures four feet in height, three in diameter, and weighs about two hundred pounds; while the dwarf cactus is so small that, loosely rooted in the sand, it frequently remains sticking between the toes of the dogs that pass over it. The splendidly coloured flowers of the cactuses form a strange contrast to the deformity of their stems, and the spectator stands astonished at the glowing life that springs forth from so unpromising a stock. These strange compounds of ugliness and beauty are in many respects useful to man. The pulp of the melocacti, which remains juicy during the driest season of the year, is one of the vegetable sources of the wilderness, and refreshes the traveller after he has carefully removed the thorns. Almost all of them bear an agreeable acid fruit, which, under the name of the Indian fig, is consumed in large quantities in the West Indies and Mexico. The light and incorruptible wood is admirably adapted for the construction of oars and many other implements. The farmer fences his garden with the prickly opuntias; but the services which they render, as the plants on which the valuable cochineal insect feeds and multiplies, are far more important.

The cactuses prefer the most arid situation, naked plains, or slopes, where they are fully exposed to the burning rays of the sun, and impart a peculiar physiognomy to a great part of tropical America.

None of the plants belonging to this family existed in the Old World previous to the discovery of America; but some species have since then rapidly spread over the warmer regions of our hemisphere. The Nopal skirts the Mediterranean along with the American agave, and from the coasts has even penetrated far into the interior of Africa, everywhere maintaining its ground, and conspicuously

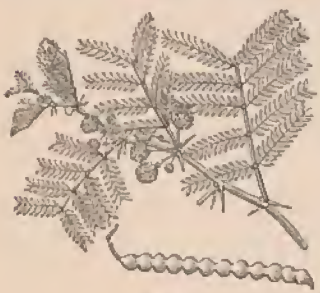


CEREUS GIGANTEUS.

figuring along with the primitive vegetation of the land.

Although chiefly tropical, the cactuses have a perpendicular range, which but few other families enjoy. From the low sand-coasts of Peru and Bolivia they ascend through vales and ravines to the highest ridges of the Andes. Magnificent dark-brown Peireskias (the only cactus genus bearing leaves instead of prickles) bloom on the banks of the Lake of Titicaca, 12,700 feet above the level of the sea; and in the bleak Puna, even at the very limits of vegetation, the traveller is astonished at meeting with low bushes of cactuses thickly beset with yellow prickles.

What a contrast between these deformities and the delicately feathered mimosas, unrivalled among the loveliest children of Flora in the matchless elegance of their foliage!



MIMOSA.

Our common acacias give but a faint idea of the beauty which these plants attain under the fostering rays of a tropical sun. In most species the branches extend horizontally, or umbrella-shaped, somewhat like those of the Italian pine, and the deep-blue sky shining through the light green foliage, whose delicacy rivals the finest embroidery, has an extremely picturesque effect. Endowed with a wonderful sensibility, many of the mimosas seem, as it were, to have outstepped the bounds of vegetable life, and to rival in acuteness of feeling the coral polyps and the sea anemones of the submarine gardens.

Large tracts of country in Brazil are almost entirely covered with sensitive plants. The tramp of a horse sets the nearest ones in motion, and, as if by magic, the contraction of the small grey-green leaflets spreads in quivering circles over the field, making one almost believe,

with Darwin and Dutrochet, that plants have feeling, or tempting one to exclaim with Wordsworth—

> "It is my faith, that every flower
> Enjoys the air it breathes."

Among the most remarkable forms of tropical vegetation, the creeping plants, bush-ropes, or lianas, that contribute so largely to the impenetrability of the forests, hold a conspicuous rank. Often three or four bush-ropes, like strands in a cable, join tree to tree, and branch to branch; others, descending from on high, take root as soon as their extremity touches the ground, and appear like shrouds and stays supporting the mainmast of a line-of-battle ship; while others send out parallel, oblique, horizontal, and perpendicular shoots in all directions.

No European is able to penetrate the intricate network of a forest thus matted together; astonished and despairing, he stands before the dense cordage that impedes his path, and, should he attempt to force his way through the maze, the strong thorns and hooks with which the tropical creepers are generally armed would soon make him repent of his boldness. The Brazilian planter never thinks of entering the forest without a large knife, or without being accompanied by slaves, who, with heavy scythe-like axes attached to long poles, clear the way by severing the otherwise impenetrable cordage.

The enormous climbing trees, that stifle the life of the mightiest giants of the forest, offer a no less wonderful spectacle. At first, these emblems of ingratitude grow straight upwards like any feeble shrub, but as soon as they have found a support in other trees, they begin to extend over their surface; for, while the stems of other plants generally assume a cylindrical form, these climbers have the peculiarity of divesting themselves of their rind when brought into contact with an extraneous body, and of spreading over it, until they at length enclose it in a tubular mass. When, during this process, the powers of

the original root are weakened, the trunk sends forth new props to restore the equilibrium; and thus the tough and hardy race continually acquires fresh strength for the ruin of its neighbours.

Several species of the fig-tree are peculiarly remarkable for this distinctive property, and, from the facility with which their seeds take root where there is a sufficiency of moisture to permit of germination, are formidable assailants of ancient monuments. Sir Emerson Tennent mentions one which had fixed itself on the walls of a ruined edifice at Polanarrua, and formed one of the most remarkable objects of the place, its roots streaming downwards over the walls as if their wood had once been fluid, and following every sinuosity of the building and terraces till they reached the earth.

On the borders of the Rio Guama, Von Martius saw whole groups of Macauba palms encased in fig-trees that formed thick tubes round the shafts of the palms, whose noble crowns rose high above them; and a similar spectacle occurs in India and Ceylon, where the Tamils look with increased veneration on their sacred pippul thus united in marriage with the palmyra. After the incarcerated trunk has been stifled and destroyed, the grotesque form of the parasite, tubular, cork-screw-like, or otherwise fantastically contorted, and frequently admitting the light through interstices like loopholes in a turret, continues to maintain an independent existence among the straight-stemmed trees of the forest—the image of an eccentric genius in the midst of a group of sedate citizens.

Like the mosses and lichens of our woods, parasites of endless variety and almost inconceivable size and luxuriance cover in the tropical zone the trunks and branches of the forest trees, forming hanging gardens, far more splendid than those of ancient Babylon. While the orchids are distinguished by the eccentric forms and splendid colouring of their flowers, sometimes resembling winged insects or birds, the Pothos family attract atten-

tion by the beauty of their large, thick-veined, generally arrow-shaped, digitated, or elongated leaves, and form a beautiful contrast to the stiff bromelias or the hairy tillandsias that conjointly adorn the knotty stems and branches of the ancient trees.

In size of leaf, the Pothos family is surpassed by the

POLANARRUA.

large tropical water-plants, the Nymphæas and Nelumbias, among which the Victoria regia, discovered in 1837 by Robert Schomburgk in the river Berbice, enjoys the greatest celebrity. The round light-green leaves of this queen of water-plants measure no less than six feet in diameter, and are surrounded by an elevated rim several inches high, and exhibiting the pale, carmine red of the

under surface. The odorous white blossoms, deepening into roseate hues, are composed of several hundred petals; and, measuring no less than fourteen inches in diameter, rival the colossal proportions of the leaves. The Victoria is found all over the Amazon district, but rarely or never in the river itself. It seems to delight in still waters, growing in inlets, lakes, or very quiet branches of the river fully exposed to the sun.

The trunk of several tropical trees offers the remarkable peculiarity of bulging out in the middle like a barrel. In the Brazilian forests, the Pao Barrigudo arrests the attention of every traveller by its odd ventricose shape, nearly half as broad in the centre as long, and gradually tapering towards the bottom and the top, whence spring a few thin and scanty branches. It is only by seeing great numbers of these trees all with their character more or less palpable, that one can believe it is not an accidental circumstance in the individual tree, instead of being truly characteristic of the species.

The Delabechea, or bottle-tree, discovered by Mr. Mitchell in tropical Australia, has the same lumpish mode of growth. Its wood is of so loose a texture that, when boiling water is poured over its shavings, a clear jelly is formed, and becomes a thick viscid mass.

In other trees which, struggling upwards to air and light, attain a prodigious altitude, or from their enormous girth and the colossal expansion of their branches require steadying from beneath, we find buttresses projecting like rays from all sides of the trunk. They are frequently from six to twelve inches thick, and project from five to fifteen feet, and, as they ascend, gradually sink into the bole and disappear at the height of from ten to twenty feet from the ground. By the firm resistance which they offer below, the trees are effectually protected from the leverage of the crown, by which they would otherwise be uprooted. Some of these buttresses are so smooth and flat as almost to resemble

sawn planks; as, for instance, in the Bombax Ceiba, one of the most remarkable examples of this wonderful device of Nature.

In other cases we find the roots fantastically spreading and revelling in a variety of grotesque shapes, such as

BOTTLE-TREE.

we nowhere find in the less exuberant vegetation of Europe. Thus, in the india-rubber tree, masses of the roots appear above ground, extending on all sides from the base, and writhing over the surface in serpentine undulations, so that the Indian villagers give it the

name of the snake-tree. Sir Emerson Tennent mentions an avenue of these trees leading to the botanical garden of Peradenia, in Ceylon, the roots of which meet from either side of the road, and have so covered the surface as to form a wooden framework, the interstices of which retain the materials that form the roadway. These tangled roots sometimes trail to such an extent that they have been found upwards of 140 feet in length, whilst the tree itself was not 30 feet high.

The roots of the Mangroves, which in the tropical

SNAKE-TREE.

zone are found fringing the shores of the sea, or the mouths of rivers, wherever the reflux of the tide exposes a broad belt of alluvial soil, are admirably adapted for securing a footing on the unstable brink of the ocean.

The growth of these salt-water-loving trees is equally peculiar and picturesque. The seeds germinate on the branches, and, increasing to a considerable length, finally fall down into the mud, where they stick, with their sharp point buried, and soon take root.

As the young mangrove grows upwards, pendulous roots issue from the trunk and low branches, and ulti-

mately strike into the muddy ground, where they increase to the thickness of a man's leg; so that the whole has the appearance of a complicated series of loops and arches, from five to ten feet high, supporting the body of the tree like so many artificial stakes.

It may easily be imagined what dense and inextricable thickets, what incomparable breakwaters, plants like these —through whose mazes even the light-footed Indian can only penetrate by stepping from root to root—are capable of forming.

Their influence in promoting the growth of land is very great, and in course of time they advance over the shallow borders of the ocean. Their matted roots stem the flow of the waters, and, retaining the earthy particles that sink to the bottom between them, gradually raise the level of the soil. As the new formation progresses, thousands of seeds begin to germinate upon its muddy foundation, thousands of cables descend, still farther to consolidate it; and thus foot by foot, year after year, the mangroves extend their empire and encroach upon the maritime domains.

The enormous deltas of many tropical rivers partly owe their immense development to the unceasing expansion of these littoral woods; and their influence should by no means be overlooked by the geologist when describing the ancient and eternal strife between land and ocean.

When the waters retire from under the tangled arcades of the mangroves, the black mud, which forms the congenial soil of these plants, appears teeming with a boundless variety of life. It absolutely swarms with the lower marine animals, with myriads of holothurias, annelides, sea-urchins, entomostraca, paguri, and crabs, whose often brilliantly coloured carapaces form a strong contrast to the black ooze in which they are seen to crawl about. Life clings even to the roots and branches bathed by the rising floods; for they are found covered with mussels, barnacles, and oysters, which thus have the appearance

of growing upon trees, and pass one-half of their existence under water, the other in the sultry atmosphere of a tropical shore.

The close-eyed Gudgeon or "Jumping Johnny," as he is more familiarly named by the sailors, plays a conspicuous part in the animal world of the mangrove swamps, where the uncouth form of this strange amphibious fish may be seen jumping about in the mud like a frog, or sliding awkwardly along on its belly with a gliding motion. By means of its pectoral fins, it is even enabled to climb with great facility among the roots of the mangroves, where it finds a goodly harvest of minute crustaceans. It must, however, not be supposed that "Johnny" has all the swamp to himself; for though he manages to swallow many a victim, he is not seldom doomed to become the prey of creatures more wily or stronger than himself. A large and powerful crab of the Grapsus family may often be observed stealing, with an almost imperceptible motion, and in a cautious, sidelong manner, towards a gudgeon basking on the shore, and, before the fish has time to plunge into the sea, the pincer of the crab secures it in a vice-like gripe, from which it is perfectly hopeless to escape.

"Johnny" is a pugnacious little fellow, and rather prolonged fights may be observed between him and his brethren. At the mouth of the Zambesi, Dr. Livingstone saw one which, in fleeing from an apparent danger, jumped into a pool a foot square, which another evidently regarded as his by prior discovery. In a twinkling the owner, with eyes flashing fury, and with dorsal fin bristling up in a rage, dashed at the intruding foe. The fight waxed furious. No tempest in a teapot ever equalled the storm of that miniature sea. The warriors were now in the water, and anon out of it, for the battle raged on sea and shore. They struck hard, they bit each other, until becoming exhausted, they seized each other by the jaws like two bull-dogs. They paused for breath, and were at

it again as fiercely as before, until the combat ended by the precipitate retreat of the invader.

The vast multitude of marine animals which people the mangrove swamps naturally attract a great number of strand and sea-birds; for it would be strange, indeed, if guests were wanting where the table is so prodigally supplied. The red ibis, the snow-white egrette, the rosy spoonbill, the tall flamingo, and an abundance of herons

A MANGROVE SWAMP.

and other water-fowl, love to frequent the mangrove thickets, enhancing by their magnificent plumage the beauty of the scene. For, however repulsive may be the swampy ground on which these strange trees delight, yet their bright green foliage, growing in radiated tufts at the ends of the branches, and frequently bespangled with large gaily-coloured flowers, affords a most pleasing spectacle. Many an interesting discovery would here, no doubt, reward the naturalist's attention; but the man-

groves know well how to keep their secrets, and to repel the curiosity of man. Should he attempt to invade their domains, clouds of bloodthirsty insects would instantly make him repent of his temerity; for the plague of the mosquitoes is nowhere more dreadful than in the thickets of the semi-aquatic Rhizophoræ. And supposing his scientific zeal intense enough to bid defiance to the torture of their stings, and to scorn the attacks of every other visible foe—insect or serpent, crocodile or beast of prey—that may be lurking among the mangroves, yet the reflection may well bid him pause, that poisonous vapours, pregnant with cholera or yellow fever, are constantly rising from that muddy soil. Even in the temperate regions of Europe the emanations from marshy grounds are pregnant with disease, but the malaria ascending from the sultry morasses of the torrid zone is absolutely deadly.

Thus there cannot possibly be a better natural bulwark for a land than to be belted with mangroves; and if Borneo, Madagascar, Celebes, and many other tropical islands and coasts, have to the present day remained free from the European yoke, they are principally indebted for their independence to the miasmas and tangles of a Rhizophora girdle, bidding defiance alike to the sharp edge of the axe or the destructive agency of fire.

As the mangroves are found in places suited to their growth throughout the whole torrid zone, it is not surprising that there are many species, some rising to the height of stately trees, while others are content with a shrub-like growth. Some are peculiar to America, others to the Old World; some grow near the sea, others prefer a brackish water and the low swampy banks of rivers.

The Jriarteas and Screw-pines are as singular as the mangroves in the formation of their roots; but those of the Lum, a large tree which Kittlitz found growing on the island of Ualan, are perhaps without a parallel in the

THE LUM TREE.

vegetable world. Each of the roots, running above ground for a considerable distance, is surmounted by a perfectly vertical crest, gradually diminishing in size as the root recedes from the trunk, but often three, or even four, feet high near its base. These crests, which are very thin but perfectly smooth, regularly follow all the sinuosities of the root, and thus form, for a considerable distance round the tree, a labyrinth of the strangest appearance. Large spaces of swampy ground are often covered with their windings, and it is no easy matter to walk on the sharp edges of these vertical bands, whose interstices are generally filled with deep mud. On being struck, the larger crests emit a deep sonorous sound, like that of a kettledrum.

The thorns and spines with which many European plants are armed, give but a faint idea of the size which these defensive weapons attain in the tropical zone. The cactuses, the acacias, and many of the palm-trees, bristle with sharp-pointed shafts, affording ample protection against the attacks of hungry animals, and might appropriately be called vegetable hedge-hogs, or porcupines. The Toddalia aculeata, a climbing plant, very common in the hill-jungles of Ceylon, is thickly studded with knobs, about half an inch high, and from the extremity of each a thorn protrudes, as large and sharp as the bill of a sparrow-hawk.

The black twigs of the buffalo-thorn, a low shrub abounding in northern Ceylon, are beset at every joint by a pair of thorns set opposite each other, like the horns of an ox, as sharp as a needle, from two to three inches in length, and thicker at the base than the stem they grow on; and the Acacia tomentosa, another member of the same numerous genus, has thorns so large as to be called the jungle-nail by Europeans, and the elephant-thorn by the natives. In some of these thorny plants, the spines grow, not singly, but in branching clusters, each point presenting a spike as sharp as a lancet; and

where these shrubs abound, they render the forest absolutely impassable, even to animals of the greatest size and strength.

The formidable thorny plants of the torrid zone, which are often made use of by man to protect his fields and plantations against wild beasts and robbers, have sometimes even been made to serve as a bulwark against hostile invasions. Thus Sir Emerson Tennent informs us that, during the existence of the Kandyan kingdom, before its conquest by the British, the frontier forests were so thickened and defended by dense plantations of thorny plants as to form a natural fortification impregnable to the feeble tribes on the other side; and at each pass which led to the level country, movable gates, formed of the same thorny beams, were suspended as an ample security against the incursions of the naked and timid lowlanders.

Poets and moralists, judging by what they see in England, have concluded that fruits of a small size, whose fall cannot be dangerous to man, invariably grow on high trees, while large fruits, such as the pumpkin, are only found trailing on the ground. But a visit to the tropics would soon convince them of their error, for two of the largest and heaviest fruits known, the Brazilian nut and the Durian of the Indian Archipelago, grow on high forest trees, from which they fall down when ripe, and frequently wound or kill the natives. "From this," says Mr. Wallace, "we can learn two things—in the first place, not to draw general conclusions from a locally very limited knowledge of nature, and, secondly, that trees and fruits, as well as the manifold productions of the animal kingdom, have not been exclusively organised with a reference to man."

## CHAPTER III.

### *PALMS AND FERNS.*

The Cocoa-nut Tree—Its hundred uses—Cocoa-nut oil—Coir—Porcupine wood—Enemies of the Cocoa Palm—The Sago Palm—The Saguer—The Gumatty—The Areca Palm—The Palmyra Palm—The Talipot—The Cocoa de Mer—Ratans—A Ratan bridge in Ceylon—The Date Tree—The Oil Palms of Africa—The Oil Trade at Bonny—Its vast and growing importance—American Palms—The Carnauba—The Ceroxylon andicola—The Cabbage Palm—Gulielma speciosa—The Piacava—Difficulties of the botanist in ascertaining the various species of Palms—Their wide geographical range—Different physiognomy of the Palms according to their height—The position and form of their fronds—Their fruits—Their trunk—The Yriartea ventricosa—Arborescent Ferns.

THE graceful acanthus gave the imaginative Greeks the first idea of the Corinthian capital; but the shady canopy of the cocoa-nut tree would no doubt form a still more beautiful ornament of architecture, were it possible for art to imitate its feathery fronds and carve their delicate tracery in stone.

Essentially littoral, this noble palm requires an atmosphere damp with the spray and moisture of the sea to acquire its full stateliness of growth, and while along the bleak shores of the Northern Ocean the trees are generally bent landward by the rough sea breeze, and send forth no branches to face its violence, the cocoa, on the contrary, loves to bend over the rolling surf, and to drop its fruits into the tidal wave. Wafted by the winds and currents over the sea, the nuts float along without losing their germinating power, like other seeds which migrate

through the air; and thus, during the lapse of centuries, the cocoa-palm has spread its wide domain from coast to coast throughout the whole extent of the tropical zone. It waves its graceful fronds over the emerald islands of the Pacific, fringes the West Indian shores, and from the Philippines to Madagascar crowns the atolls, or girds the sea-border of the Indian Ocean.

But nowhere is it met with in such abundance as on the coasts of Ceylon, where for miles and miles one continuous grove of palms, pre-eminent for beauty, encircles the "Eden of the eastern wave." Multiplied by planta-

A CEYLONESE COCOA-NUT OIL-MILL.

tions and fostered with assiduous care, the total number in the island cannot be less than twenty millions of full-grown trees; and such is its luxuriance in those favoured districts, where it meets with a rare combination of every advantage essential to its growth—a sandy and pervious soil, a free and genial air, unobstructed solar heat, and abundance of water—that, when in full bearing, it will annually yield as much as a ton weight of nuts—an example of fruitfulness almost unrivalled even in the torrid zone.

No other tree in the world, no other plant cultivated by

man, contributes in *so many ways* to his wants and comfort as this inestimable palm; and it is a curious illustration of its innumerable uses, that some years ago a ship from the Maldive Islands touched at Galle, which was entirely built, rigged, provisioned, and laden with the produce of the cocoa-tree. Besides furnishing their chief food to many tribes on the coast within the torrid zone, the nut contains a valuable oil, which burns without smoke or smell, and serves, when fresh, for culinary purposes. Consisting of a mixture of solid and fluid fat, it congeals at a temperature of 72°; but both its component substances acquire additional value after having been separated by means of the hydraulic press; for while the liquid part furnishes an excellent lamp-oil, the solid fat is manufactured into candles rivalling wax, and at the same time not much dearer than tallow.

COCOA-NUT TREE.

This important product first became known in the European markets at the beginning of the present century, and is now a considerable article of commerce, so that, to meet the constantly increasing demand, new plantations are continually forming on the coasts of Ceylon, Java, and other islands of the Indian Ocean.

The fibrous rind or husk of the nut furnishes coir, a scarcely less important article of trade than the oil itself. It is prepared by being soaked for some months in water, for the purpose of decomposing the interstitial

pith, after which it is beaten to pieces until the fibres have completely separated, and ultimately dried in the sun. Ropes made of coir, though not so neat in appearance as hempen cords, are superior in lightness, and exceed them in durability, particularly if wetted frequently by salt water. From their elasticity and strength they are exceedingly valuable for cables. Besides cordage of every calibre, beds, cushions, carpets, brushes, and nets are manufactured from the filaments of the cocoa-nut husk, while the hard shell is fashioned into drinking-cups, spoons, beads, bottles, and knife-handles. From the spathes of the unopened flowers a delicious "toddy" is drawn, which, drunk at sunrise before fermentation has taken place, acts as a cooling gentle aperient, but in a few hours changes into an intoxicating wine, and may either be distilled into arrack—the only pernicious purpose to which the gifts of the bounteous tree are perverted—or soured into vinegar, or inspissated by boiling into sugar.

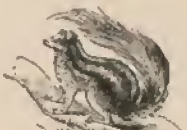
The strong tough foot-stalks of the fronds, which attain a length of from eighteen to twenty feet, are used for fences, for yokes, for carrying burthens on the shoulders, for fishing-rods; the leaflets serve for roofing, for mats, for baskets, for cattle-fodder; and their midribs form good brooms for the decks of ships. Cooked or stewed, the cabbage or cluster of unexpanded leaves is an excellent vegetable, though rarely used, as it necessarily involves the destruction of the tree; and even the tough web or network, which sustains the foot-stalks of the leaves, may be stripped off in large pieces and used for straining.

After the cocoa-nut tree has ceased to bear, its wood serves for many valuable purposes—for the building of ships, bungalows, and huts, for furniture and farming implements of every description.

When we consider the numerous gifts conferred upon mankind by this inestimable tree, we cannot wonder at

the animation with which the islander of the Indian Ocean recounts its "hundred uses," or at the superstition which makes him believe that, by some mysterious sympathy, it pines when beyond the reach of the human voice. But man is not the only being that profits by its gifts, for wherever it grows, its sweet and nutritious nuts are eagerly sought for by many animals. The small black long-clawed cocoa-nut bear, which inhabits Sumatra and Borneo, and surpasses all other members of the Ursine family by its surprising agility in climbing, though far from despising other fruit, yet shows by its name to which side its inclinations chiefly lean. The East Indian Palm-martin and the sprightly Palm-

MALAY BEAR.



PALM SQUIRREL.

squirrel likewise climb the cocoa-palms, and, perforating the soft and unripe nuts, eagerly sip their juice. The ubiquitous rat bites holes into the cocoa-nuts close to their stalk, taking good care not to gnaw the shell where the juice would run out and defraud it of its meal.

Even the birds diminish the produce of the cocoa-nut grove. The Noddy builds his nest between the footstalks, and picks so busily at the blossom, when stormy weather prevents him making any long excursions, that on many islands he is considered as a chief cause of the sterility of numerous palms.

In every zone we find nations in a low degree of civilisation living almost exclusively upon a single animal or

plant. The Laplander has his reindeer, the Esquimaux his seal, the Sandwich Islander his taro-root; and thus also we find the natives of a great part of the Indian Archipelago depending for their subsistence upon the pith of the Sago palm. This tree, which is of such great importance to the indolent Malay, as it almost entirely relieves him of the necessity of labour, grows at first very slowly, and is covered with thorns. As soon, however, as the stem is once formed, it shoots upwards with such rapidity that it speedily attains its full height of ten yards, with a girth of five

or six feet, losing in this stage its thorny accompaniments. The crown is larger and thicker than that of the cocoa-nut tree; the efflorescence colossal, forming an immense bunch,

the branches of which spread out like the arms of a gigantic candelabrum. The tree must, however, be felled before the fruit begins to form, as otherwise the farina would be exhausted, which man destines for his food. When the trunk has been cut and split into convenient pieces, the pith is scooped out, kneaded with water, and strained, to separate the meal from the fibres. One tree will produce from two to four hundredweight of flour, which is mostly consumed on the spot. The Sago palm serves to feed several millions of men, and a great quantity of its produce is exported to Europe.

The Sago palm forms large forests, particularly on swampy ground in Borneo and Sumatra, in the Moluccas and New Guinea. Mushrooms of an excellent flavour frequently cover the mouldering trunks, and in the pith the fat grubs of a large beetle are found, which the natives consider a great delicacy when roasted.

The Gomuti, which almost rivals the cocoa by the multiplicity of its uses, is likewise a native of the Indian Archipelago. On seeing its rough and swarthy rind, and the dull dark-green colour of its fronds, the stranger wonders how the unsightly tree is allowed to grow, but when he has tasted its delicious wine he is astonished not to see it cultivated in greater numbers. Although the outer covering of the fruits has venomous qualities, and is used by the Malays to poison springs, the nuts have a delicate flavour, and the wounded spathe yields an excellent toddy, which, like that of the cocoa and palmyra palms, changes by fermentation into an intoxicating wine, and on being thickened by boiling furnishes a kind of black sugar, much used by the natives of Java and the adjacent isles. The reticulum or fibrous net at the base of the petioles of the leaves constitutes the gumatty, a substance admirably adapted to the manufacture of cables, and extensively used for cordage of every description. The small hard twigs found mixed up with this material are employed as pens, besides forming the shafts of the

sumpits or poisoned arrows of the Malays, and underneath the reticulum is a soft silky material, used as tinder by the Chinese, and applied as oakum in caulking the seams of ships, while from the interior of the trunk a kind of sago is prepared.

The Areca palm bears a great resemblance to the cocoa-nut tree, but is of a still more graceful form, rising to the height of forty or fifty feet, without any inequality on its thin polished stem, which is dark green towards the top, and sustains a crown of feathery foliage, in the midst of which are clustered the astringent nuts, for whose sake it is carefully tended. In the gardens of Ceylon the areca palm is invariably planted near the wells and water-courses, and the betel plant, which immemorial custom has associated to its use, is frequently seen twining round its trunk.

The Palmyra palm, celebrated in verse and prose for the numerous benefits it confers upon mankind, extends from the confines of Arabia to the Moluccas, and is found in every region of Hindostan from the Indus to Siam, the cocoa and the date tree being probably the only palms that enjoy a still wider geographical range. In northern Ceylon, and particularly in the peninsula of Jaffna, it forms extensive forests; and such is its importance in the Southern Dekkan, and along the Coromandel coast, that its fruits afford a compensating resource to seven millions of Hindoos on every occasion of famine or failure of the rice crop. Unlike the cocoa, which gracefully bends under its ponderous crown, the palmyra rises vertically to its full height of seventy or eighty feet, and presents a truly majestic sight when laden with its huge clusters of fruits, each the size of an ostrich's egg, and of a rich brown tint, fading into bright golden at its base. It is not till the tree has attained a mature age that its broad fan-like leaves begin to detach themselves from the stem; they climb from the ground to its summit in spiral convolutions, forming a dense cover for many animals—

ichneumons, squirrels, and monkeys, that resort to it for concealment. In these hiding-places the latter might easily defy the sportsman; but they frequently fall victims to a silly curiosity, for when he is accompanied by his dog, they cannot resist the temptation of watching the animal's movements, and, coming forth to peep, expose themselves to a fatal shot.

The stalks of the decayed leaves remain partly attached to the trunk, affording supports to a profusion of climbing and epiphytic plants, which hide the stem under a brilliant tapestry of flower and verdure.

When the spathes of the fruit-bearing trees exhibit themselves, the toddy-drawer forthwith commences his operations, climbing by the assistance of a loop of flexible jungle-vine, sufficiently wide to admit both his ankles and leave a space between them, thus enabling him to grasp the trunk of the tree with his feet and support himself as he ascends. Having pruned off the stalks of fallen leaves, and cleansed the crown from old fruit-stalks and other superfluous matter, he binds the spathes tightly with thongs to prevent them from further expansion, and descends, after having thoroughly bruised the embryo flowers within to facilitate the exit of the juice. For several succeeding mornings the operation of crushing is repeated, and each day a thin slice is taken off the end of the racemes, to facilitate the exit of the sap and prevent its bursting the spathe. About the eighth morning the sap begins to exude, an event which is notified by the immediate appearance of birds, especially of the "toddy bird," a species of shrike, attracted by the flies and other insects which come to feed on the luscious juice of the palm.

The crows, ever on the alert when any unusual movement is in progress, keep up a constant chattering and wrangling; and about this time the palymra becomes the resort of the palm-martin and the graceful genet, which frequent the trees in quest of birds. On ascertaining that the

first flow of the sap has taken place, the toddy-drawer again trims the wounded spathe, and inserts its extremity in an earthen chatty to collect the juice. Morning and evening these vessels are emptied, and for four or five months the palmyra will continue to pour forth its sap at the rate of three quarts a day. But once in every three years the operation is omitted, and the fruit is allowed to form, without which the natives assert that the tree would pine and die. The hard and durable wood of the palmyra, which, consisting like the other palms of straight horny fibres, can easily be split into lengths, is said to resist the attacks of the termites, and is used universally in Ceylon and India for roofing and similar purposes. The leaves, finally, are employed for roofs, fences, mats, baskets, fans, and paper.

The Talpot or Talipot of the Singalese rises to the height of one hundred feet, and expands into a crown of enormous fan-like leaves, each of which when laid upon the ground will form a semicircle of sixteen feet in diameter, and cover an area of nearly two hundred superficial feet. These gigantic foliaceous expansions are employed by the Singalese for many purposes. They form excellent fans, umbrellas, or portable tents, one leaf being sufficient to shelter seven or eight persons; but their most interesting use is for the manufacture of a kind of paper, so durable as to resist for many ages the ravages of time. The leaves are taken, whilst still tender, cut into strips, boiled in spring water, dried, and finally smoothed and polished, so as to enable them to be written on with a style, the furrow made by the pressure of the sharp point being rendered visible by the application of charcoal ground with a fragrant oil. The leaves of the palmyra similarly prepared are used for ordinary purposes; but valuable documents are written to-day, as they have been for ages past, on strips of the talipot.

The currents of the sea sometimes drift to the shores of the Maldives, and even to the south and west coasts of

Java and Sumatra, a nut exceeding the ordinary cocoa-nut many times in size, with the additional peculiarity of presenting a double, or sometimes even a triple form, as if two separate fruits had grown together. These mysterious gifts of the ocean, the product of an unknown tree, were believed to be of submarine origin, and to have the wonderful power of neutralising poisons. On the Maldive Islands they were the exclusive property of the king, who either sold them at an exorbitant price, or made presents of them to other potentates. At length, about a hundred years ago, the French traveller Sonnerat discovered in the uninhabited Seychelles the home of the *Lodoicea Sechellarum*, which, like the cocoa, grows on the strand of that small and secluded group, and drops its large nuts into the sea, which then carries them along to the east. The trunk of the Lodoicea rises to the height of forty or fifty feet, and bears a crown of immense fan-like leaves, upwards of twenty feet long and fifteen broad, with foot-stalks seven feet long. As soon as the real origin of the wonderful drift nuts became known, they of course immediately lost their imaginary value, to the great vexation, no doubt, of the Maldive potentate, who thus found himself deprived of the best part of his scanty revenues.

The Ratans, a most singular genus of creeping plants, luxuriate in the forests of tropical Asia. Sometimes their slender stems, armed with dreadful spines at every joint, climb to the summit of the highest tree; sometimes they trail along the ground; and while it is impossible to find out their roots among the intricate tangles of the matted underwood, their palm-like tops expand in the sunshine, the emblems of successful parasitism. They frequently render the forest so impervious, that the distinguished naturalist Junghuhn, while exploring the woods of Java, was obliged to be accompanied by a vanguard of eight men, one-half of whom were busy cutting the ratans with their hatchets, while the others removed the stems. These

rope-like plants frequently grow to the incredible length of four or even six hundred feet, often consisting of a couple of hundred joints two or three feet long, and bearing at every knot a feathery leaf, armed with thorns on its lower surface. Though often extremely disagreeable to the traveller, yet they are far from being useless. The natives of Java and the other islands of the Eastern Archipelago cut the cane into fine slips, which they plait into beautiful mats, manufacture into strong and neat baskets, or twist into cordage of such strength and durability that it is even used with success in the formation of bridges across the water-courses and ravines.

On turning from the Indian Ocean to Arabia and Africa, we enter upon a new world of palms, several of which are no less valuable than the cocoa-nut or the palmyra.

The date-tree, sung from time immemorial by the poets of the East, is as indispensable as the camel to the inhabitants of the wastes of North Africa and Arabia, and, next to the "ship of the desert," the devout Mussulman esteems it the chief gift of Allah. Few palms have a wider range, for it extends from the Persian Gulf to the borders of the Atlantic, and flourishes from the twelfth to the thirty-seventh degree of northern latitude. Groves of dates adorn the coasts of Valencia in Spain; near Genoa its plantations afford leaves for the celebration of Palm Sunday; and in the gardens of southern France a date-tree is sometimes seen growing among the oranges and olives. But it never bears fruit on these northern limits of its empire, and thrives best in the oases on the borders of the sandy desert.

The date-palm is propagated by shoots, and the female tree bears its first fruits after four or five years. It is said to attain to an age of two centuries, but is rarely left standing longer than eighty years, when the trunk is tapped in spring, producing a kind of toddy, which is consumed in great quantities in "Biledulgerid," or the

long line of oases situated to the south of the Atlas, and pre-eminently called the "land of dates."

It is not to be wondered at that the tribes of the desert so highly value a tree which, when in full growth, bears as much as two hundredweight of dates, and by enabling a family to live on the produce of a small spot of ground, extends as it were the bounds of the green islands of the desert. It is considered criminal to fell it while still in its vigour, and both the Bible and the Koran forbid the warriors of the true God to apply the axe to the date-trees of an enemy.

DATE-TREE.

In Arabia the date palms of El Medinah are celebrated above all others for the excellence of their fruit, which was the favourite food of the Prophet—a circumstance investing them in the eyes of all true believers with a certain degree of sanctity. Their stately columnar stems here seem higher than in other lands, and their lower fronds, which in Egypt are lopped off about Christmas time to increase the flavour of the fruit, are allowed to remain unmutilated. One of the reasons for the excellence of Medinah dates is the quantity of water

they obtain. Each garden or field has its well; and, even in the hottest weather, the water-wheel floods the soil every third day. The date-tree can live in dry and barren spots; but it loves the beds of streams, and places where moisture is procurable. Books enumerate 139 varieties of date-trees. Of these between sixty and seventy are well known, and each is distinguished as usual, among Arabs, by its peculiar name.

The best kind, El Shelebi, is packed in skins or in flat round boxes covered with paper, and sent as gifts to the remotest parts of the Moslem world, for the pilgrim to the Holy Cities would be badly received by the women of his family if he did not present them on his return with a few boxes of this fruit. Imagination has also done its best to invest the better kinds of dates with a legendary interest. Thus, the Ajwah is eaten but not sold, because a tradition of the Prophet declares that whoso breaketh his fast every day with six or seven of the Ajwah date need fear neither poison nor magic. The third kind, El Hilwah, also a large date, derives its name from its exceeding sweetness. Of this tree the Moslems relate that the Prophet planted a stone, which in a few minutes grew up and bore fruit. The Wahski on one occasion bent its head and salaamed to Mahomet as he ate its fruit, for which reason even now its lofty tuft turns earthwards. The Sayhani is so called because, when the founder of El Islam, holding Ali's hand, happened to pass beneath it, it cried, "This is Mahomet the Prince of the Prophets, and this is Ali the Prince of the Pious." Of course the descendants of this intelligent tree hold a high rank in the kingdom of palms.

The citizens of Medinah delight in speaking of dates as an Irishman does of potatoes—with a kind of familiar fondness: they eat them for medicine as well as food. The fruit is ripe about the middle of May, and the gathering of it forms the Arab's vintage. The people make merry the more readily because their favourite

fruit is liable to a variety of accidents; droughts injure the tree, locusts destroy the produce, and thus the date crop, like most productions which men are imprudent enough to adopt singly as the staff of life, is subject to failure.

Towards the equator the date-tree disappears, while the Doum, distinguished from most other palms by its branching trunk, each branch being surmounted by a tuft of large stiff flabelliform leaves, assumes a conspicuous place in the landscape. Its fruits, which are of the size of a small apple, and covered with a tough yellow lustrous rind, have a sugary taste, and serve for the preparation of sherbet. The old leaf-stalks with their thorns and sheathes, which remain attached to the trunk, render the task of climbing it next to impossible. The chief seat of this beautiful palm are the banks of the Nile, in the region of the cataracts. In Kordofan the Delebl palms form large clumps with tamarinds, cassias, adansonias, and various mimosas. Straight as an arrow and perfectly smooth-rinded, this magnificent tree rises to the height of a hundred feet, bearing large fan-like leaves, attached to foot-stalks ten feet long, and armed with mighty thorns. From ten to twenty large bunches of nuts, as big as a man's head, hang beneath the fronds, but unfortunately these fine-looking fruits disappoint the taste.

Thus various forms of palms flourish along the banks of the Nile, but in general Africa has a smaller variety of these trees to boast of than either Asia or America. On the other hand, the forests of Brazil have no palms at all comparable in commercial importance to the Cocos butyracea and the Elæis guineensis, the oil-teeming fruit-trees of tropical West Africa. The productiveness of the Elæis may be inferred from its bearing clusters of from 600 to 800 nuts, larger than a pigeon's egg, and so full of oil that it may be pressed out with the fingers. As long as the slave trade reigned along the coast of Guinea,

these vegetable treasures remained unnoticed; but since England began to raise her voice against this infamous traffic, they have become the object of an immense and constantly increasing commerce.

OIL PALM.

The American palms are pre-eminent in beauty, and many of them rank highly in the list of useful plants.

The leaves of the Carnauba furnish an abundance of

wax. The lowlands of Guiana, between 3° and 7° N. lat., are frequently covered with this social fan-palm, whose full-grown fronds, when cut and dried in the shade, cover themselves with light-coloured scales. These melt in a warmth of 206° F., and then form a straw-coloured liquid, which again concretes on cooling. It burns with as clear and bright a flame as the best bees'-wax, and will no doubt become a considerable article of trade, when once the spirit of industry awakens in those rich but thinly-populated regions. Like many other palms, the Carnauba does not confine her gifts to one single product. The boiled fruit is edible, and the pith of the young stems affords a nutritious fecula. Roofs thatched with its leaves resist for many years the effects of the weather, and its wood may be used for a variety of purposes.

A kind of wax, exuding from the rings of its trunk, is also produced by the beautiful *Ceroxylon andicola*, which grows on the slopes of the Andes, up to an elevation of eight thousand feet. Even the lofty vault of the Crystal Palace would be unable to span this majestic palm, which, according to Humboldt's accurate measurement, towers one hundred and eighty feet above the ground, and bears a tuft of fronds each twenty-four feet long.

The cabbage-palm of the Antilles almost rivals the mountain Ceroxylon in magnificence of growth, as its stem, which near to its base is about seven feet in circumference, ascends straight and tapering to the height of 130 feet. Its lofty fronds, moved by the gentlest breeze, are an object of beauty which can hardly be conceived by those who are unused to the magnificent vegetation of a tropical sun. Within the leaves which surround the top of the trunk, the cabbage, composed of longitudinal flakes, like ribands, but so compact as to form a crisp and solid body, lies concealed. It is white, about two or three feet long, as thick as a man's arm, and perfectly cylindrical. When eaten raw, it resembles the almond in

flavour, but is more tender and delicious. It is usually cut into pieces, boiled, and served as an auxiliary vegetable with meat. To obtain this small portion, borne on the pinnacle of the tree, and hidden from the eye of man, the axe is applied to the stately trunk, and its towering pride laid low.

Besides its cabbage, the Oreodoxa furnishes another great delicacy to the table. After the removal of the heart, a kind of black-beetle deposits its egg in the cavity, from which fat grubs are developed, growing to the size and thickness of a man's thumb. These, though disgusting in appearance, when fried in a pan, with a very little butter and salt, have a taste which savours of all the spices of India.

Both the Oreodoxa and the Ceroxylon are far surpassed in height by the Californian firs and the Eucalypti of Australia, but no other trees rise so proudly in the air on shafts comparatively so slender. While the enormous trunks of the Sequoias and Wellingtonias remind one of the massy pillars of our old Gothic churches, the graceful palms recall to our memory the slender Ionic or Corinthian columns which adorn the masterpieces of Grecian architecture.

The oil of the Corozo is usually burnt in the houses and churches of Carthagena and New Granada; and the *Oenocarpus disticha* is cultivated in Brazil, as it furnishes an excellent oil for culinary purposes. The Pirijao is planted round the huts of the Indians, and replaces in some districts the Mauritia as the tree of life. The Piaçava, whose stone-hard dark-brown nuts are manufactured into rosaries by the inhabitants of Villa Nova de Olivenza, is far more important, on account of its fibres, which, unknown a few years ago, are now imported into England in large quantities, where they serve for making brooms; and the amazingly hard nuts of the Cabeza di Negro, rivalling ivory in whiteness, solidity, and beauty, are extensively used by our turners for similar purposes.

Besides the height of the shaft, the position of the leaves serves chiefly to impart a more or less majestic character to the palms: those with drooping leaves being far less stately than those whose fronds shoot more or less upwards to the skies. Nothing can exceed the elegance of the Jagua palm, which along with the splendid Cucurito adorns the granite rocks in the rapids of the Orinoco at Atures. The fronds, which are but few in number, rise almost perpendicularly sixteen feet high, from the top of the lofty columnar shaft, and their feathery leaflets of a thin and grass-like texture play lightly round the tall leaf-stalks, slowly bending in the breeze. In the palms with a feathery foliage, the leaf-stalks rise either immediately from a brown ligneous trunk (cocoa-nut, date), or, as in the beautiful Palma Real of the Havana, from a smooth, slender, and grass-green shaft, placed like an additional column upon the dark-coloured trunk. In the fan-palms, the crown frequently rests upon a layer of dried leaves, which impart a severe character to the tree.

YRIARTEA VENTRICOSA.

The form of the trunk also varies greatly; sometimes it is extremely short, as in *Chamærops humilis;* and sometimes, as in the ratans, assumes a bush-rope appearance. In some species it is smooth and unarmed, in others rugged or bristling with spines. In the American Yriarteas it rests upon a number of roots rising above the ground. Thus the *Y. exorrhiza* frequently stands upon a dozen or more supports, embracing a circumference of twenty feet; and the *Y. ventricosa* is still more curious, as the spindle-shaped trunk, which at both ends is scarce a foot thick,

swells in the middle to a threefold diameter, and, from its convenient form, is frequently used by the Indians for the construction of their canoes.

The form and colour of the fruits are also extremely various. What a difference between the large double nuts of the Lodoicea and the date—between the egg-shaped fruits of the Mauritia, whose scaly rind gives them the appearance of fir-cones, and the gold and purple peaches of the Pirijao, hanging in colossal clusters of sixty or eighty from the summit of the majestic trunk.

ARECA PALM.

The family of the ferns is spread over the whole earth, but chiefly abounds in the vicinity of the tropics. Most of these plants love the shady and damp ground of the primitive forest, others attach themselves with their roots to rocks or trees. In the equatorial regions several of their species attain arboreal dimensions, with stems from twelve to thirty feet high and extensive crowns of large fronds, imitating the stately tufts of palms. But they do not possess the noble elegance of these kings of the vegetable world; and their stems, of a sombre brown colour,

are rather an image of decrepit old age than of the youthful vigour which we admire in the growth of the palms. They do not seem to love the highest temperature of the equator, but rather the milder climate of the mountainous regions near the tropics. Here they frequently stand singly in the thicket, particularly where a waterfall impregnates the air with moisture, or on the borders of sources and ponds. No parasites settle upon them, no bird constructs its nest among their fronds, no quadruped burrows in the mouldy ground where they take root, even the ants disdain to build on their sapless stems, and thus they give the impression of friendless aliens in a convivial group.

## CHAPTER IV.

### *THE CHIEF ESCULENT PLANTS OF THE TORRID ZONE.*

Rice—Various aspect of the Rice-fields at different seasons—The Rice-Bird—Maize—First imported from America by Columbus—Its enormous productiveness—Its wide zone of cultivation—Millet, Dhourra—The Bread-Fruit Tree—The Bananas—Their ancient cultivation—Avaca or Manilla Hemp—Humboldt's remarks on the Banana—The Traveller's Tree of Madagascar—The Cassava Root—Tapioca—Yams—Batatas—Arrowroot—Taro—Tropical Fruit-Trees—The Chirimoya—The Litchi—The Mangosteen—The Mango.

Of all the cereals there is none that affords food to so vast a multitude as the rice-plant, on whose grains from time immemorial the countless millions of south-eastern Asia chiefly subsist. From its primitive seat, on the Ganges, or the Sikiang, its cultivation has gradually spread not only over the whole tropical zone, but even far beyond its bounds, as it thrives both in the swamps of South Carolina and in the rich alluvial plains of the Danube and the Po.

Along the low river banks, in the delta-lands which the rains of the tropics annually change into a boundless lake, or where, by artificial embankments, the waters of the mountain streams have been collected into tanks for irrigation, the rice-plant attains its utmost luxuriance of growth, and but rarely deceives the hopes of the husbandmen.

The aspect of the lowland rice-fields of India and its isles is very different at various seasons of the year.

Where, in Java, for instance, you see to-day long-legged herons gravely stalking over the inundated plain partitioned by small dykes, or a yoke of indolent buffaloes slowly wading through the mud, you will three or four months later be charmed by the view of a gracefully undulating corn-field, bearing a great resemblance to our indigenous barley. Cords, to which scarecrows are attached, traverse the field in every direction, and converge to a small watch-house erected on high poles. Here the attentive villager sits, like a spider in the centre of its web, and by pulling the cords, puts them from time to time into motion, whenever the wind is unwilling to undertake the office. Then the grotesque and noisy figures begin to rustle and to caper, and whole flocks of the neat little rice-bird or Java sparrow rise on the wing, and hurry off with all the haste of guilty fright. After another month has elapsed, and the waters have long since evaporated or been withdrawn, the harvest takes place, and the rice-fields are enlivened by a motley crowd, for all the villagers, old and young, are busy reaping the golden ears.

JAVA SPARROW.

The rice-fields offer a peculiarly charming picture when, as in the mountain valleys of Ceylon, they rise in terraces along the slopes. "Selecting an angular recess where two hills converge, the Kandyans construct a series of terraces, raised stage above stage, and retiring as they ascend along the slope of the acclivity, up which they are carried as high as the soil extends. Each terrace is furnished with a low ledge in front, behind which the requisite depth of water is retained during the germination of the seed, and what is superfluous is permitted to trickle down to the one below it. In order to carry on this peculiar cultivation the streams are led along the level of the hills, often from a distance of many miles

with a skill and perseverance for which the natives of these mountains have attained a great renown."

Maize is no less important to the rapidly-growing nations of America than the rice-plant to the followers of Buddha or of Brama. The time when the cereals of the Old World were first transplanted from their unknown Asiatic homes is, and ever will be, hidden in legendary obscurity; but the epoch when maize was for the first time seen and tasted by Europeans lies before us in the broad daylight of authentic history. For, when Columbus

THE BANANA AND THE PLANTAIN.

discovered Cuba, in the year 1492, he found maize cultivated by the Indians, and was equally pleased with the taste of the roasted grains and astonished at their size. In the following year, when he made his triumphant entry into Barcelona, and presented his royal patrons—Ferdinand and Isabella—with specimens of the various productions of the New World, the maize-spikes he laid down before their throne, though but little noticed, were in reality of far greater importance than the heaps of gold which were so falsely deemed to be the richest prizes of

his grand discovery. In this manner maize was first conveyed from the New World to Spain, whence its cultivation gradually extended over the tropical and temperate zones of the eastern hemisphere. Round the whole basin of the Mediterranean, maize has found a new home, and its grain now nourishes the Lombard and the Hungarian, as it does the Egyptian fellah or the Syrian peasant.

While our northern cereals only produce a pleasing effect when covering extensive fields, but are individually too insignificant to claim attention, the maize-plant almost reminds the spectator of the lofty bamboos of the tropical world. Even in our gardens it rises above a man's height, and in warmer countries not seldom attains the gigantic stature of fourteen feet. Ensiform, dark green, lustrous leaves, somewhat resembling those of the large oarweeds of the northern seas, spring alternately from every joint of this cereal, streaming like pennants and sharply rustling in the wind. The top produces a bunch of male flowers of various colours, which is called the *tassel*. Each plant likewise bears three or more spikes or ears, proceeding from the stem, at various distances from the ground, and closely enveloped by several thin leaves, forming a sheath, or *husk*. They consist of a cylindrical substance of the nature of pith, which is called the *cobb*, and over the entire surface of which the seeds are ranged and fixed, in eight or more straight rows. Each of these has generally as many as thirty or more seeds, and each seed weighs at least as much as five or six grains of wheat or barley. Surely a cereal like this deserves beyond all others to symbolise abundance, and, had it been known to the Greeks, it would beyond all doubt have figured conspicuously in the teeming horn of Amalthea.

In light sandy soils, under the scorching rays of the sun, and in situations where sufficient moisture cannot be obtained for the production of rice, numerous varieties of millet are successfully cultivated in many tropical countries—in India, Arabia, the West Indies, in Central

Africa, and in Nubia, where it is grown almost to the exclusion of every other esculent plant. Though the seeds are by much the smallest of any of the cereal plants, the number borne upon each stalk is so great as to counterbalance this disadvantage, and to render the cultivation of millet as productive as that of any other grain.

The bread-fruit tree is the great gift of Providence to the fairest isles of Polynesia. No fruit or forest tree in the north of Europe, with the exception of the oak or linden, is its equal in regularity of growth and comeliness of shape; it far surpasses the wild chestnut, which somewhat resembles it in appearance. Its large oblong leaves are deeply lobed like those of the fig-tree, which they resemble not only in colour and consistence, but also in exuding a milky juice when broken. About the time when the sun, advancing towards the Tropic of Capricorn, announces to the Tahitians that summer is approaching, it begins to produce new leaves and young fruits, which commence ripening in October, and may be plucked about eight months long in luxuriant succession. The fruit is about the size and shape of a new-born infant's head, with a thin skin, and a core about as big as the handle of a small knife. The edible part, which lies between the skin and the core, and is as white as snow, must be roasted before it is eaten; its taste is insipid, with a slight sweetness, somewhat resembling that of the crumb of wheaten bread mixed with boiled potatoes. When the season draws to an end, the last fruits are laid in heaps, and closely covered with leaves. In this state they undergo a fermentation and become disagreeably sweet: the core is then taken out entire, which is done by gently pulling out the stalk, and the rest of the fruit is thrown into a hole, where it undergoes a second fermentation, and becomes sour, after which it will suffer no change for many months. It is taken out of the hole as it is wanted for use, and, being made into balls, it is wrapped up in leaves and baked.

To procure this principal article of their food costs the

fortunate South Sea Islanders no more trouble than plucking and preparing it in the manner above described; for, though the tree which produces it does not grow spontaneously, yet, if a man plants but ten of them in his lifetime, which he may do in about an hour, he will, as Cook remarks, "as completely fulfil his duty to his own and future generations, as the native of our less genial climate by ploughing in the cold of winter and reaping in the summer's heat as often as the seasons return."

Dampier (1688) is the first English writer that mentions the bread-fruit tree, which he found growing in the Ladrones, and a few years later Lord Anson enjoyed its fruits at Tinian, where they contributed to save the lives of his emaciated and scurvy-stricken followers. It continued, however, to remain unnoticed in Europe, until the voyages of Wallis and Cook attracted the attention of the whole civilised world to the fortunate islands, whose inhabitants, instead of gaining their bread by the sweat of their brow, plucked it ready formed from the teeming branches of their groves.

But the wonderful luxuriance of tropical vegetation is perhaps nowhere more conspicuous and surprising than in the magnificent Musaceæ, the banana, and the plantain, whose fruits most probably nourished mankind long before the gifts of Ceres became known. A succulent shaft or stem, rising to the height of fifteen or twenty feet, and frequently two feet in diameter, is formed of the sheath-like leaf-stalks rolled one over the other, and terminating in enormous light-green and glossy blades, ten feet long and two feet broad, of so delicate a tissue that the slightest wind suffices to tear them transversely as far as the middle rib. A stout foot-stalk arising from the centre of the leaves, and reclining over one side of the trunk, supports numerous clusters of flowers, and subsequently a great weight of several hundred fruits about the size and shape of full-grown cucumbers. On seeing the stately plant, one might suppose that many years had

been required for its growth; and yet only eight or ten months were necessary for its full development.

Each shaft produces its fruit but once, when it withers and dies; but new shoots spring forth from the root, and, before the year has elapsed, unfold themselves with the same luxuriance. Thus, without any other labour than now and then weeding the field, fruit follows upon fruit, and harvest upon harvest. A single bunch of bananas often weighs from sixty to seventy pounds, and Humboldt has calculated that thirty-three pounds of wheat and ninety-nine pounds of potatoes require the same space of ground to grow upon as will produce 4000 pounds of bananas.

This prodigality of Nature, seemingly so favourable to the human race, is however attended with great disadvantages; for where the life of man is rendered too easy, his best powers remain dormant, and he almost sinks to the level of the plant which affords him subsistence without labour. Exertion awakens our faculties as it increases our enjoyments, and well may we rejoice that wheat and not the banana ripens in our fields.

As the seeds of the cultivated plantain and banana never or very rarely come to maturity, they can only be propagated by suckers. "In both hemispheres," says Humboldt, "as far as tradition or history reaches, we find plantains cultivated in the tropical zone. It is as certain that African slaves have introduced, in the course of centuries, varieties of the banana into America, as that before the discovery of Columbus the plantain was cultivated by the aboriginal Indians.

"These plants are the ornaments of humid countries. Like the farinaceous cereals of the north, they accompany man from the first infancy of his civilisation. Jewish traditions place their original home on the banks of the Euphrates; others, with greater probability, at the foot of the Himalayas. According to the Greek mythology, the plains of Enna were the fortunate birthplace of the

cereals; but while the monotonous fields of the latter add but little to the beauty of the northern regions, the tropical husbandman multiplies in the banana one of the noblest forms of vegetable life."

The Musaceæ are not only useful to man by their mealy, wholesome, and agreeable fruits, but also by the fibres of their long leaf-stalks. Some species furnish filaments for the finest muslin, and the coarse fibres of the *Musa textilis*, known in trade under the name of Manilla hemp, serve for the preparation of very durable cordage.

To the same family of plants belongs also the traveller tree of Madagascar, one of those wonderful sources of refreshment which Nature has provided for the thirsty wanderer in the wilderness. The foot-stalks of the elliptical, alternate leaves embrace the trunk with broad sheathes, in which the dew trickling from their surface is collected. Thus the ravenala, the hollow baobab, the pitcher-plant, and the juicy cactuses, all answer a similar purpose, and it is impossible to say which of them is most to be admired.

Life and death are strangely blended in the Cassava or Mandioca root; the juice a rapidly destructive poison, the meal a nutritious and agreeable food, which, in tropical America, and chiefly in Brazil, forms a great part of the people's sustenance. The height to which the cassava attains varies from four to six feet: it rises by a slender, woody, knotted stalk, furnished with alternate palmated leaves, and springs from a woody root, the slender collateral fibres of which swell into those farinaceous parsnip-like masses, for which alone the plant is cultivated. It requires a dry soil, and is not found at a greater elevation than 2000 feet above the level of the sea. It is propagated by cuttings, which very quickly take root, and in about eight months from the time of their being planted, the tubers will generally be in a fit state to be collected; they may, however, be left in the ground

for many months without sustaining any injury. The usual mode of preparing the cassava is to grind the roots after peeling off the dark-coloured rind, to draw out the poisonous juice, and finally to bake the meal into thin cakes on a hot iron hearth. Fortunately the deleterious principle is so volatile as to be entirely dissipated by exposure to heat; for when the root has been cut into small pieces, and exposed during some hours to the direct rays of the sun, cattle may be fed on it with perfect safety. If the recently extracted juice be drunk by cattle or poultry, the animals soon die in convulsions; but if this same liquid is boiled with meat and seasoned, it forms a wholesome and nutritious soup. The Sweet Cassava, though very similar to the Manihot or bitter variety, and wholly innocuous, is far less extensively cultivated.

The yam-roots, so frequently mentioned in narratives of travel through the tropical regions, are the produce of two climbing plants—the Dioscorea sativa and alata—with tender stems of from eighteen to twenty feet in length, and smooth sharp-pointed leaves on long foot-stalks, from the base of which arise spikes of small flowers. The roots of the D. sativa are flat and palmated, about a foot in breadth, white within and externally of a dark brown colour; those of the D. alata are still larger, being frequently about three feet long, and weighing about thirty pounds. Both kinds are cultivated like the common potato, which they resemble in taste, though of a closer texture.

The Dioscoreæ are natives of South Asia, and are supposed to have been thence transplanted to the West Indies, as they have never been found growing wild in any part of America; while in the island of Ceylon, and on the coast of Malabar, they flourish in the woods with spontaneous and luxurious growth.

The Spanish or Sweet Potato, commonly cultivated in the tropical climates both of the eastern and the western hemispheres, is an herbaceous perennial, which sends out

many trailing stalks, extending six or eight feet every way, and putting forth at each joint roots which in a genial climate grow to be very large tubers, so that from a single plant forty or fifty large roots are produced. The leaves are angular and stand on long petioles, the flowers are purple. The batata is propagated by laying down the young shoots in the spring; indeed in its native climate it multiplies almost spontaneously, for if the branches of roots that have been pulled up are suffered to remain on the ground, and a shower of rain falls soon after, their vegetation will recommence.

Arrowroot is chiefly obtained from two different plants —the Marantha arundinacea and the Tacca pinnatifida. The former, a native of South America, is an herbaceous perennial, and is propagated by parting the roots. It rises to the height of two or three feet, has broad pointed leaves, and is crowned by a spike of small white flowers. It is much cultivated, both for domestic use and for exportation, in the West Indies, and in some parts of Hindostan. The arrowroot is obtained by first pounding the long stalky roots in a large wooden mortar, and pouring a quantity of water over them. After the whole has been agitated for some time, the starch, separated from the fibres, collects at the bottom of the vessel, and, having been cleansed by repeated washing, is dried in the sun.

The Tacca pinnatifida, likewise an herbaceous plant with pinnated leaves, an umbelliform blossom, and large potato-like roots, is scattered over most of the South Sea Islands. It is not cultivated in the Hawaiian group, but found growing wild in abundance in the more elevated districts, where it is satisfied with the most meagre soil, and sprouts forth among the lava blocks of those volcanic islands. Arrowroot is prepared from this plant in the same manner as from the West Indian Marantha, but, as the improvident Polynesians only think of digging it out of the earth, and never give themselves the trouble of

replanting the small and useless tubers, its quantity has very much diminished.

The Caladium esculentum, an aquatic plant, furnishes the large Taro roots which, boiled to a thick paste, form the chief food of the Sandwich Islanders, and are extensively cultivated in many other groups of the South Seas. It grows like rice on a marshy ground, the large sagittated leaves rise on high foot-stalks, immediately springing from the root, and are likewise very agreeable to the taste, but are more seldom eaten, as they are used for propagation. Severed from the root, they merely require to be planted in the mud to produce after six months a new harvest of roots. The growth is so abundant that 1500 persons can live upon the produce of a single square mile, so that supposing the United Kingdom to be one vast taro-field, its surface would be able to nourish about two thousand millions of souls.

As there is a mountain-rice which thrives without artificial irrigation, there is also a mountain-taro which resembles the former in general appearance, but prefers a more dry and elevated soil. Although the plant grows wild both in the Society and Marquesas Islands, yet Pitcairn's Island was the only spot where Mr. Bennett saw it cultivated.

But the possession of a plant which furnishes so much food with so little labour can hardly be considered as a benefit for the Sandwich Islanders, whose natural indolence is too much encouraged by the abundance it creates. The Hawaiian constantly sees before his eyes the coffee-groves and sugar-plantations, the cotton and indigo fields, which, cultivated by Chinese coolies, amply reward the enterprise of the European and American settlers in his native land, and yet he saunters by, too indolent even to stretch out his hand and gather the berries from the trees.

It may easily be imagined that the tropical sun, which distils so many costly juices and fiery spices in indescrib-

able multiplicity and abundance, must also produce a variety of fruits. But man has as yet done but little to improve by care and art these gifts of Nature, and, with rare exceptions, the delicious flavour for which our native fruits are indebted to centuries of cultivation is found wanting in those of the torrid zone. In our gardens Pomona appears in the refined garb of civilisation, while in the tropics she still shows herself as a savage beauty, requiring the aid of culture for the full development of her attractions.

Yet there are exceptions to the rule, and among others the Peruvian Chirimoya is vaunted by travellers in such terms of admiration that it can hardly be inferior to, and probably surpasses, the most exquisite fruits of European growth. Hänke calls it, in one of his letters, a masterpiece of Nature, and Tschudi says that its taste is quite incomparable. It grows to perfection at Huanuco, where it attains a weight of from fourteen to sixteen pounds. The fruit is generally heart-shaped, with the broad base attached to the branch. The rind is green, covered with small tubercles and scales, and encloses a snow-white, juicy pulp, with many black kernels. Both the fruit and the blossoms exhale a delightful odour. The tree is about twenty feet high, and has a broad dull green crown.

In the eastern hemisphere, the litchi, the mangosteen, and the mango enjoy the highest reputation.

The Litchi, a small insignificant tree, with lanceolate leaves, and small greenish-white flowers, is a native of China and Cochin-China, but its cultivation has spread over the East and the West Indies. The plum-like scarlet fruit is generally eaten by the Chinese to their tea, but it is also dried in ovens and exported. In order to obtain the fruit in perfection, for the use of the Imperial Court, the trees, as soon as they blossom, are conveyed from Canton to Pekin on rafts, at a very great trouble and expense, so that the plums may just be ripe on their arrival in the northern capital.

The beautiful Mangosteen, a native of the Moluccas, and thence transplanted to Java, Siam, the Philippines, and Ceylon, resembles at a distance the citron-tree, and bears large flowers like roses. The dark brown capsular fruit, about the size of a small apple, is described as of unequalled flavour—juicy and aromatic, like a mixture of strawberries, raspberries, grapes, and oranges. It is said that the patient who has lost an appetite for everything else still relishes the mangosteen, and that the case is perfectly hopeless when he refuses even this.

The stately Mango bears beautiful girandoles of flowers, followed by large plum-like fruits, of which, however, but four or five ripen on each branch. More than forty varieties are grown at Kew, the finest of which are reserved for the Queen's table. From Ceylon, its original seat, the mango has been transplanted far and wide over the torrid zone.

MANGOSTEEN.

## CHAPTER V.

### *SUGAR, COFFEE, CACAO, COCA.*

Progress of the Sugar Cane throughout the Tropical Zone—The Tahitian Sugar Cane—The enemies of the Sugar Cane—The Sugar-harvest—The Coffee Tree—Its cultivation and enemies—The Cacao Tree and the Vanilla—The Cocoa Plant—Wonderful strengthening effects of Cocoa, and fatal consequences of its abuse.

SUGAR is undoubtedly one of the most valuable products of the vegetable world, and may be said with truth to be only surpassed in importance by the nourishing meal of the cereals, or the textile fibres of the cotton-plant. Our garden fruit owes its agreeable taste to the sugar which the ripening sun develops in its juices. The sap of many a plant — the palm, the birch, the maple, the American agave—is rendered useful to man by the sugar it contains. It is this substance which imparts sweetness to the honey gathered by bees from flowers, and, after undergoing fermentation, changes the juice of the grape into delicious wine.

But although sugar is of almost universal occurrence throughout the vegetable world, yet few plants contain it in such abundance as to render its extraction profitable; and even the beet-root requires high protective duties to be able to compete with the tropical sugar-cane, a member of the extensive family of the grasses. The original home of this plant—for which, doubtless, the lively fancy of the ancient Greeks, had they been better acquainted with it, would have invented a peculiar god, as for the vine or the cereals—was most probably south-eastern Asia, where

the Chinese seem to have been the first people that learnt the art to multiply it by culture.

CUTTING THE SUGAR CANE.

From China its cultivation spread westwards to India and Arabia, and the conquests of Alexander the Great

first made Europe acquainted with the sweet-juiced cane, while sugar itself had long before been imported by the Phœnicians as a rare production of the Eastern world.

During the dark ages which followed the fall of the Roman Empire, all previous knowledge of the Oriental sugar-plant became lost, until the Crusades, and, still more, the revival of commerce in Venice and Genoa re-opened the ancient intercourse between the Eastern and the Western world. From Egypt, where the cultivation of the sugar-cane had meanwhile been introduced, it now extended to the Morea, to Rhodes, and Malta; and at the beginning of the twelfth century we find it growing in Italy, on the sultry plains at the foot of Mount Etna.

After the discovery of Madeira by the Portuguese, in the year 1419, the first colonists added the vine of Cyprus and the Sicilian sugar-cane to the indigenous productions of that lovely island; and both succeeded so well as to become, after a few years, the objects of a lively trade with the mother country.

Yet, in spite of this extension of its culture, the importance of sugar as an article of international trade continued to be very limited, until the discovery of *tropical* America* by Columbus opened a new world to commerce. As early as the year 1506 the sugar-cane was transplanted from the Canary Islands to Hispaniola, where its culture, favoured by the fertility of a virgin soil and the heat of a tropical sun, was soon found to be so profitable that it became the chief occupation of the European settlers. The Portuguese, in their turn, conveyed the cane to Brazil; from Hispaniola it spread over the other West Indian Islands; thence wandered to the Spanish main, and followed Pedrarias and Pizarro to the shores of the Pacific. Unfortunately, a dark shade obscures its triumphal march, as its cultivation was the chief cause which entailed the curse of negro slavery on some of the fairest regions of the globe.

* The northern part of the new continent had been visited and colonised centuries before by the mariners of Iceland.

Towards the middle of the last century, the Chinese or Oriental sugar-cane had thus multiplied to an amazing extent over both hemispheres, when the introduction of the Tahitian variety, which was found to attain a statelier growth, to contain more sugar, and to ripen in a shorter time, began to dispossess it of its old domains. This new and superior plant is now universally cultivated in all the sugar-growing European colonies; and if Cook's voyages had produced no other benefit than making the world acquainted with the Tahitian sugar-cane, they would for this alone deserve to be reckoned by the political economist among the most successful and important ever performed by man.

The sugar-cane bears a great resemblance to the common reed, but the blossom is different. It has a knotty stalk, frequently rising to the height of fourteen feet, and produces at each joint a long, pointed, and sharply serrated leaf or blade. The joints in one stalk are from forty to sixty in number, and the stalks rising from one root are sometimes very numerous. A field of canes, when agitated by a light breeze, affords one of the most pleasing sights, particularly when, towards the period of their maturity, the golden plants appear crowned with plumes of silvery feathers, delicately fringed with a lilac dye.

The sugar-cane is liable to be destroyed by many enemies. Sometimes herds of monkeys come down from the mountains by night, and having posted sentinels to give the alarm if anything approaches, destroy incredible quantities of the cane by their gambols as well as their greediness. It is in vain to set traps for these creatures, however baited; and the only way to protect a plantation and destroy them, is to set a numerous watch, well-armed with fowling-pieces, and furnished with dogs.

The rat, which the extension of commerce has gradually spread over the world, is still more destructive to the sugar-cane, and great pains are taken to keep it in check by poison or by its arch-enemy the cat.

The sugar-cane is also subject to the *blast*—a disease which no foresight can obviate, and for which human wisdom has hitherto in vain attempted to find a remedy. When this happens, the fine broad green blades become sickly, dry, and withered; soon after they appear stained in spots, and if these are carefully examined, they will be found to contain countless eggs of an insect like a bug, which are soon quickened, and cover the plants with vermin; the juice of the canes thus affected becomes sour, and no future shoot issues from the joints. The ravages of the ants concur with those of the bugs in ruining the prospects of many a sugar-field, and often a long continued drought or the fury of the tornado will destroy the hopes of the planter.

The land crabs are also very injurious to the sugar-fields, some of the species being particularly fond of the cane, the juice of which they suck and chiefly subsist on. They are of course narrowly watched, and no opportunity of catching them is lost sight of; but such is their activity in running, that they are almost always enabled to escape. They seldom go far from their burrows in day-time; and their watchfulness is such that they regain them in a moment, and disappear as soon as a man or dog comes near enough to be seen.

Harvest-time in the sugar-plantations is no less a season of gladness than in the corn-fields of England. So palatable, wholesome, and nourishing is the fresh juice of the cane, that every animal drinking freely of it derives health and vigour from its use. The meagre and sickly among the negroes exhibit a surprising alteration in a few weeks after the mill is set in action. The labouring oxen, horses, and mules, though almost constantly at work during this season, yet being indulged with plenty of the green tops and some of the scummings from the boiling-house, improve more than at any other period of the year. Even the pigs and poultry fatten on the refuse, and enjoy their share of the banquet. The wholesome effects

of the juice of the sugar-cane has not escaped the attention of English physicians, and many a weak-breasted patient, instead of coughing and freezing at home over what is ironically termed a comfortable fireside, now spends his winter in the West Indian Islands, chewing

GENERAL FRASER'S COFFEE ESTATE AT RANGBODDE, CEYLON.

the sweet cane and enjoying in January a genial warmth of seventy-two degrees in the shade.

The mountain regions of Enarea and Caffa, which the reader, on consulting a map of Africa, will find situated to the south of Abyssinia, are most probably the countries where the coffee-tree was first planted by Nature, as it

has here not only been cultivated from time immemorial, but is everywhere found growing wild in the forests.

Here also the art of preparing a beverage from its berries seems to have been first discovered. Arabic authors inform us that about four hundred years ago, a learned mufti of Aden, having become acquainted with its virtues on a journey to the opposite shore of Africa, recommended it on his return to the dervises of his convent as an excellent means for keeping awake during their devotional exercises. The example of these holy men brought coffee into vogue, and its use spreading from tribe to tribe, and from town to town, finally reached Meccah about the end of the fifteenth century. There fanaticism endeavoured to oppose its progress, and in 1511 a council of theologians condemned it as being contrary to the law of Mahomet, on account of its intoxicating like wine, and sentenced the culprit who should be found indulging in his cup of coffee to be led about the town on the back of an ass. The Sultan of Egypt, however, who happened to be a great coffee-drinker himself, convoked a new assembly of the learned, who declared its use to be not only innocent but healthy; and thus coffee advanced rapidly from the Red Sea and the Nile to Syria, and from Asia Minor to Constantinople, where the first coffee-house was opened in 1554, and soon called forth a number of rival establishments. But here also the zealots began to murmur at the mosques being neglected for the attractions of the ungodly coffee divans, and declaimed against it from the Koran, which positively says that *coal* is not of the number of things created by God for good. Accordingly the mufti ordered the coffee-houses to be closed; but his successor declaring coffee not to be *coal*, unless when over-roasted, they were allowed to reopen, and ever since the most pious Mussulman drinks his coffee without any scruples of conscience. The commercial intercourse with the Levant could not fail to make Europe acquainted with this new source of enjoyment. In 1652, Pasquia, a Greek,

opened the first coffee-house in London, and twenty years later the first French cafés were established in Paris and Marseilles.

As the demand for coffee continually increased, the small province of Yemen, the only country which at that time supplied the market, could no longer produce a sufficient quantity, and the high price of the article naturally prompted the European Governments to introduce the cultivation of so valuable a plant into their colonies. The islands of Mauritius and Bourbon took the lead in 1718, and Batavia followed in 1723. Some years before, a few plants had been sent to Amsterdam, one of which found its way to Marly, where it was multiplied by seeds. Captain Desclenx, a French naval officer, took some of these young coffee-plants with him to Martinique, desirous of adding a new source of wealth to the resources of the colony. The passage was very tedious and stormy; water began to fail, and all the gods seemed to conspire against the introduction of the coffee-tree into the New World. But Desclenx patiently endured the extremity of thirst that his tender shoots might not droop for want of water, and succeeded in safely bringing over one single plant, the parent stock whence all the vast coffee plantations of America are said to have derived their origin.

On examining the present state of coffee-production throughout the world, we find that the European markets obtain their chief supplies from Brazil, Java, Ceylon, and the West Indies; but with regard to quality, Mocha coffee, though comparatively insignificant in point of quantity, is still prominent in flavour and aroma.

When left to the free growth of nature, the coffee-tree attains a height of from fifteen to twenty feet; in the plantations, however, the tops are generally cut off in order to promote the growth of the lower branches, and to facilitate the gathering of the crop. Its leaves are opposite, evergreen, and not unlike those of the bay-tree; its blossoms are white, sitting on short foot-stalks, and

resembling the flower of the jasmine. The fruit which succeeds is a green berry, ripening into red, of the size and form of a large cherry, and having a pale, insipid, and somewhat glutinous pulp, enclosing two hard and oval seeds or beans, which are too well known to require any further description.

The seeds are known to be ripe when the berries assume a dark red colour, and if not then gathered, will drop from the trees.

To be cultivated to advantage, the coffee-tree requires a climate where the mean temperature of the year amounts to 68°, and where the thermometer never falls below 55°. It is by nature a forest tree requiring shade and moisture, and thus it is necessary to screen it from the scorching rays of the sun by planting rows of umbrageous trees at certain intervals throughout the field. These also serve to protect it from the sharp winds which would injure the blossoms. It cannot bear either excessive heat or a long-continued drought, and where rain does not fall in sufficient quantity, artificial irrigation must supply it with the necessary moisture.

In Java the zone of the coffee-plantations extends between 3000 and 4000 feet above the level of the sea; and the primitive forest is constantly receding before them. Frequently, on felling the woods, a part of the original trees is left standing to shade the tender coffee-plants; but oftener the rows are made to alternate with those of the sheltering dadab. Thus a new and luxuriant grove replaces the old thicket of nature's planting. Straight paths, kept carefully clean, lead through the dense, dark green shrubbery, under whose thick cover the wild cock hastily retreats when surprised by the wanderer. When the trees are in flower, the branches seem to bend under a weight of snow, from the number of dazzling white blossoms, which form a pleasing contrast to the dark and lustrous foliage, while high above, the dadabs extend their airy crowns, whose light green leaves are agreeably inter-

spersed with flowers of a brilliant red. A few months later, when the fruits are ripening into carmine, a scene of the most bustling animation ensues, for old and young are busily employed in plucking the swelling berries, and hurrying with filled baskets to the nearest pulping mill.

In Ceylon the native woodmen are singularly expert in felling forest trees preparatory to the cultivation of coffee. Turning to advantage the luxuriance of tropical vegetation,

THE COFFEE-RAT.

which lashes together whole forests by a maze of interlacing climbers as firm and massy as the cables of a line-of-battle ship, their practice in steep and mountainous places is to cut half-way through each stem in succession till an area of some acres in extent is prepared for the final overthrow. They then sever some tall group on the eminence, and allow it in its descent to precipitate itself on those below, when the whole expanse is in one moment brought

headlong to the ground, the falling timber forcing down those beneath it by its weight, and dragging those behind to which it is harnessed. The crash occasioned by this startling operation is so loud that it is audible for two or three miles in the clear and still atmosphere of the hills.

Like the sugar-cane, or indeed any other plant cultivated by man, the coffee-tree is exposed to the ravages of many enemies. Wild cats, monkeys, and squirrels prey upon the ripening berries, and hosts of caterpillars feed upon the leaves. Since 1847 the Ceylon plantations have been several times invaded by swarms of the Golunda, a species of rat which inhabits the forests, making its nest among the roots of the trees, and, like the lemmings of Lapland, migrating in vast numbers when the seeds of the nillo-shrub, its ordinary food, are exhausted. "In order to reach the buds and blossoms of the coffee, the Golunda eats such slender branches as would not sustain its weight, and feeds as they fall to the ground; and so delicate and sharp are its incisors, that the twigs thus destroyed are detached by as clean a cut as if severed with a knife."

Another great enemy of the Ceylon planters is a species of *coccus*, which establishes itself on young shoots and buds, covering them with a noisome incrustation of scales, from the influence of which the fruit shrivels and drops off. A great part of the crop is sometimes lost, and on many trees not a single berry forms from the invasion of this insect plague.

Theobroma—food for gods—the Greek name given by Linnæus to the cacao or chocolate tree, sufficiently proves how highly he valued the flavour of its seeds.

Indigenous in Mexico, it had long been in extensive cultivation before the arrival of the Spaniards, who found the beverage which the Indians prepared from its beans so agreeable that they reckoned it among the most pleasing fruits of their conquest, and lost no time in making their European friends acquainted with its use. From Mexico they transplanted it into their other dependencies, so that

in America its present range of cultivation extends from 20° N. lat. to Guayaquil and Bahia. It has even been introduced into Africa and Asia, in return for the many useful trees that have been imported from the Old into the New World. The cacao-tree seldom rises above the height of twenty feet; its leaves are large, oblong, and pointed. The flowers, which are of a pale red colour, grow on the stem and larger branches, and spring even from the roots. "Never," says Humboldt, "shall I forget the deep impression made upon me by the luxuriance of tropical vegetation on first seeing a cacao-plantation. After a damp night, large blossoms of the theobroma issue from the root at a considerable distance from the trunk, emerging from the deep black mould. A more striking example of the expansive powers of life can hardly be met with in organic nature." The fruits are large, oval, pointed pods, about five or six inches long, and containing in five compartments from twenty to forty beans.

The trees are raised from seed, generally in places screened from the wind. As they are incapable of bearing the scorching rays of the sun, particularly when young, bananas, maize, manioc, and other broad-leaved plants are sown between their rows, under whose shade they enjoy the damp and sultry heat which is indispensable to their growth, for the Theobroma Cacao is essentially tropical, and requires a warmer climate than the coffee-tree or the sugar-cane.

Two years after having been sown, the plant attains a height of three feet, and sends forth many branches, of which, however, but four or five are allowed to remain. The first fruits appear in the third year, but the tree does not come into full bearing before it is six or seven years old, and from that time forward it continues to yield abundant crops of beans during more than twenty years. When an Indian can get a few thousand cacao-trees planted, he passes an idle, quiet, contented life; all he has to do is to weed under the trees two or three times in the year, and to gather and dry the seeds in the sun.

Cacao is chiefly used under the form of chocolate. The beans are roasted, finely ground, so as to convert them into a perfectly smooth paste, and improved in flavour by the addition of spices, such as the sweet-scented vanilla, a short notice of which will not be out of place.

Like our parasitical ivy, the Vanilla aromatica, a native of torrid America, climbs the summits of the highest forest-trees, or creeps along the moist rock crevices on the banks of rivulets.

The stalk, which is about as thick as a finger, bears at each joint a lanceolate and ribbed leaf, twelve inches long and three inches broad. The large flowers which fill the forest with their delicious odours are white intermixed with stripes of red and yellow, and are succeeded by long and slender pods containing many seeds imbedded in a thick oily and balsamic pulp. These pods seldom ripen in the wild state, for the dainty monkey knows no greater delicacy, and his agility in climbing almost always enables him to anticipate man.

At present the vanilla is cultivated not only in Mexico, but in Java, where the industrious Dutch have acclimatised it since 1819. It is planted under shady trees on a damp ground, and grows luxuriantly; but as a thousand blossoms on an average produce but one pod, it must always remain a rare and costly spice.

Although but little known beyond the confines of its native country, Coca is beyond all doubt one of the most remarkable productions of the tropical zone.

The sultry valleys on the eastern slopes of the Peruvian and Bolivian Andes are the seat of the Coca, which, like the coffee-tree, bears a lustrous green foliage, and white blossoms ripening into small scarlet berries. The leaves, when brittle enough to break on being bent, are stripped from the plant, dried in the sun, and closely packed in sacks. The naked shrub soon gets covered with new foliage, and after three or four months its leaves are ready for a second plucking, though in some of the higher mountain-

valleys it can only be stripped once a year. Like the coffee-tree, the coca-shrub thrives only in a damp situation, under shelter from the sun; and for this reason maize, which rapidly shoots up, is generally sown between the rows of the young plants.

The local consumption of coca is immense, as the Peruvian Indian reckons its habitual use among the prime necessaries of life, and is never seen without a leathern pouch filled with a provision of the leaves, and containing besides a small box of powdered unslaked lime. At least three times a day he rests from his work to chew his indispensable coca. Carefully taking a few leaves out of the bag, and removing their midribs, he first masticates them in the shape of a small ball, which is called an acullico; then repeatedly inserting a thin piece of moistened wood like a toothpick into the box of unslaked lime, he introduces the powder which remains attached to it into the acullico until the latter has acquired the requisite flavour. The saliva, which is abundantly secreted while chewing the pungent mixture, is mostly swallowed along with the green juice of the plant.

When the acullico is exhausted, another is immediately prepared, for one seldom suffices. The corrosive sharpness of the unslaked lime requires some caution, and an unskilled coca-chewer runs the risk of burning his lips, as, for instance, the celebrated traveller Tschudi, who, by the advice of his muleteer, while crossing the high mountain passes of the Andes, attempted to make an acullico, and instead of strengthening himself as he expected, merely added excruciating pain to the fatigues of the journey.

The taste of coca is slightly bitter and aromatic, like that of bad green tea, but the addition of lime, or of the sharp ashes of the quinoa, renders it less disagreeable to the European palate.

It is a remarkable fact that the Indians who regularly use coca require but little food, and when the dose is

augmented are able to undergo the greatest fatigues without tasting almost anything else. Professor Pöppig ascribes this astonishing increase of endurance to a momentary excitement, which must necessarily be succeeded by a corresponding collapse, and therefore considers the use of coca absolutely hurtful. Tschudi, however, is of opinion that its moderate consumption, far from being injurious, is, on the contrary, extremely wholesome, and cites the examples of several Indians who, never allowing a day to pass without chewing their coca, attained the truly patriarchal age of one hundred and thirty years. The ordinary food of these people consists almost exclusively of roasted maize or barley, which is eaten dry without any other addition; and the obstinate obstructions caused by these mealy aliments are obviated by the tonic effects of the coca, which thus removes the cause of many maladies.

Tschudi often found coca the best preservative against the asthmatic symptoms which are produced by the rapid ascension of high mountains. While hunting in the Puna, 14,000 feet above the level of the sea, he always drank a strong infusion of coca before starting, and was then able to climb among the rocks, and to pursue his game, without any greater difficulty in breathing than would have been the case upon the coast.

If the moderate use of coca is thus beneficial in many respects, its abuse is attended with the same deplorable consequences as those which are observed in the Oriental opium-eaters and smokers, or in our own incorrigible drunkards.

The confirmed coca-chewer, or coquero, is known at once by his uncertain step, his sallow complexion, his hollow, lack-lustre, black-rimmed eyes, deeply sunk in the head, his trembling lips, his incoherent speech, and his stolid apathy. His character is irresolute, suspicious, and false; in the prime of life he has all the appearances of senility, and in later years sinks into complete idiocy. Avoiding the society of man, he seeks the dark forest, or

some solitary ruin, and there, for days together, indulges in his pernicious habit. While under the influence of coca, his excited fancy riots in the strangest visions, now revelling in pictures of ideal beauty, and then haunted by dreadful apparitions. Secure from intrusion, he crouches in an obscure corner, his eyes immovably fixed upon one spot; and the almost automatic motion of the hand raising the coca to the mouth, and its mechanical chewing, are the only signs of consciousness which he exhibits. Sometimes a deep groan escapes from his breast, most likely when the dismal solitude around him inspires his imagination with some terrific vision, which he is as little able to banish as voluntarily to dismiss his dreams of ideal felicity. How the coquero finally awakens from his trance, Tschudi was never able to ascertain, though most likely the complete exhaustion of his supply at length forces him to return to his miserable hut.

No historical record informs us when the use of the coca was introduced, or who first discovered the hidden virtues of its leaves. When Pizarro destroyed the empire of Atahualpa he found that it played an important part in the religious rites of the Incas, and that it was used in all public ceremonies, either for fumigation or as an offering to the gods. The priests chewed coca while performing their rites, and the favour of the invisible powers was only to be obtained by a present of these highly valued leaves. No work begun without coca could come to a happy termination, and divine honours were paid to the shrub itself.

After a period of more than three centuries, Christianity has not yet been able to eradicate these deeply-rooted superstitious feelings, and everywhere the traveller still meets with traces of the ancient belief in its mysterious powers. To the present day, the miners of Cerro de Pasco throw chewed coca against the hard veins of the ore, and affirm that they can then be more easily worked—a custom transmitted to them from their forefathers, who

were fully persuaded that the Coyas or subterranean divinities rendered the mountains impenetrable unless previously propitiated by an offering of coca. Even now the Indians put coca into the mouths of their dead, to ensure them a welcome on their passage to another world; and whenever they find one of their ancestral mummies, they never fail to offer it some of the leaves.

During the first period after the conquest of Peru, the Spaniards endeavoured to extirpate by all possible means the use of coca, from its being so closely interwoven with the Indian superstitions; but the proprietors of the mines soon became aware how necessary it was for the successful prosecution of their undertakings; the planters also found after a time that the Indians would not work without it; private interest prevailed, as it always does in the long run, over religious zeal and despotic interdictions, and in the last century we even find a Jesuit, Don Antonio Julian, regretting that the use of coca had not been introduced into Europe as well as that of tea and coffee.

When we consider its remarkable properties, it is indeed astonishing that it has so long remained unnoticed. Were it concealed in the interior of Africa, or extremely difficult to procure, this neglect could be more easily accounted for; but hundreds of our vessels annually frequent the harbours of Peru and Bolivia, where it may be obtained in large quantities, and yet its tonic and stimulating powers are but just beginning to attract the attention of the medical world.

## CHAPTER VI.

### *TROPICAL PLANTS USED FOR INDUSTRIAL PURPOSES.*

Cotton—Its cultivation in the United States—Caoutchouc and Gutta-percha—Manner in which these resins are collected—Indigo—The British Logwood cutters in Honduras—Brazil Wood—Arnatto.

UNDER the Plantagenets and the Tudors, wool formed the chief export of England. The pastoral races that inhabited the British Isles, unskilled in weaving, suffered the more industrious Flemings to convert their fleeces into tissues; and the dominions of the Duke of Burgundy, enriched by manufactures and by the stimulus they gave to agriculture, became the most prosperous part of Europe. At length the islanders began to discover the sources of the wealth which rendered Ghent and Bruges, Ypres and Louvain, the marvel and envy of the mediæval world; and gradually learning to keep their wool at home, invited the Flemings to the shores of England.

The bigoted oppression of Spain came in aid of this more enlightened policy: our wool ceased to be sent abroad, and English cloth eventually became the chief of our exports. But, like all human affairs, trade is subject to eternal fluctuation, new wants are constantly created, new markets opened, new articles introduced, and thus, almost within the memory of living man, the wool-manufactory has ceased to be the great staple of our industry, and, thanks to the inventive genius of our Arkwrights and Cromptons, a vegetable fibre furnished by a plant totally unknown to

our forefathers, now ranks as the first of all the world-wide importations of England.

There are many different species of the cotton-plant, herbaceous, shrubby, and arboreal. Their original birth-place is the tropical zone, where they are found growing wild in all parts of the world; but the herbaceous species still thrive under a mean temperature of from 60° to 64° F., and are capable of being cultivated with advantage as far as 40° or even 46° N. lat. The five-lobed leaves have a dark green colour, the flowers are yellow with a purple centre, and produce a pod about the size of a walnut, which, when ripe, bursts and exhibits to view the fleecy cotton in which the seeds are securely embedded.

It is almost superfluous to mention that the United States is the first cotton-producing country in the world. The area suitable for cotton south of the thirty-sixth degree of latitude comprises more than 39,000,000 acres, of which less than one-sixth part is now devoted to the plant. The yield depends in part upon the length of the season. Seven months are required for an average crop, and the average periods in which the last killing frost of spring and the first killing frost of autumn occur are March 23 and October 26. Cotton is cultivated in large fields, and when the soil is superior, the plant rises to a height of six or eight feet, although in the richest cane-brake soil, exhausted by successive crops, it dwindles down to a height of three or four feet only. The aspect of a cotton-field is most pleasing in the autumn, when the dark-coloured foliage and bright yellow flowers, intermingling with the snow-white down of the pods when burst, produce a charming contrast. At that time all hands are at work, for it is important to pluck as much as possible during the first hours of morning, since the heat of the sun injures the colour of the cotton, and the over-ripe capsules shed their contents upon the ground, or allow the wind to carry them away.

The collected produce is immediately carried to the

steam-mill to be cleansed of the seeds, and then closely packed in bales, which in the seaports are further reduced by hydraulic presses to half of their previous volume, thus causing a great saving in the freight. Large clippers frequently carry eight or ten thousand of these bales to Liverpool, whence, perhaps on the

PICKING COTTON.

day of their arrival, they are conveyed by rail to the next manufacturing town, which returns them in a few days

to the port, ready to clothe the Australian gold-digger or the labourer on the banks of the Ganges.

When we consider the luxuriance of vegetation in the tropical zone, it is not to be wondered at that so many plants of those climes abound with juices of a variety and richness unknown to those of the temperate latitudes. The resins and gums which our indigenous trees produce, either in smaller quantities or fit only for common uses, are there endowed with higher virtues, and ennobled, as it were, by the rays of a more powerful sun. Sometimes

CAOUTCHOUC TREES—INDIANS INCISING THEM.

they exude spontaneously through the rind and harden in the atmosphere; more frequently a slight incision is required to make the sap gush forth, but in every case they require but trifling labour for their collection. Many of them have medicinal qualities, others are esteemed for their aromatic odour, but none ranks higher in a commercial and technical point of view than caoutchouc or indiarubber, which was first brought from South America to Europe as a great curiosity at the beginning of the last century, and is now absolutely

indispensable for a thousand different uses. Nothing was known even of its origin until the year 1736, when the French naturalist La Condamine, while exploring the banks of the Amazon, discovered that it was chiefly produced by the Siphonia elastica, a large tree growing wild in the primitive forests along the borders of the rivers in Guiana and North Brazil.

The resin is collected by the Indians in a very simple manner. With a small hatchet they make deep and long incisions in the rind, from which a milky sap abundantly exudes. A small wooden peg is then fixed into each aperture to prevent its closing, and a cup of moist clay fastened underneath, which in about four or five hours is filled with as many table-spoonfuls of the juice. The produce of a number of incisions having been gathered in a large earthen vessel, is then spread in thin coatings upon moulds made of clay, and dried, layer after layer, over a fire, until the whole has acquired a certain thickness. When perfectly dry, the clay form within is broken into small fragments, and the pieces are extracted through an aperture, which is always left for the purpose.

INDIARUBBER TREE.

The Icosandra Gutta, which furnishes the guttapercha of commerce, is a native of the Eastern Archipelago and the adjacent lands. A few years since, this substance, now so celebrated and of such widely extended use, was totally unknown in Europe, for though from time immemorial the Malays employed it for making the handles of their hatchets and creeses, it was only in the year 1843 that Mr. Montgomery, an English surgeon, having casually become acquainted with its valuable properties,

sent an account of it, with samples, to the Royal Society, for which he was most justly rewarded with its gold medal. The fame of the new article spread rapidly throughout the world; science and speculation seized upon it with equal eagerness; a thousand newspapers promulgated its praises; it was immediately analysed, studied, and tried in every possible way, so that it is now as well known and as extensively used as if it had been in our possession for centuries.

The Icosandra Gutta is a large high tree, with a dense crown of rather small dark green leaves, and a round smooth trunk. The white blossoms change into a sweet

GUTTAPERCHA TREE.

fruit, containing an oily substance fit for culinary use. The wood is soft, spongy, and contains longitudinal cavities filled with brown stripes of guttapercha. The original method of the Malays for collecting the resin consisted in felling the tree, which was then placed in a slanting position, so as to enable the exuding fluid to be collected in banana leaves. This barbarous proceeding, which from the enormous demand which suddenly arose for the gutta would soon have brought the rapidly rising trade to a suicidal end, fortunately became known before it was too late, and the resin is now gathered in the same manner

as caoutchouc, by making incisions in the bark with a chopping knife, collecting the thin, white, milky fluid which exudes in large vessels, and allowing it to evaporate in the sun or over a fire. The solid residuum, which is the guttapercha of commerce, is finally softened in hot water, and pressed into the form of slabs.

Guttapercha has many properties in common with caoutchouc, being completely insoluble in water, tenacious, but not elastic, and an extremely bad conductor of caloric and electricity. The name of vegetable leather, which has been applied to it, gives a good idea both of its appearance and tenacity.

Its uses are manifold. It serves for water-pipes, for vessels fit for the reception of alkaline or acid liquids which would corrode metal or wood, for surgical implements, for boxes, baskets, combs, and a variety of other articles. The wonder of the age, submarine telegraphy, could hardly have been realised without it, as it is only by being cased in so isolating a substance, and one so impermeable by water, that the metallic wire is able to transmit the galvanic stream through the depths of ocean from land to land.

Of all the dyeing substances which the tropical zone produces in such endless variety, none is more important in a commercial point of view than indigo. Various species of plants producing this beautiful cerulean colour are found growing spontaneously in the warmer countries of both hemispheres, but the *Indigofera tinctoria* is most generally cultivated. The knotty shrubby plant rises about two feet from the ground; the leaves are winged like those of the acacia, smooth and soft to the touch, furrowed above, and of a darker colour on the upper than the under side. The small reddish flowers which grow in ears from the axillæ of the leaves have no smell, and are succeeded by long crooked brown pods, which contain small yellow seeds. The plant requires a smooth rich soil, well tilled, and neither too dry nor too moist. A child of the sun, it cannot be advantageously cultivated anywhere

except within the tropics, a higher mean temperature than 60° being absolutely necessary for its vegetation. The seed is sown in furrows a foot apart from each other, and two or three inches in depth. Sufficient moisture causes it to shoot above the surface in three or four days, and it is usually fit for gathering at the end of two months. When it begins to flower it is cut with a sickle a few inches above the roots, and furnishes, after six or eight weeks, a second crop. The cultivation of indigo would thus seem to be extremely profitable, but the sun, which so rapidly improves and invigorates the plant, calls forth at the same time a multitude of insects and caterpillars, that prey upon the valuable leaves, and frequently disappoint the planter's expectations.

All the intermediate shades of violet and purple may be obtained from the mixture of red and blue, varying according to the different proportions wherein these colours are applied. There are, however, some few vegetable substances which yield a violet or purple dye, without being combined with another colour, and of these logwood is the most important. The stately tree which furnishes this valuable article of commerce is a native of the western world, having been first discovered in the swampy forests of Yucatan, and in the low alluvial grounds that girdle the Bays of Campeachy and Honduras.

About the year 1661, logwood became in great request; and as the indolent Spaniards to whom the country at that time belonged failed to supply the market, several English adventurers, without first asking permission, settled or squatted on the uninhabited coast of Yucatan, and made the woods near Laguna de Terminos ring with the sound of their industrious axe. Many years passed without the Spaniards taking any notice of the intruders; but as these, growing bolder by sufferance, began to penetrate farther into the country, to build houses and form plantations, as if they had been masters of the soil, their jealousy was at length aroused, and in 1680 the English settlers

were forcibly ejected. This triumph on the part of their adversaries was, however, but transitory ; and a few months after our sturdy countrymen were again cutting their logwood as busily as ever, in spite of the enmity of man and the innumerable hardships of their laborious occupation.

Their mode of life is thus quaintly described by Dampier in his Voyage to the Bay of Campeachy :—"The logwood-

CUTTING THE INDIGO PLANT.

cutters inhabit the creeks of the lagunes in small companies, building their huts by the creeks' sides for the benefit of the sea-breeze, as near the logwood groves as they can, and often removing to be near their business. Though they build their huts but slightly, yet they take care to thatch them very well with palmetto leaves, to prevent the rains, which are there very violent, from soaking in. For their bedding, they raise a wooden frame, three

feet and a half above ground on one side of the house, and stick up four stakes at each corner, to fasten their curtains, out of which there is no sleeping for mosquitoes. Another frame they raise, covered with earth, for a hearth, to dress their victuals; and a third to sit at, when they eat it. During the wet season, the land where the logwood grows is so overflowed that they step from their beds into the water, perhaps two feet deep, and continue standing in the wet all day till they go to bed again; but, nevertheless, account it the best season for doing a good day's labour in. Some fell the trees, others saw and cut them into convenient logs, and one chips off the bark, and he is commonly the principal man; and when a tree is so thick that after it is logged it remains still too great a burden for one man, it is blown up with gunpowder. The logwood-cutters are generally sturdy strong fellows, and will carry burthens of three or four hundredweight. In some places they go a-hunting wild cattle every Saturday to provide themselves with beef for the week following. When they have killed a beef they cut it into quarters, and taking out the bones, each man makes a hole in the middle of his quarter, just big enough for his head to go through, then puts it on like a frock and trudgeth home; and, if he chanceth to tire, he cuts off some of it and throws it away."

The entire freedom from all restraint which accompanied this wild and adventurous life had such charms for Dampier's bold and roving spirit, that he sojourned for about a year among the rude wood-cutters of Campeachy, and left them with the intention of again returning for a longer stay.

Most of the red dye-woods are furnished by the Cæsalpinias, a genus of plants belonging to the widespread family of the Leguminosæ, and indigenous in both hemispheres. The *C. crista*, which furnishes the best quality, commonly known under the name of Brazil wood, grows profusely in the forests of that vast empire, preferring dry places and a rocky ground. Its trunk is large, crooked, and full of knots; at a short distance from the ground

immumerable branches spring forth and extend in every direction in a straggling manner. The branches are armed with short strong upright thorns, the leaves are small, and never appear in luxuriant foliage. The flowers are of a beautiful red colour, and emit a fragrant smell. Both the thick bark and the white pithy part of the trunk are useless, the hard close-grained heart being the only portion impregnated with colouring matter. The wood is sometimes used in turning, and is susceptible of a good polish, but its chief use is as a red dye. By the addition of acids it produces a permanent orange or yellow colour, while the crimson tints which it imparts are very fleeting.

The first Europeans that settled on the banks of the Amazons found that several of the Indian tribes that roamed about in their vicinity painted their bodies with a showy orange-red colour. Their attention was by this means attracted to the Arnatto, which attains about the size of our hazel-tree. The heart-shaped leaves are about four inches long, of a lighter green on the upper surface, and divided by fibres of a reddish-brown colour; the rosy flowers are succeeded by bristled pods somewhat resembling those of a chestnut, which, bursting open when ripe, display a splendid crimson farina or pulp, in which are contained thirty or forty seeds, in shape similar to raisin stones. As soon as they have arrived at maturity the pods are gathered, divested of their husks, bruised, immersed in water, and after a few weeks beaten with sticks to promote the separation of the pulp from the seeds. The turbid liquor is then strained, boiled to a consistent paste, and finally formed into cakes, which are left to dry in the sun. In England arnatto is generally used by the dyer to give a deeper shade to the simple yellow. Being perfectly soluble in spirits of wine, it is much used in this state for lacquering and for giving an orange tint to the yellow varnishes. It is likewise employed in large quantities as a colouring ingredient for cheese, to which it gives the required tinge without imparting any unpleasant flavour or unwholesome quality.

## CHAPTER VII.

### *TROPICAL SPICES.*

The Cinnamon Gardens of Ceylon—Immense profits of the Dutch—Decline of the trade—Neglected state of the Gardens—Nutmegs and Cloves—Cruel monopoly of the Dutch—A Spice Fire in Amsterdam—The Clove Tree—Beauty of an avenue of Clove Trees—The Nutmeg Tree—Mace—The Pepper Vine—The Pimento Tree.

ALTHOUGH the beautiful laurel whose bark furnishes the most exquisite of all the spices of the East is indigenous to the forests of Ceylon, yet, as no author previous to the fourteenth century mentions its aromatic rind among the productions of the island, there is every reason to believe that the cinnamon, which in the earlier ages was imported into Europe through Arabia, was obtained first from Africa, and afterwards from India. That the Portuguese, who had been mainly attracted to the East by the fame of its spices, were nearly twenty years in India before they took steps to obtain a footing at Colombo, proves that there can have been nothing very remarkable in the quality of the spice at the beginning of the sixteenth century, and that the high reputation of the Ceylon cinnamon is comparatively modern, and attributable to the attention bestowed upon its preparation for market by the Portuguese, and afterwards on its cultivation by the Dutch.

Long after the appearance of Europeans in Ceylon, cinnamon was only found in the forests of the interior, where it was cut and brought away by the *Chalias*, an emigrant tribe which, in consideration of its location in villages, was bound to go into the woods to cut and

deliver, at certain prices, a given quantity of cinnamon properly peeled and ready for exportation.

This system remained unchanged so long as Portugal was master of the country, but the forests in which the spice was found being exposed to constant incursions from the Kandyans, the Dutch were compelled to form enclosed plantations of their own within range of their fortresses. The native chieftains, fearful of losing the profits derived from the labour of the Chalias, who were attached as serfs to their domains, and whose work they let out to the Dutch, were at first extremely opposed to this innovation, and endeavoured to persuade the Hollanders that the cinnamon would degenerate as soon as it was artificially planted. The withering of many of the young trees seemed to justify the assertion, but on a closer examination it was found that boiling water had been poured upon the roots. A law was now passed declaring the wilful injury of a cinnamon plant a crime punishable with death, and by this severity the project was saved.

CINNAMON.

The extent of the trade during the time of the Dutch may be inferred from the fact, that the five principal cinnamon-gardens around Nejombo, Colombo, Barberyn, Galle, and Maduro were each from fifteen to twenty miles in circumference. Although they were only first planted in the year 1770, yet before 1796, when Colombo was taken by the English, their annual produce amounted to more than 400,000 lbs. of cinnamon, as much as the demands of the market required.

The profits must have been enormous, for cinnamon was then at least ten times dearer than at present, the trade

being exclusively in the hands of the Dutch East Indian Company, which, in order to keep up the price, restricted the production to a certain quantity, and watched over its monopoly with the most jealous tyranny. No one was allowed to plant cinnamon or to peel it, and the selling or importing of a single stick was punished as a capital offence. Since that time the cultivation of the cinnamon laurel having been introduced into many other tropical lands, competition has reduced prices, and the spice which was formerly the main product of Ceylon is now of very inferior importance. The cinnamon-gardens, whose beauty and luxuriance have been so often vaunted by travellers, have partly been sold, partly leased to private individuals, and though less than a century has elapsed since they were formed by the Dutch, they are already becoming a wilderness. Those which surround Colombo on the land side exhibit the effects of a quarter of a century of neglect, and produce a feeling of disappointment and melancholy. The beautiful shrubs which furnish this spice have been left to the wild growth of nature, and in some places are entirely supplanted by an undergrowth of jungle, while in others a thick cover of climbing plants and other parasites conceals them under masses of verdure and blossom. It would, however, be erroneous to suppose that the cinnamon-gardens have been universally doomed to the same neglect. Thus Professor Schmarda, who visited Mr. Stewart's plantation two miles to the south of Colombo, admired the beautiful order in which it was kept. A reddish sandy clay and fine white quartz sand form the soil of the plantation. White sand is considered as the best ground for the cinnamon tree to grow on, but it requires an abundance of rain (which is never wanting in the south-western part of the island), much sun, and many termites. For these otherwise so destructive creatures do not injure the cinnamon trees, but render themselves useful by destroying many other insects. They consequently remain unmolested, and everywhere raise their

high conical mounds in the midst of the plantation. The aspect of a well-conditioned cinnamon-garden is rather monotonous, for though the trees when left to their full growth attain a height of forty or fifty feet, yet, as the best spice is furnished by the shoots that spring from the roots after the chief stem has been removed, they are kept as a kind of coppice, and not allowed to rise higher than ten feet.

Nutmegs and cloves, the costly productions of the remotest isles of the Indian Ocean, were known in Europe for centuries before the countries where they grow had ever been heard of. Arabian navigators brought them to Egypt, where they were purchased by the Venetians, and sold at an enormous profit to the nations of the West. But, as is well known, the commercial grandeur of the City of the Lagunes was suddenly eclipsed after Vasco de Gama discovered the new maritime road to the East Indies, round the Cape of Good Hope (1498); and when, a few years later, the countrymen of the great navigator conquered the Moluccas (1511), they for a short time monopolised the whole spice trade much more than their predecessors had ever done before. But here also, as in Ceylon, the Portuguese were soon obliged to yield to a stronger rival; for the Dutch now appeared upon the scene, and by dint of enterprise and courage soon made themselves masters of the Indian Ocean. In 1605 they drove the Portuguese from Amboyna, and before 1621 had elapsed the whole of the Moluccas were in their possession. Five-and-twenty years later, Ceylon also fell into their hands, and thus they became the sole purveyors of cinnamon, cloves, and nutmegs to Europe. Unfortunately, the scandalous manner in which they misused

CLOVE.

their power throws a dark shade over their exploits. For the better to secure the monopoly of the spice trade, they declared war against nature itself, allowed the trees to grow only in particular places, and extirpated them everywhere else. Thus the planting of the nutmeg tree was confined to the small islands of Banda, Lonthoir, and Pulo Aij, and that of the clove to Amboyna. Wherever the trees were seen to grow in a wild state they were unsparingly rooted up, and the remainder of the Moluccas were occupied and subjugated for no other reason. The natives were treated with unmerciful cruelty, and blood flowed in torrents to keep up the prices of cloves and nutmegs at an usurious height.

When the spices accumulated in too large a quantity for the market, they were thrown into the sea or destroyed by fire. Thus M. Beaumare, a French traveller, relates that on June 10, 1760, he beheld near the Admiralty at Amsterdam a blazing pile of cinnamons and cloves, valued at four millions of florins, and an equal quantity was to be burnt the next day. The air was perfumed with their delicious fragrance, the essential oils freed from their confinement distilled over, mixing in one spicy stream, which flowed at the feet of the spectators; but no one was suffered to collect any of this, or, on pain of heavy punishment, to rescue the smallest quantity of the spice from the flames.

Fortunately these distressing scenes—for it is painful to see man, under the impulse of an insatiable greed, thus wilfully destroying the gifts of Nature—belong to the history of the past. The reign of monopoly has ceased even in the remote Moluccas, and their ports are now, at length, thrown open to the commerce of all nations; for the spice trees having been transplanted into countries beyond the control of the Dutch, the ancient system could not possibly be maintained any longer.

The clove tree belongs to the far-spread family of the myrtles; the small lanceolate evergreen leaves resemble

those of the laurel, the flowers growing in bunches at the extremity of the branches. When they first appear, which is at the beginning of the rainy season, they are in the form of elongated greenish buds, from the extremity of which the corolla is expanded, which is of a delicate peach-blossom colour. The corolla having fallen off, the calyx turns yellow, and then red; when it is beaten from the tree, and dried in the sun. If the fruit be allowed to remain longer on the tree the calyx or clove gradually swells, the embryo seed enlarges, and the pungent properties of the clove are in great part dissipated.

The whole tree is highly aromatic, and the foot-stalks of the leaves have nearly the same pungent quality as the calyx of the flowers. "Clove trees," says Sir Stamford Raffles, "as an avenue to a residence, are perhaps unrivalled—their noble height, the beauty of their form, the luxuriance of their foliage, and, above all, the spicy fragrance with which they perfume the air, produce, on driving through a long line of them, a degree of exquisite pleasure only to be enjoyed in the clear light atmosphere of the Eastern Archipelago."

NUTMEG.

In spite of the endeavours of the Dutch to confine the nutmeg tree to the narrow precincts of Banda, it has likewise extended its range not only over Sumatra, Mauritius, Bourbon, and Ceylon, but even over the western hemisphere. It is of a more majestic growth than the clove, as it attains a height of fifty feet, and the leaves of a fine green on the upper surface, and grey beneath, are more handsome in the outline, and broader in proportion to the length. When the trees are about nine years old, they begin to bear. They are dioecious, having male or barren flowers

upon one tree, and female or fertile upon another. The flowers of both are small, white, and bell-shaped; the embryo-fruit appearing at the bottom of the female flowers in the form of a little reddish knob. When ripe, it resembles in appearance and size a small peach, and then the outer rind, which is about half an inch thick, bursts at the side, and discloses a shining black nut, which seems the darker from the contrast of the leafy network of a fine red colour with which it is enveloped. The latter forms the Mace of commerce, and having been laid to dry in the shade for a short time, is packed in bags and pressed together very tightly.

The shell of the nut is larger and harder than that of the filbert, and could not, in the state in which it is gathered, be broken without injuring the nut. On that account the nuts are successively dried in the sun and then by fire-heat, till the kernel shrinks so much as to rattle in the shell, which is then easily broken.

Although not so costly as cloves or cinnamon, pepper is of a much greater commercial value, as its consumption is at least a hundred times greater. It grows on a beautiful vine, which, incapable of supporting itself, twines round poles or mango and other trees of straight high stems. As these are stripped of the lower branches, the vine embraces the trunk, covering it with elegant festoons and rich bunches of fruit in the style of the Italian vineyards.

PEPPER PLANT.

The leaf of the pepper plant is large, resembling that of the ivy, and of a bright green; the blossoms appear in June, soon after the commencement of the rains; they are small, of a greenish white, and are followed by the pungent berries, which hang in large bunches, resembling in shape those of grapes, but the fruit grows distinct on little stalks like currants.

This valuable spice grows chiefly on the Malabar Coast, in Sumatra, Borneo, Java, Singapore; its cultivation has also been introduced in Cayenne and the West Indies. The black and white sorts of pepper are both the produce of the same plant.

The best white peppers are supposed to be the finest berries, which drop from the tree, and, lying under it, become somewhat bleached by exposure to weather; the greater part of the white pepper used as a condiment is, however, the black merely steeped in water, and decorticated, by which means the pungency and real value of the spice are diminished; but having a fairer and more uniform appearance when thus prepared, it fetches a higher price.

Jamaica is the chief seat of the magnificent myrtle which furnishes the pimento of commerce. This beautiful tree grows to the height of about thirty feet, with a smooth, brown trunk, and shining green leaves resembling those of the bay. In July and August a profusion of white flowers, filling the air with their delicious odours, forms a very pleasing contrast to the dark foliage of its wide-spreading branches. It grows spontaneously in many parts of the island, particularly on the northern side, in high spots near the coast.

When a new plantation is to be formed, no regular planting or sowing takes place, for, as Edwards ("History of Jamaica") observes, "the pimento tree is purely a child of Nature, and seems to mock all the labours of man in his endeavours to extend or improve its growth; not one attempt in fifty to propagate the young plants, or to raise them from the seeds in parts of the country where it is not found growing spontaneously, having succeeded. For this reason, a piece of land is chosen, either in the neighbourhood of a plantation already formed, or in a part of the woodland where the pimento-myrtles are scattered in a native state. The land is then cleared of all wood but these trees, which are left standing, and the felled timber is allowed to remain, where it falls to decay, and perishes.

In the course of a year, young pimento plants are found springing up on all parts of the land, produced, it is supposed, in consequence of the ripe berries having been scattered there by the birds, while the prostrate trees protect and shade the tender seedlings. At the end of two years the land is thoroughly cleared, and none but the most vigorous plants, which come to maturity in about seven years, are left standing."

The berries are carefully picked while yet green, since, when suffered to ripen, they lose their pungency. One person on the tree gathers the small branches, and three others, usually women and children, find full employment in picking the berries from them. The produce is then exposed to the sun for about a week, when the berries lose their green hue and become of a reddish brown. When perfectly dry, they are in a fit state for exportation. In favourable seasons, which, however, seldom occur above once in five years, the pimento crop is enormous, a single tree having been known to yield one hundredweight of the dried spice. From its combining the flavour and properties of many of the Oriental aromatics, pimento has derived its popular name of allspice, and, from its being cheaper than black pepper, its consumption is very great.

THE END.

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EDINBURGH AND LONDON.

TROPICAL VEGETATION.

PRIMITIVE FOREST.

FOREST SCENE IN CENTRAL AFRICA.

IVORY-BILLED WOODPECKER.

BAOBAB TREES AT MANAAR.

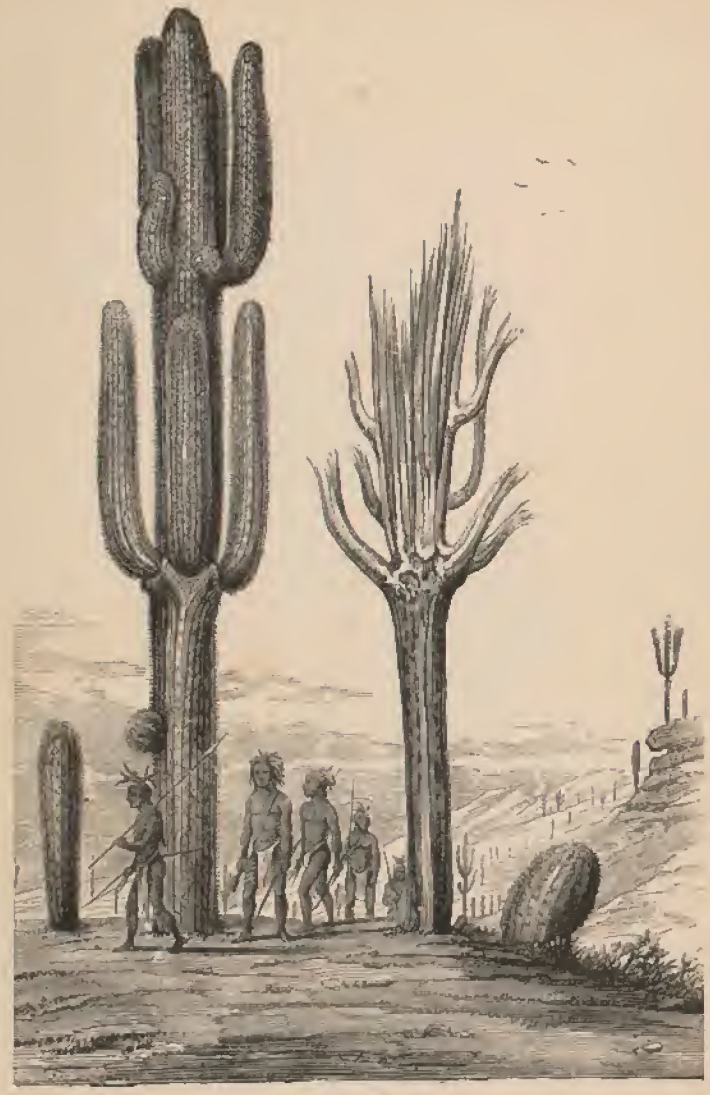
DRAGON-TREE OF OROTAVA.

SYCAMORE.

BANYAN TREE.

THE SACRED BO-TREE OF ANARAJAPOORA.

AN AGAVE PLANTATION, MEXICO.



CEREUS GIGANTEUS.

MIMOSA.


POLANARRUA.

BOTTLE-TREE.

SNAKE-TREE.

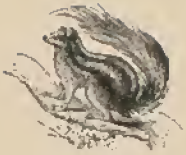
A MANGROVE SWAMP.

THE LUM TREE.

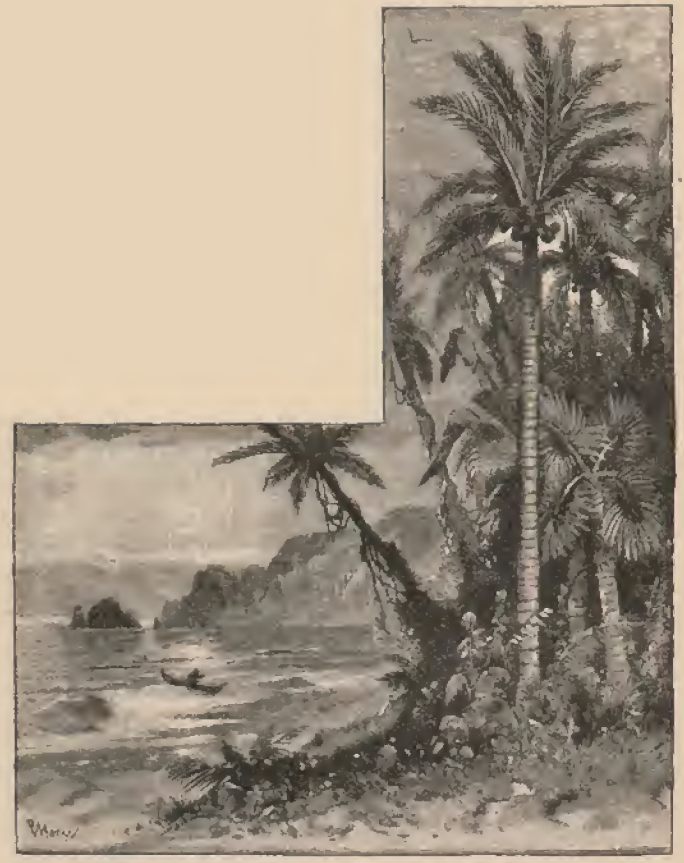
A CEYLONESE COCOA-NUT OIL-MILL.

COCOA-NUT TREE.

MALAY BEAR.



PALM SQUIRREL.



DATE-TREE.

OIL PALM.

YRIARTEA VENTRICOSA.

ARECA PALM.

JAVA SPARROW.

THE BANANA AND THE PLANTAIN.

MANGOSTEEN.

CUTTING THE SUGAR CANE.

GENERAL FRASER'S COFFEE ESTATE AT RANGBODDE, CEYLON.

THE COFFEE-RAT.

PICKING COTTON.

CAOUTCHOUC TREES—INDIANS INCISING THEM.

INDIA RUBBER TREE.

GUTTAPERCHA TREE.

CUTTING THE INDIGO PLANT.

CINNAMON.

CLOVE.

NUTMEG.

PEPPER PLANT.