N O T E S O F A B O T A N I S T

BY RICHARD SPRUCE

TOMO III

CHAPTER XXIV

ANTS AS MODIFIERS OF PLANT-STRUCTURE

[THE paper which forms the greater part of this chapter was written during the first few years after Spruce's return to England, and at a time when he had probably not seen, and had certainly not carefully read, the *Origin of Species*, the teachings of which at a later period he fully appreciated. At this period he accepted—as did almost all naturalists, including Darwin himself—what is termed the heredity of acquired characters, such as the effects on the individual of use or disuse of organs, of abundant or scanty nutrition, of heat and cold, excessive moisture or aridity, and other like agencies. But in the paper here given he went a step beyond this, and expressed his conviction that growths produced by the punctures and gnawings of ants, combined perhaps with their strongly acid secretions, continued year after year for perhaps long ages, at length became hereditary and thus led to the curious cells and other cavities on the leaves and stems of certain plants, which are now apparently constant in each species and appear to be specially produced for the use of the ants which invariably frequent them.

This paper Spruce sent to Darwin, asking him to send it to the Linnean Society if he thought it

worthy of being read there. I will here give some passages from Darwin's reply, dated April 1, 1869.

"The facts which you state are extraordinary, and quite new to me. If you can prove that the effects produced by ants are really inherited, it would be a most remarkable fact, and would open up quite a new field of inquiry. You ask for my opinion; if you had asked a year or two ago I should have said that I could not believe that the visits of the ants could produce an inherited effect; but I have lately come to believe rather more in inherited mutilations. I have advanced in opposition to such a belief, galls not being inherited. After reading your paper I admit, Firstly, from the presence of sacs in plants of so many families, and their absence in certain species, that they must be due to some extraneous cause acting in tropical South America. Secondly, I admit that the cause must be the ants, either acting mechanically or, as may perhaps be suspected from the order to which they belong, from some secretion. Thirdly, I admit, from the generality of the sacs in certain species, and from your not having observed ants in certain cases (though may not the ants have paid previous visits?), that the sacs are probably inherited. But I cannot feel satisfied on this head. Have any of these plants produced their sacs in European hot-houses? Or have you observed the commencement of the sacs in young and unfolded leaves which could not *possibly* have been visited by the ants? If you have any such evidence, I would venture strongly to advise you to produce it. . . .

"I may add that you are not quite correct (towards the close of your paper) in supposing that I believe that insects directly modify the structure of flowers. I only believe that spontaneous variations adapted to the structure of certain insects flourish and are preserved."

The paper was read on April 15, 1869, and then, as usual, was submitted to the Council to decide as to its publication. After full consideration, their decision was communicated to Spruce by the secretary as follows :—

"I am requested to communicate to you their opinion that the paper will require modification before they can recommend its publication. It is considered that the evidence adduced is insufficient to overcome the improbability of the sacs in the course of ages having become inherited, and that although there would be no objection to a statement that the author has been led to suspect that the structures in question are now inherited (which might lead to further investigations), it would be inadvisable for the Society to publish positive statements on the subject of inheritance without much fuller evidence. The Council wish me to say that if you do not object to alter the title of the paper, and to strike out some short passages, marked in pencil on the margin, they will be glad to undertake the publication of the paper, as they think it highly desirable that the facts recorded should be made known."

The paper was returned to him to make the alterations required if he wished to do so, but nothing more was heard of it, and it has remained

among his papers till now. Spruce was very sensitive to criticisms of his writings by persons who had not the same knowledge that he possessed; but in this case I think it probable that he himself, later on, recognised the incompleteness of the evidence. A year and a half later he corresponded with Mr. Hanbury on the subject, and he was evidently seeking for more information. I therefore now print his paper in full, with a few omissions of unimportant details or digressions, giving the passages objected to within square brackets. It will be seen that they involve very slight alterations, in no way affecting the facts or observations of the paper itself. That he intended to modify and enlarge the paper may perhaps be concluded from the fact that the paper cover in which the MSS. was kept contains in pencil two alternative titles, both less dogmatic than that on the paper itself. They are as follows :—

(1) "On Changes in the Structure of Plants produced by the Agency of Ants."

(2) "On Structures formed in Living Plants by Ants, which apparently become permanent in the Species."

The paper here follows, and I shall at the end adduce a few additional facts which will serve as a partial reply to the questions put by Darwin.]

ANT-AGENCY IN PLANT-STRUCTURE; Or the Modifications in the Structure of Plants which have been caused by Ants [by whose long-continued Agency they have become Hereditary and have acquired sufficient Permanence to be employed as Botanical Characters].

In the forests of the Amazon and Orinoco, and elsewhere in Tropical America, there are numerous plants belonging to very distinct orders, which have singular dilatations of the tissues and membranes, in the form of sacs on the leaves, or of hollow fusiform nodes on the petioles or branches (becoming tubers on the rhizomes), or of slender inordinately-elongated fistulose branches. I have reason to believe that all these apparently abnormal structures have been originated by ants, and are still sustained by them; so that if their agency were withdrawn, the sacs would immediately tend to disappear from the leaves, the dilated branches to become cylindrical, and the lengthened branches to contract; [and although the inheritance of structures no longer needed might in many cases be maintained for thousands of years without sensible declension, I suppose that in some it would rapidly subside and the leaf or branch revert to its original form].

§ 1. *Of Sac-bearing Leaves*

These exist chiefly in certain genera of Melastomes, whereof one (Tococa) is very numerous in species and individuals throughout the Amazon valley, growing in the form of slender weak bushes, 8 to 12 feet high, chiefly in that part of the forest

which is adjacent to and inundated by the rivers and lakes, but sometimes deep in the virgin forest, wherever the land is so low that the water of rains may accumulate thereon to a slight depth. All the species have the unmistakable aspect of their order —the ribbed opposite leaves, the polypetalous flowers with beaked porose anthers, etc.; but they are distinguished at sight from most others of the order by the large, thin, lanceolate or ovate acuminate leaves, very sparsely set with long hairs, and having a hollow sac or a pair of sacs at the base either of all the leaves, or (more frequently) of only one of each pair when that one is much larger than the other. The leaves in the majority of the species have but three ribs; a few species, however, have five- or even seven-ribbed leaves; but, in all, the origin of the innermost pair of ribs is an inch or so up the midrib from the base of the leaf; and it is this portion of the leaf, from the insertion of the inner ribs downwards, which is occupied by the sac. The latter sometimes takes up only a part of the breadth of the leaf, when it is technically considered to be seated *on* the leaf (Epiphysca); in other cases the sac in its lower half absorbs the whole breadth of the leaf, when it seems to be seated half on the leaf, half on the petiole (Anaphysca); or, lastly, throughout its length it absorbs the whole breadth of the leaf, and then seems seated entirely on the petiole (Hypophysca). That it is really formed in all cases at the expense of the lamina, and not of the petiole, is proved by the occasional occurrence of imperfectly-developed sacs in the hypophyscous form, bordered by a narrow wing continuous with the leaf, and giving to the latter a

panduriform outline. Sometimes there is a pair of sacs, one on each side of the midrib, but in most cases the two sacs are confluent into one, which has a medial furrow along the upper side.

I proceed to describe a few forms of sacs in various species of Tococa. In one species (*T. disolenia*, MSS. hb. 1412) which grows by forest-streams entering the lower part of the Rio Negro, the leaves of each pair are very unequal, and the larger of the two (11 by $3\frac{1}{2}$ inches) is alone sacciferous. The axils of the inner pair of ribs are perforated, giving entrance to two tubes or fistulæ—one on each side of the midrib—which conduct to a large basal sac, inhabited by small brownish ants, which pour out of the tubes and patter over the leaves to attack any animal that disturbs their domicile.

In most species, however, the sac springs at once from the base of the inner ribs, through whose perforated axils the ants have access to it without any intervening tubular way.

T. bullifera, Mart., grows in moist forests about the mouth of the Rio Negro, and is of humbler growth than the other species of the genus, reaching barely 5 feet; but the berries are more juicy and better flavoured than in any other Tococa, although so scanty and perishable that they cannot possibly serve as food for ants except for a very short period, and can hardly have influenced them in the choice of an abode. The leaves are long-lanceolate, either subequal and then with a large fusiform sac at the base of each of the pair, or very unequal and then the smaller leaf esaccate. The sacs afford refuge to multitudes of minute reddish ants which are fragrant when crushed. Most species

of Tococa, however, are inhabited by ants of medium size, with a blackish or brownish abdomen and pale thorax, and a milky fluid exudes from them when crushed; they bite but do not sting.

T. macrophysca, Benth. (Spruce, 2188), grows in moist caatingas of the Rio Negro and Uaupés, and has leaves sometimes a foot long, not very unequal, and all of them usually bearing a stout elongato-cuneiform sac, an inch long, at the top of the petiole.

Tococas are scattered over the Amazon region from the sea-coast to the roots of the Andes, and two species (*T. pterocalyx*, sp. n., and *T. parviflora*, sp. n.) ascend the Peruvian Andes to 2500-3000 feet. I gathered altogether twenty-four or twenty-five species of Tococa, and all but one or two (*T. planifolia*, Benth., and a closely-allied species or variety) have sacs on the leaves inhabited by ants. An examination of the circumstances of growth of the esaccate *T. planifolia* seems to throw light on the origin of sacs on the leaves of the other species.

Tococa planifolia grows here and there along the shores of the Rio Negro, at least as far up as to the foot of the cataracts, or say for about 700 miles. From the cataracts upwards, on the main river, on its tributary the Uaupés, and on some clear-water affluents of the Casiquiari, it is replaced by an allied non-sacciferous species or possibly a mere variety. Wherever it grows, it always occupies the very edge of the riparial forest, to which it forms an inner fringe, along with various Rubiaceæ, Apocyneæ, etc., of similar humble growth, all of which are *completely submerged* in the time of flood;

so that even if the leaves of this Tococa were sacciferous, they could not afford a permanent refuge to ants. But all the other sub-riparial species grow so far away from the real shore that the periodical inundations never overwhelm them completely, but leave at least the tops of the branches out of water; and it is noticeable that not only are the first leaves of young plants of every Tococa often esaccate, but that also the lowest leaves of each ramulus of the adult plant have either no sac or only the slightest rudiment of one. I suppose, then, that the primeval Tococa—the ancestor of all the existing species—had no sac at all on the leaves, but that a few ants having sheltered in the deep narrow angles formed by the junction of the prominent lateral ribs with the midrib, found the axils perforable, and having thereby reached the interior of the leaf, scooped out the parenchyma between the two surfaces. The leaves of any plant, when its juices are sucked away by insects (Aphides, for example) or otherwise diverted from their usual course on the one surface, are apt to become bullate on the opposite surface; hence it is easy to understand that, when mined by ants, the cuticular tissue of both surfaces should expand outwardly and contract laterally so as to form a sac, whose further enlargement would be effected by the continual crowding in of ants. [This process repeated on the plants for many generations would induce an hereditary tendency to the production of sac-bearing leaves.] It is natural that the ants should select the largest leaves, as affording most room for their operations; but that one leaf of each pair should be often larger than the other depends on some cause anterior to any action of

ants, for it is a very common thing all through the order of Melastomes. In species which have the leaves of each pair nearly equal, it is usual to see some of the smaller ones saccate and others altogether esaccate on the same plant. [I have often examined *half-grown plants and have seen that sacs begin to be developed* (*by inheritance*) *long before any ants touch them*, but that when the sacs are taken possession of by ants they speedily became much enlarged.]

Seeing, then, how the sacs on the leaves have originated, and what purpose they serve, it is plain that a species of Tococa, like *T. planifolia*, inhabiting the very river's brink, and liable to be completely submerged for several months of every year, could never serve as a permanent residence for ants, nor consequently have any character impressed on it by their merely temporary sojourn; even if their instinct did not teach them to avoid it altogether, as they actually seem to do; whereas the species of Tococa growing far enough inland to maintain their heads above water even at the height of flood are thereby fitted to be permanently inhabited, and are consequently *never destitute of saccate leaves*, nor at any season of the year clear of ants; as I have reason to know from the many desperate struggles I have had with those pugnacious little creatures when breaking up their homes for the sake of specimens.

In one species (hb. 3477) with seven-ribbed leaves, growing by the Rio Negro near the mouth of the Casiquiari, the leaves on some plants have a small distorted sac at the base inhabited by ants, and on others are nearly all esaccate; and I noted

of this species that the plants grow sometimes where they are totally overwhelmed by the periodical floods, rendering them a precarious dwelling-place for the ants. This leads to the suspicion that some of the sacciferous species, growing far away in the forest, may have sprung originally from *T. planifolia*, which grows on the river-banks; and even that some of the epiphyscous, anaphyscous, and hypophyscous species may be mere varieties of one another, or may have had a common progenitor at no very remote epoch. This and many other interesting problems can only be solved when naturalists shall become permanent members of the fauna of Equatorial America, and not as now have to be classed among "occasional visitants"; for their solution would require observations to be carried on through many consecutive years on the same spot.

Besides Tococa, there are other allied genera of Melastomes, viz. Myrmidone, Mart., Majeta, Aubl., and Calophysa, DC., which have sac-bearing leaves infested by ants. They are all found in the forests of humble sparse growth called "caatingas," and especially where the soil of white sand, or the granite floor almost bare of herbs, lies low and is liable to get transformed into a shallow lake in the time of heavy rains, thus driving ants and other insects to take refuge in the trees and bushes. Of Myrmidone I gathered four species, including the original *M. macrosperma* of Martius. They are low-growing, sparingly-branched shrubs of 3 to 8 feet; the leaves of each pair are very unequal in size, the smaller one sometimes even obsolete, the larger saccate, as in the *Tococa Anaphyscæ*, but the sac always rugose as well as unisulcate;

flowers solitary, rather large, terminal or axillary, rose (turning red); hairs of stem, leaves, etc., spreading, more copious than in Tococa, and red or crimson, corresponding curiously with the colour of the minute ants—of that viciously-stinging tribe called "Formiguinhas de fogo" (Little Fire-Ants)—which inhabit the sacs, and also make covered ways of intercommunication along the outside of the stem and branches—a precaution I have rarely noted among the Tococa-dwellers.

Myrmidone rotundifolia, sp. n., grows in caatingas in the lower angle of the confluence of the Rio Negro and Casiquiari. It is only 3 feet high, and has crowded, subunequal leaves, the larger of each pair $3\frac{1}{2}$ inches long, orbiculari-panduriform, cordate at the base, where there is a large sac; while the smaller leaf is orbiculari-cordate and mostly (but not always) has no sac.

Majeta guianensis, Aubl., has very much the habit of the Myrmidones, but it has also fistulose branches swollen at the nodes, so that the inhabitants have an inner way of communication between the sacs at the base of the larger of each pair of sessile leaves.

Calophysa tococoida, DC., is a slender shrub with thin hairy leaves, the larger leaf of each pair having a large bifid sac at the base of the petiole; but the frequent presence of a narrow wing connecting the leaf with the sac proves that the latter belongs really to the lamina (as in the Tococas) and that the leaf is sessile.

Examples of sac-like ant-dwellings exist in the leaves of plants of other orders, so like those already described in Melastomes, that it is scarcely worth

while to do more than indicate some of the species. The solitary instance known to me in Chrysobalans is that of *Hirtella physophora*, Mart., a slender arbuscle growing just within reach of inundations in the forests about the mouth of the Rio Negro. The distichous, oblong, apiculate leaves are nearly a foot long, and at the cordate base have a pair of compresso-globose sacs tenanted by ants. On cutting open the sacs I was rather surprised to find them lined with cuticular tissue and hairs, just like the underside of the leaf; which seems to show that they have been produced by a recurvation of the alæ of the leaf, through the ants nestling at first (Aphis-like) under the leaf and causing it to become bullate, and that the recurved margins have at length reached and coalesced with the midrib so as to form a pair of sacs.

Rubiads afford a few instances of sac-bearing leaves, especially in the genus Amaiona (Aubl.). In caatingas of the Rio Negro, almost throughout its extent, grows *Amaiona saccifera*, Mart., a small bushy tree with leaves three together, above a foot long, obovate with a minute apiculus, tapering to the base, where there are two contiguous sacs inhabited by small red fire-ants. The fruit resembles a large plum (except that like the leaves it is harshly hairy), and when ripe is soft and edible; but long before it reaches that stage the ants crowd on it and seem to suck the juices through the pores of the cuticle.

To the same order belongs *Remijia physophora*, Bth., a remarkable tree found at the falls of the Uaupés, having the aspect of an Amaiona, but the dry capsules and other characters of Cinchona and

its allies. The opposite leaves, 9 inches long, are oblong-oval, obtuse with a short apiculus, near the base abruptly panduriform, and bearing a small ant-sac on the midrib. All the other known species of this large genus have non-sacciferous leaves.

In all the plants I have seen bearing sacs on the leaves, to whatever order they belong, it is remarkable that the pubescence consists of long hairs having a tubercular base; and although I do not see what connection that peculiarity can have with the ants' choice of a habitation, it is probable they find some advantage in it.

§ 2. *Of Inflated Petioles*

A true swelling of the petiole, inhabited by ants, and (as I believe) owing its existence to their agency, I have seen only in two genera of Leguminose Cæsalpinieæ, viz. Tachigalia and Sclerolobium. The Tachigaliæ are low-growing riparial trees, of black-water rivers, and have pinnate, often silky foliage, and small, yellow, sweet-smelling, nearly regular flowers disposed in panicles. All have trigonous petioles, which are mostly dilated at the base into a fusiform sac tenanted by ants. *T. caripes*, sp. n., grows abundantly on the banks, and on inundated islands, of the Uaupés. It is a spreading tree of 30 feet, and has the ramuli, petioles, and leaves clad with a fine, close, silky pubescence. The sacs of the petiole are inhabited by small black ants, whose entrance is by a little hole on the underside of the sac. *T. ptychophysca*, sp. n., grows in moist sandy caatingas by the same river, and has a similar sac on the petiole.

The species of Sclerolobium are not usually riparial, but one species (*S. odoratissimum*, sp. n.) is eminently so, constituting a great ornament of the shores and islands of the Rio Negro towards the mouth of the Casiquiari, and perfuming the whole breath of the river with the abundance of its pale yellow honey-scented flowers; and it is notable that this is the only species of the genus in which I have found sacciferous petioles. The sac is large, extending upwards from the knee of the petiole to the base of the second pair of leaflets, and it has a furrow along the upper face.

I presume the ants have been induced to take up their residence on these particular trees on account of the abundance and long persistence of their honied flowers. On other species of Sclerolobium, inhabiting dry lands solely, such as *S. tinctorium*, Benth., and *S. paniculatum*, Vog., I have seen the flowering panicles infested with little fire-ants, which, however, seemed to have their permanent habitation in the ground, about or near the tree-roots, and never to perforate the leaf-stalks. Many other Leguminosæ, especially the woody climbing Phaseoleæ, are visited by ants when in flower, and knobs or galls caused by the perforation of those insects are frequent on the panicles of Dioclea and allied genera; [but I have not remarked any instance of such knobs having become hereditary, except in *Pterocarpus ancylocalyx*, Benth., a small tree on the banks of the Solimoẽs or Upper Amazon, which has the rachis of the racemes thickened in the middle, the swelling being sometimes (but not always) tenanted by ants].

In the shrubby Cassias, which are common weeds

of tropical America, the knee of the petiole may sometimes be seen hollowed and enlarged by ants; [but the action of these insects has not been maintained with sufficient constancy to render the swelling a permanent character in any species of Cassia I have met with].

Ants congregate on the pods of some Cassias and other plants which have seeds in sweet pulp; and on those parts of any plant where they find suitable food, in the shape of mucilaginous exudations, etc.; but they mostly sojourn there just so long as that food lasts, and no longer; or otherwise they merely visit the plants for the sake of collecting their products and carrying them off at once to a permanent storehouse elsewhere.

§ 3. *Of Inflated Branches*

Ants' nests in swellings of the branches are found chiefly in soft-wooded trees of humble growth, which have verticillate or quasi-verticillate branches and leaves, and especially where the branches put forth at the extremity a whorl or fascicle of three or more ramuli; then, either at each leaf-node or at least at the apex of the penultimate (and sometimes of the ultimate) branches, will probably be found an ant-house, in the shape of a hollow swelling of the branch; communication between the houses being kept up, sometimes by the hollowed interior of the branches, but nearly always by a covered way along their outside.

The genus Cordia (Boraginaceæ) affords many examples of this structure. One of the rather artificial sections into which Cordia is divided in the

"Prodromus," viz. Physoclada, is characterised by "rami sub foliis congesto-verticillatis inflati cavi," the hollow inflation being tenanted by ants, whence *C. nodosa*, the type-species of the group, is known to the South Americans as "Ant tree" (Pao de formiga). *C. formicarum*, Hoffmans, and *C. callococca*, Aubl., are supposed to be synonyms of *C. nodosa*.

. . . . . .

Cordia gerascantha, Jacq., differs from the Physocladæ in the structure of its rather showy white flowers. It rises to a stoutish tree of 30 to 40 feet, and is throughout fasciculately branched (branches 3–5-nate). At the point where the branches divide there is mostly a sac, inhabited by very vicious ants of the tribe called "Tachí" by the Brazilians. The preceding species are usually tenanted by the small fire-ant, but sometimes by the Tachí. Probably the former was in all cases the original occupant, and the Tachí is an intruder.

All these sacciferous Cordiæ have fascicled or whorled branches, and are beset (not often densely) with long coarse hairs arising from tubercles, much as in the Amaiona and the Melastomaceæ above described; but of the numerous other Cordiæ I have gathered, with vague ramification and often short soft pubescence, not one was seen with saccate branches, or any other structure serving as a permanent residence to ants.

Some of the aromatic shrubby Crotons, with trichotomous branches, have occasionally the branch-axils perforated by ants and swollen; but the process does not seem to have been carried on long enough to make the character permanent in any species I have met with.

To this category belong the creeping rhizomes of some ferns which are often beaded with globose swellings inhabited by ants; *e.g.* of *Phymatodes Schomburgkii*, J. Sm., a not uncommon fern on shady rocks and trees by the Rio Negro. [In a small Polypodium, found by Dr. Jameson on the river Napo, the moniliform character of the rhizomes seems to have become permanent, for he did not see a single specimen wanting it; but the presence of ants in all the swellings revealed the origin of the latter.]

A curious epiphytal genus of Solanaceæ, Marckea, whereof I gathered two species on the Rio Negro and Uaupés, is singularly affected by ants. The stem is reduced to a large tuber—sometimes as big as a child's head—and attains that size through the agency of ants, who inhabit its hollow interior and cover it outwardly with paper of their own manufacture. From the tuber radiate several branches, simple or sparingly forked. The leaves are very like those of *Acnistus arborescens*, save that they are verticillate (or at least approximated) in one species (*M. ciliata*, Benth.) in threes and in the other species in fives; but the large hypocrateriform corollas, with a tube 3 inches long, are more like those of some Gesnerea. There are perforated swellings at the forks of the branches, and sometimes also at the leaf-nodes, which serve the ants as detached apartments. I did not see a single plant wanting the basal tuber.

§ 4. *Of Elongated and Fistulose Stems and Branches*

There is an order of plants, whereof several genera and species inhabit Equatorial America, and

all, with the exception of the herbaceous species, are infested by ants. The order is Polygoneæ; the ant-infested species belong to the genera Triplaris, Coccoloba, Campderia, Symmeria, and Rupprechtia; and the exceptions are species of Polygonum, some of them closely resembling common European species. All, both trees and herbs, grow in moist situations, and most of them on lands subject to periodical inundations. Not only is every lignescent Polygonea a habitation for ants, but the whole of the medulla of every plant, from the root nearly to the growing apex of the ramuli, is scooped out by those insects. The ants make a lodgment in the young stem of the tree or shrub, and as it increases in size and puts forth branch after branch, they extend their hollow ways through all its ramifications. They appear to belong all to a single genus, and are long and slender, with a fusiform, very fine-pointed, dark-coloured, shining abdomen, and they all sting virulently. They are known in Brazil by the name of "Tachí" or "Tacýba," and in Peru by that of "Tangarána"; and in both countries the same name is commonly applied to any tree they infest as to the ants themselves.

A few trees and shrubs of other orders are similarly infested by Tachí ants; such as Platymiscium (Vog.) in Leguminosæ, Tachia (Aubl.) in Gentianeæ, and Mabea (Aubl.) in Euphorbiaceæ.

Triplaris surinamensis, Camb., a Polygoneous tree of very rapid growth, reaching at maturity a hundred or more feet in height, and conspicuous from afar when in fruit from the abundance and bright red colour of its enlarged shuttlecock-like

calyces, is common all along the Amazon, both on the river banks and in marshy inland sites; and solitary trees of it are often seen standing out above the Cacao plantations. *T. Schomburgkii*, Benth., a smaller tree, grows in the same way on the Upper Orinoco and Casiquiari. These trees, as well as the other arborescent Polygoneæ, have slender elongated tubular branches, often geniculate at the leaf-nodes, and nearly always with perforations, like pinholes, just within the stipule of each leaf, which are the sallyports of the garrison, whose sentinels are besides always pacing up and down the main trunk, as the incautious traveller finds to his cost when, invited by the smoothness of the bark, he ventures to lean his back against a Tachí tree. I suspect that the remote progenitors of these ants have at first sheltered in the ocrea (sheathing stipule) which is so characteristic a feature of the Polygoneæ; but, having found the wood soft and thin and the pith easy to scoop out, have made their more secure abode within the stem and branches.

Some Tachí trees seem as if they were actually trying to run away from the ever-encroaching ants. *Coccoloba parimensis*, Benth., found by Schomburgk in British Guayana and by myself on the river Uaupés, is an arbuscle with a stem 15 feet long, that tapers upwards and arches over so as finally to touch the ground, the ants all the while hollowing it out, as it stretches away apparently in the hopeless attempt to escape their invasion. Some slender Coccolobas climb high into the adjacent trees, not by twining but by crooking their branches and thereby hoisting themselves up; others are

self-standing bushy trees, but still have the same slender geniculate branches.

The pretty Gentianeous shrubs of the genus Tachia have long, slender, hollowed branches, that either hang down or support themselves on the branches of adjoining shrubs and trees; [yet although this character is (as I suppose) an undoubted inheritance of the effects of ant-agency, it is singular that Tachias are nowadays often found entirely free from ants; while the name, taken by Aublet from the Tupí language, distinctly implies that in his day they were notoriously ant-infested.] The genus Tachigalia, spoken of above, also doubtless owed its name to the same peculiarity, which it still enjoys unabated. Aublet tells us he got these and other Tupí names from a colony of Indians from Pará, who had crossed the Amazon and established themselves in Cayenne.

Some Mabeas are still more remarkable, the long sarmentose branches stretching away to a great length among the adjacent vegetation, although never actually twining. All Mabeas of the section Taquari have this habit, and all are infested by Tachí ants. The slender but tough twigs, hollowed and polished interiorly by ants, are a favourite material for tobacco-pipes with the Indians of the Amazon, who strip off the bark and paint and varnish the surface of the wood. These "Taquaris," as they are called, are commonly sold in the shops at Pará. A bundle of them which I purchased there is now in the Kew Museum. The arborescent Mabeas, however, with tall erect trunks and paniculate inflorescence, are apparently never touched by ants.

None of these fistulose trees and shrubs have any sacs or swellings on the branches, except the leguminous genus Platymiscium, which has the pinnate leaves usually in whorls of three, and the tubular branches sometimes dilated at the leaf-nodes; so that this genus has almost as much right to be placed in the preceding section as here.

All the plants above named belong to the eastern side of the Andes and the Amazonian plain; but when I crossed over to the western side of the Andes I saw a Triplaris in the Red Bark forests of Chimborazo, and *Rupprechtia Jamesoni*, Meisn., and a Coccoloba on the inundated savannas of Guayaquil, with just the same long, slender, geniculate branchlets—infested by the same class of ants—as their congeners east of the Andes.

A few other plants with long-drawn-out stems and branches, such as some species of Remijia, may be supposed to owe at least the exaggeration of that feature to the ants which still continue to infest them.

Nearly all tree-dwelling ants, although in the dry season they may descend to the ground and make their summer-houses there, retain the sacs and tubes above-mentioned as permanent habitations; and some kinds of ants appear never to reside elsewhere, at any time of year. The same is probably true also of ants which build nests in trees, of extraneous materials, independent of the growing tissues of the tree itself. There are some ants which apparently must always live aloft; and the Tococa-dwellers continue to inhabit Tococas where there is never any risk of flood, as in the case of the *T. pterocalyx*, which grows on wooded ridges

of the Andes. Their case is parallel to that of the lake-dwellers of the mouth of the Orinoco and the inundated savannas of Guayaquil, whose descendants must needs elevate their houses on stages six feet or more in height, although nowadays erected on rising ground far beyond the reach of river floods or ocean-tides. We call this "instinct" in the case of ants, "inherited custom" in the case of men; yet there is obviously no difference.

There are numerous instances of the effects of Ant-agency in the plants of Tropical America, not reducible to any of the foregoing sections. At Tarapoto, in the Andes of Maynas, a prickly suffruticose Solanum, with pinnate leaves, is frequent in sandy ground. The fruit is a small scarlet edible berry, tasting like that of Physalis. The very prickly calyx persists with the fruit, and is dilated into a wide cup which holds the water of rains, for whose sake it is visited by fire-ants that have their burrows in the sand. The contained water is slightly mucilaginous, and possibly, after standing a while, partakes of the flavour of the berry that is partially immersed in it. After a shower, the ants may be seen crowding on the inner edge of the calyx and sipping the liquid; but in dry weather they fill the calyx, bent apparently on extracting the last drop. The consequence of this crowding into the calyx is to sustain and augment the inflation. The bulging, gummy, water-holding leaf-bases of many epiphytal Bromels seem to owe those properties to the same influence, for they are commonly infested by ants, whose papery nest, indeed, often envelops the root of the plant.

[When I compare these and similar instances with the Pitchers of the Nepenthes, in which (as I learn from the accounts of travellers) ants as well as water are nearly always found, I cannot doubt that those curious appendages have attained their actual dimensions through the deepening and widening which they have undergone from ants through untold ages.]

We have a curious example, in the genus Cinchona, of the supposed correlation of a minute structural peculiarity with chemical and medical properties. Eminent botanists, such as Weddell and Karsten, who have studied that genus in its native forests, have thought they had found a character in the leaves always associated with a bark rich in alkaloids, viz. the presence of a small pit or scrobicule in the axil of each vein on the underside of the leaf. But when good specimens of *C. succirubra*, the richest of all the barks in alkaloids, came to be examined, the leaves were found entirely destitute of scrobicules! See now how this comes about. The leaves of the Hill Barks—those, namely, that grow at an elevation of 8000 feet and upwards—are liable to be infested by a small mite which nestles in the scrobicules—has caused them, in fact—its remote ancestors having at first sheltered in the vein-axils; but *C. succirubra* grows always below that elevation—indeed, as low down as 2400 to 6000 feet—and is the only quinine-producing Cinchona that descends so low, the other species of Cinchona that grow at a low elevation having all medically worthless bark. But as all these species, *C. succirubra* included, are equally destitute of scrobiculate leaves and of mites, the reasonable inference is that

that kind of mite is confined to a higher and cooler zone, and never descends to the warm zone of the Red Bark.

Let it be observed that these scrobicules, although I have no doubt of their origin by insect-agency, are quite as good and permanent a botanical character as many others—as the sacciferous leaves of Tococa, for example. [What a vast length of time, compared with man's brief life, it must have taken to impress a character of permanence on the latter character and render it hereditary! Probably a period far longer than those we choose to designate "historical" or "bronze" or "stone." The inimitable researches of Mr. Darwin have rendered it (to my mind) almost certain that many of the deviations from symmetry in the form and direction of the parts of a flower have been brought about by the direct mechanical agency of insects; and that the origin of every obliquity, unequal-sidedness, and so forth, in any organ of a plant, is to be sought in the action of forces not only internal, but also external to the plant itself.] In this wonderful "life," which exists only through perpetual change, every equilibrium is unstable, and even what we call "permanence" is but a transitory state.

In fine, the list of structures which I have above assigned to Ant-agency might no doubt be very much extended, and perhaps more satisfactorily classified. I have described only what I have seen with my own eyes and noted down on the spot; and corroborative specimens of all the plants mentioned exist in the Royal Herbarium at Kew, by means of which the accuracy of my account of the structures inhabited by ants may at any time be tested.

Remarks by the Editor

[The Director of the Kew Gardens, Lieutenant-Colonel Prain, informs me that the genus Tococa in cultivation produces the inflated bladders, but he does not know that the plant has ever been raised from seed, which is not produced in Europe. Prof. James W. H. Trail, who has observed these plants and the ants that infest them in Amazonia, informs him that in one or two cases plants which had no ants on them, though possessing the ant-dwellings moderately developed, were being damaged by herbivorous pests. This important observation indicates the "utility" to the plant itself, which is always needed to bring natural selection into play for the purpose of modifying and rendering permanent any special adaptation in plant- or animal-structure.

Much light is thrown on this question by the observations of Mr. Henry O. Forbes, recorded in his *Naturalist's Wanderings in the Eastern Archipelago* (pp. 79-82). He found the strange tuberous Myrmecodia and Hydnophytum abundant in Sumatra and Amboyna (as they are all over the Archipelago), and raised many young plants from seed, which, though completely isolated from the ants that make their homes in the wild plants, grew vigorously and developed the internal branching cells and galleries from the very first. These chambers are formed by the shrivelling up of a delicate pith with which they are at first filled, and as they grow rapidly and form irregular tuberous masses as large as a man's head, it seems probable that this pith, as well as the watery liquid secreted in a large central chamber,

are the primary attraction to the ants, which are always of one species and sting virulently.

I find that I had myself given a short account of these ant-infested plants of both hemispheres in my volume on *Natural Selection and Tropical Nature* (p. 284), in which I refer to Mr. Forbes's observations, and also to those of the late Mr. Belt on the Bull's-Horn Acacia, which has the thorns in a young state filled with a sweetish pulpy substance which at first serves as food for the ants, while later on they are supplied by honey-glands upon all the leaves. He also notices and figures in his *Naturalist in Nicaragua* (p. 223) the leaves of one of the Melastomæ with swollen petioles, and he states that, besides the small ants always infesting them, he noticed, several times, some dark-coloured Aphides. He also suggests that these small virulently-stinging ants are of use to the plants by guarding them from leaf-eating enemies such as caterpillars, snails, and even herbivorous mammals, but above all from the omnipresent Saúba or leaf-cutting ant, which he declares he observed to be much afraid of these small species.

I think the facts that have now been observed in both the western and eastern tropics are really sufficient to enable us to understand the probable origin of the various remarkable structures that have been developed in many different groups of plants and are utilised by ants. There is clearly "utility" on both sides. The ants obtain dwellings, protection from floods, a safe shelter for their eggs and larvæ, and a portion of their food—in some cases perhaps all—from the plant they inhabit; while the plant derives protection to its foliage,

and perhaps also in some cases to its flowers—as shown by Kerner—by the presence of whole armies of virulently-stinging ants whose very minuteness renders them the more formidable. In the most remarkable plant-formicaria known—those of the Myrmecodia and Hydnophytum of the Malay Archipelago—the whole structure has been proved to be hereditary, and we may therefore conclude that in the Tococas of the Amazon, and other cases in which the cavities inhabited by the ants are constantly present, they are also hereditary. In other cases, as Spruce himself states, they are not so, being directly formed by the ants or being abnormal growths due to their irritations.

Spruce's error was in not recognising that the ever-present variability in all the parts and organs of plants furnished *the material*, and the survival of the fittest *the agency*, by which these, as well as all other specific modifications of plants, have been brought about; and that this is a far more powerful, as well as a more exact and certain, mode of doing so than the hereditary transmission of mutilations, the effects of which would in many cases be the reverse of beneficial.

In my recent work, *My Life* (vol. ii. p. 64), I give a letter from Spruce written shortly after the paper was rejected, in which he explains his reasons for refusing to alter his paper. Three years later he wrote me another letter on an allied subject—the purport of aromatic leaves (printed at p. 65), at the commencement of which he says: "Every structure, every secretion of a plant is (before all) beneficial to the plant itself. That is, I suppose, an incontrovertible axiom."

This is a great advance on the views stated in the earlier letter, in which he wrote: "The ants cannot be said to be useful to the plants, any more than fleas and lice are to animals; and the plants have to accommodate to their parasites as best they may." The evidence, however, now shows that, in all probability, they are always useful, in which case their becoming hereditary is merely a question of variability in the plant, and the continued preservation of those whose variations were in the direction of utility to the ants.

The whole of these very interesting phenomena, so well described by Spruce, are thus seen to be in complete accordance with those of the modification of flowers by insect-agency, which are now admitted to depend upon a mutual adaptation for the benefit of both plant and insect.

They lead, I think, to the establishment of the general principle, that no special adaptation of one organism to another can become fixed and hereditary unless it is of direct utility to both.]

CHAPTER XXV

INDIGENOUS NARCOTICS AND STIMULANTS USED BY THE INDIANS OF THE AMAZON

[THIS chapter consists of a carefully written account of the above subject, compiled by Spruce about 1870 from his notes and observations, and printed in the short-lived *Geographical Magazine*. Fortunately, he presented the beautifully written manuscript to his Yorkshire friend and fellow-botanist, Mr. G. Stabler, of Milnthorpe, Westmoreland, who has kindly lent it me for reproduction here, and I feel sure that it will be both new and interesting to the great majority of readers of this volume. Besides its main subject, it touches upon the beliefs and customs of the Indians who use these narcotics, and on the proceedings of their "pajés" or medicine-men; and incidentally it narrates the occurrence of rare and mysterious sounds in the forest, and their very curious explanation, which I believe he was the first, and probably still the only, traveller to obtain. The whole essay affords a good example of the writer's style and of his power of making even technical details interesting, and of introducing bright descriptive flashes and touches of human nature in what might otherwise be a rather dry exposition of botanical and pharmaceutical facts. Two paragraphs

only have been omitted as unsuitable for the present work. The rest is printed verbatim, and will, I think, even to the non-botanical reader, prove not one of the least interesting chapters of this volume.]

On some remarkable Narcotics of the Amazon Valley and Orinoco

In the accounts given by travellers of the festivities of the South American Indians, and of the incantations of their medicine-men, frequent mention is made of powerful drugs used to produce intoxication, or even temporary delirium. Some of these narcotics are absorbed in the form of smoke, others as snuff, and others as drink; but with the exception of tobacco, and of the fermented drinks prepared from the grain of maize, the fruit of plantains, and the roots of *Manihot utilissima*, *M. Aypi*, and a few other plants, scarcely any of them are well made out. Having had the good fortune to see the two most famous narcotics in use, and to obtain specimens of the plants that afford them sufficiently perfect to be determined botanically, I propose to record my observations on them, made on the spot.

The first of these narcotics is afforded by a climbing plant called Caapi. It belongs to the family of Malpighiaceæ, and I drew up the following brief description of it from living specimens in November 1853.

I. Banisteria Caapi, Spruce

(*Pl. Exsicc.* No. 2712, *Anno* 1853)

Description.—Woody twiner; stem = thumb, swollen at joints. Leaves opposite, 6.4 × 3.3, oval acuminate, apiculato-acute,

thinnish, smooth above, appresso-subpilose beneath; on a petiole 0.9 inch long. Panicles axillary, leafy. Umbels 4-flowered. Pedicels appresso-tomentose, bracteolate only at base. Calyx deeply 5-partite; segments ligulate, eglandulose, or with only rudimentary glands, appresso-tomentose. Petals 5, on longish thick claws; lamina pentagonal, fimbriate, the fimbriæ clavate. Stamens 10, subunequal; anthers roundish. Styles 3, subulate; stigmas capitate. Capsules muricato-cristate, prolonged on one side into a greenish-white semiobovate wing (1.7 × 0.6 inch).

Habitat.—On the river Uaupés, the Içanna, and other upper tributaries of the Rio Negro, where it is commonly planted in the roças or mandiocca-plots; also at the cataracts of the Orinoco, and on its tributaries, from the Meta upwards; and on the Napo and Pastasa and their affluents, about the eastern foot of the Equatorial Andes. Native names: Caapi, in Brazil and Venezuela; Cadána, by the Tucáno Indians on the Uaupés; Aya-huasca (*i.e.* Dead man's vine) in Ecuador.[1]

The lower part of the stem is the part used. A quantity of this is beaten in a mortar, with water, and sometimes with the addition of a small portion of the slender roots of the Caapi-pinima.[2] When sufficiently triturated, it is passed through a sieve, which separates the woody fibre, and to the residue

[1] Caapí (the Portuguese have made it Caapîm) is the Tupí or Lingoa Geral name for "grass." It means simply "thin leaf," and in that sense may correctly be applied to the *Banisteria Caapi*. In the same language the Maté of Paraguay (*Ilex Paraguayensis*) is called Caamirim, *i.e.* "small leaf," which is certainly not so truly said of it. The Brazilian Indians accent the last, the Venezuelan the first, syllable of Caapi.

[2] Caapi-pinima, *i.e.* "painted Caapi," is an Apocyneous twiner of the genus Hæmadictyon, of which I saw only young shoots, without any flowers. The leaves are of a shining green, painted with the strong blood-red veins. It is possibly the same species as one I gathered in flower, in December 1849, at an Indian settlement on the river Trombetas (Lower Amazon), and has been distributed by Mr. Bentham under the name of *Hæmadictyon amazonicum*, n. sp. It may be the Caapi-pinima which gives its nauseous taste to the caapi drink prepared on the Uaupés, and it is probably poisonous, like most of its tribe; but it is not essential to the narcotic effect of the Banisteria, which (so far as I could make out) is used without any admixture by the Guahibos, Zaparos, and other nations, out of the Uaupés.

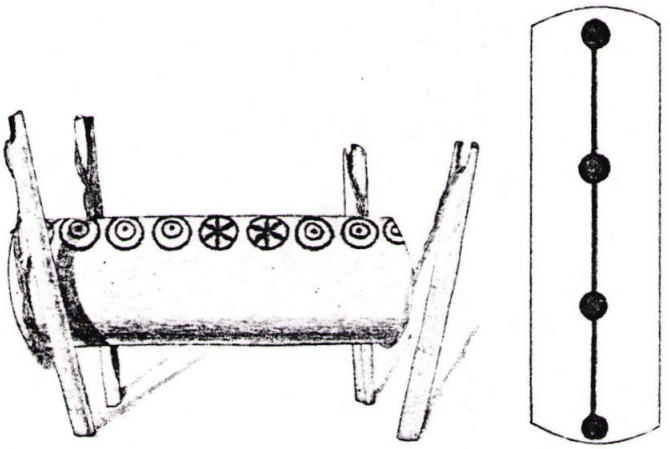
The Tucáno Indians call this plant Cadána-pira, which means the same as the Tupí name. They are the most powerful tribe on the Uaupés, and the greatest consumers of caapi; but all the other tribes on that river—and they are about a dozen—use it in the same way.

enough water is added to render it drinkable. Thus prepared, its colour is brownish-green, and its taste bitter and disagreeable.

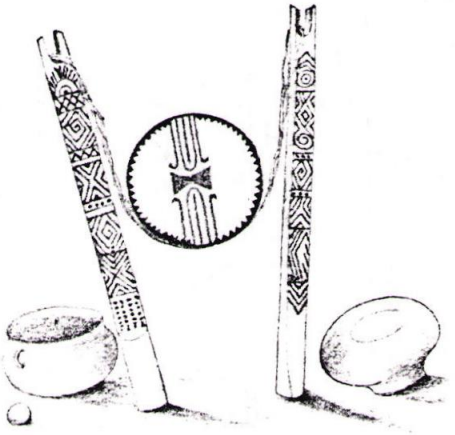
The Use and Effects of Caapi

In November 1852 I was present, by special invitation, at a Dabocurí or Feast of Gifts, held in a mallóca or village-house called Urubú-coará (Turkey-buzzard's nest), above the first falls of the Uaupés; the village of Panuré, where I was then residing, being at the base of the same falls, and about four miles away from Urubú-coará, following the course of the river, which during that space is a continuous succession of rapids and cataracts among rocky islands. We reached the mallóca at nightfall, just as the botútos or sacred trumpets began to boom lugubriously within the margin of the forest skirting the wide space kept open and clear of weeds around the mallóca.[1] At that sound every female outside makes a rush into the house, before the botútos emerge on the open; for to merely see one of them would be to her a sentence of death. We found about 300 people assembled, and the dances at once commenced. I need not detail the whole proceedings, for similar feasts have already been described by Mr. Wallace (*Travels on the Amazon and Rio Negro*, pp. 280 and 348). Indeed, there

[1] Some of the trumpets used at this very feast are now in the Museum of Vegetable Products at Kew. To get them out of the river Uaupés, when I left for Venezuela in March 1853, I wrapped them in mats and put them on board myself at dead of night, stowing them under the cabin floor, out of sight of my Indian mariners, who would not one of them have embarked with me had they known such articles were in the boat. The old Portuguese missionaries called these trumpets juruparís or devils—merely a bit of jealousy on their part: the botúto being the only fetish—not worshipped, but held in high respect—throughout the whole Negro-Orinoco region. (See figures opposite.)



Side view. Back view.



End view.

FIG. 15.—INDIAN SACRED DRUM OR TRUMPET.

The upright outline shows the holes at bottom of the drum (as suspended) through which the inside has been scooped out. The patterns are in red and blue.

is such a family likeness in all the Indian festivities of Tropical America that, allowing for slight local variations, the description of one might serve for all. There is no more graphic account of a native feast than that by old Wafer, of one he saw on the Isthmus of Darien (*New Voyage and Description of the Isthmus of America*, p. 363).

In the course of the night, the young men partook of caapi five or six times, in the intervals between the dances; but only a few of them at a time, and very few drank of it twice. The cup-bearer—who must be a man, for no woman can touch or taste caapi—starts at a short run from the opposite end of the house, with a small calabash containing about a teacupful of caapi in each hand, muttering "Mo-mo-mo-mo-mo" as he runs, and gradually sinking down until at last his chin nearly touches his knees, when he reaches out one of his cups to the man who stands ready to receive it, and when that is drunk off, then the other cup.

In two minutes or less after drinking it, its effects begin to be apparent. The Indian turns deadly pale, trembles in every limb, and horror is in his aspect. Suddenly contrary symptoms succeed: he bursts into a perspiration, and seems possessed with reckless fury, seizes whatever arms are at hand, his murucú, bow and arrows, or cutlass, and rushes to the doorway, where he inflicts violent blows on the ground or the doorposts, calling out all the while, "Thus would I do to mine enemy (naming him by his name) were this he!" In about ten minutes the excitement has passed off, and the Indian grows calm, but appears exhausted. Were he at home in his hut, he would sleep off the

remaining fumes, but now he must shake off his drowsiness by renewing the dance.

I had gone with the full intention of experimenting the caapi on myself, but I had scarcely dispatched one cup of the nauseous beverage, which is but half a dose, when the ruler of the feast—desirous, apparently, that I should taste all his delicacies at once—came up with a woman bearing a large calabash of caxirí (mandiocca-beer), of which I must needs take a copious draught, and as I knew the mode of its preparation, it was gulped down with secret loathing. Scarcely had I accomplished this feat when a large cigar, 2 feet long and as thick as the wrist, was put lighted into my hand, and etiquette demanded that I should take a few whiffs of it—*I*, who had never in my life smoked a cigar or a pipe of tobacco. Above all this, I must drink a large cup of palm-wine, and it will readily be understood that the effect of such a complex dose was a strong inclination to vomit, which was only overcome by lying down in a hammock and drinking a cup of coffee which the friend who accompanied me had taken the precaution to prepare beforehand.

White men who have partaken of caapi in the proper way concur in the account of their sensations under its influence. They feel alternations of cold and heat, fear and boldness. The sight is disturbed, and visions pass rapidly before the eyes, wherein everything gorgeous and magnificent they have heard or read of seems combined; and presently the scene changes to things uncouth and horrible. These are the general symptoms, and intelligent traders on the Upper Rio Negro, Uaupés, and

Orinoco have all told me the same tale, merely with slight personal variations. A Brazilian friend said that when he once took a full dose of caapi he saw all the marvels he had read of in the *Arabian Nights* pass rapidly before his eyes as in a panorama; but the final sensations and sights were horrible, as they always are.

At the feast of Urubú-coará I learnt that caapi was cultivated in some quantity at a roça a few hours' journey down the river, and I went there one day to get specimens of the plant, and (if possible) to purchase a sufficient quantity of the stems to be sent to England for analysis; in both which objects I was successful. There were about a dozen well-grown plants of caapi, twining up to the tree-tops along the margin of the roça, and several smaller ones. It was fortunately in flower and young fruit, and I saw, not without surprise, that it belonged to the order Malpighiaceæ and the genus Banisteria, of which I made it out to be an undescribed species, and therefore called it *Banisteria Caapi*. My surprise arose from the fact that there was no narcotic Malpighiad on record, nor indeed any species of that order with strong medicinal properties of any kind. Byrsonima—a Malpighiaceous genus that abounds in the Amazon valley—includes many species, all handsome little trees, with racemes of yellow or rose-coloured flowers, followed by small edible but rather insipid drupes. Their bark abounds in tannin, and is the usual material for tanning leather at Pará, as also, by the Indians, for dyeing coarse cotton garments a red-brown colour. Another genus—Bunchosia—grows chiefly on the slopes of the Andes, at from

7000 to 9000 feet elevation, and the species are trees of humble growth, bearing large yellowish-green edible drupes known as Ciruelas de fraile (Friar's plums). In cultivation the fruits are mostly seedless, and in that state are sometimes brought for sale to Ambato and other towns. The seed is described in books as poisonous, and if it be really so, then it is the only instance, so far as I know, of the existence of any hurtful principle in the entire family of Malpighiads, always excepting that of the Caapi. Yet strong poisons may lurk undiscovered in many others of the order, which is very large, and (the twining species especially) of great sameness of aspect; and the closely-allied Soapworts (Sapindaceæ) contain strong narcotic poisons, especially in the genus Paullinia.

I obtained a good many pieces of stem, dried them carefully, and packed them in a large box, which contained botanical specimens, and dispatched them down the river for England in March 1853. The man who took that box and four others on freight, in a large new boat he had built on the Uaupés, was seized for debt when about half-way down the Rio Negro, and his boat and all its contents confiscated. My boxes were thrown aside in a hut, with only the damp earth for floor, and remained there many months, when my friend Senhor Henrique Antonij, of Manáos, whom I had advised by letter of the sending-off of the boxes, heard of the mishap, and succeeded in redeeming them and getting them sent on to the port of Pará. When Mr. Bentham came to open them in England, he found the contents somewhat injured by damp and mould, and the sheets of specimens near the bottom

of the boxes quite ruined. The bundle of Caapi would presumably have quite lost its virtue from the same cause, and I do not know that it was ever analysed chemically; but some portion of it should be in the Kew Museum at this day.

Caapi is used by all the nations on the river Uaupés, some of whom speak languages differing *in toto* from each other, and have besides (in other respects) widely different customs. But on the Rio Negro, if it has ever been used, it has fallen into disuse; nor did I find it anywhere among nations of the true Carib stock, such as the Barrés, Banihuas, Mandauacas, etc., with the solitary exception of the Tarianas, who have intruded a little way within the river Uaupés, and have probably learnt to use caapi from their Tucáno neighbours.

When I was at the cataracts of the Orinoco, in June 1854, I again came upon caapi, under the same name, at an encampment of the wild Guahibos, on the savannas of Maypures. These Indians not only drink the infusion, like those of the Uaupés, but also chew the dried stem, as some people do tobacco. From them I learnt that all the native dwellers on the rivers Meta, Vichada, Guaviare, Sipapo, and the intervening smaller rivers, possess caapi, and use it in precisely the same way.

In May 1857, after a sojourn of two years in the North-Eastern Peruvian Andes, I reached, by way of the river Pastasa, the great forest of Canelos, at the foot of the volcanoes Cotopaxi, Llanganati, and Tunguragua; and in the villages of Canelos and Puca-yacu—inhabited chiefly by tribes of Zaparos—I again saw Caapi planted. It was the identical species of the Uaupés, but under a different name,

in the language of the Incas, Aya-huasca, *i.e.* Dead man's vine. The people were nearly all away at the gold-washings, but from the Governor of Puca-yacu I got an account of its properties coinciding wonderfully with what I had previously learnt in Brazil. Dr. Manuel Villavicencio, a native of Quito, who had been some years governor of the Christian settlements on the Napo, published the following year, in his *Geografia de la Republica del Ecuador* (New York, 1858), an interesting account of the customs of the natives of that river, and amongst others of their drinking the aya-huasca; but of the plant itself he could tell no more than that it was a liana or vine. The following is a summary of what I learnt at Puca-yacu and from Villavicencio of the uses and effects of the aya-huasca or caapi, as observed on the Napo and Bombonasa.

Aya-huasca is used by the Zaparos, Angutéros, Mazánes, and other tribes precisely as I saw caapi used on the Uaupés, viz. as a narcotic stimulant at their feasts. It is also drunk by the medicine-man, when called on to adjudicate in a dispute or quarrel —to give the proper answer to an embassy—to discover the plans of an enemy—to tell if strangers are coming—to ascertain if wives are unfaithful—in the case of a sick man to tell who has bewitched him, etc.

All who have partaken of it feel first vertigo; then as if they rose up into the air and were floating about. The Indians say they see beautiful lakes, woods laden with fruit, birds of brilliant plumage, etc. Soon the scene changes; they see savage beasts preparing to seize them, they can no longer hold themselves up, but fall to the ground.

At this crisis the Indian wakes up from his trance, and if he were not held down in his hammock by force, he would spring to his feet, seize his arms, and attack the first person who stood in his way. Then he becomes drowsy, and finally sleeps. If he be a medicine-man who has taken it, when he has slept off the fumes he recalls all he saw in his trance, and thereupon deduces the prophecy, divination, or what not required of him. Boys are not allowed to taste aya-huasca before they reach puberty, nor women at any age: precisely as on the Uaupés.

Villavicencio says (*op. cit.* p. 373): "When I have partaken of aya-huasca, my head has immediately begun to swim, then I have seemed to enter on an aerial voyage, wherein I thought I saw the most charming landscapes, great cities, lofty towers, beautiful parks, and other delightful things. Then all at once I found myself deserted in a forest and attacked by beasts of prey, against which I tried to defend myself. Lastly, I began to come round, but with a feeling of excessive drowsiness, headache, and sometimes general *malaise*."

This is all I have seen and learnt of caapi or aya-huasca. I regret being unable to tell what is the peculiar narcotic principle that produces such extraordinary effects. Opium and hemp are its most obvious analogues, but caapi would seem to operate on the nervous system far more rapidly and violently than either. Some traveller who may follow my steps, with greater resources at his command, will, it is to be hoped, be able to bring away materials adequate for the complete analysis of this curious plant.

Niopo Snuff and the Mode of using it

II. PIPTADENIA NIOPO, Humboldt

Synonyms—*Acacia*? *Niopo*, Humb., *Rel. Hist.* ii. p. 620; ejusdem *Nov. Gen. Amer.* vi. p. 282; *DC. Prodr.* ii. p. 471. *Inga Niopo*, Willd.

Description.—Tree, 50 feet by 2 feet, with muricated bark, otherwise unarmed. Leaves bipinnate; pinnæ twenty-four pairs; pinnules very numerous, minute, linear, mucronato-apiculate, ciliated, sparsely sub-pubescent. An oblong gland on petiole above base; another between terminal pinnæ. Racemes axillary and terminal; pedicels twin, each bearing a small globose head of white flowers. Corolla slightly emersed from 5-angled calyx. Stamens 10; anthers tipped with a gland. Pod linear, sub-compressed, apiculate, 7–12-seeded, sub-constricted between seeds. Seeds flattish, green.

Habitat.—In the drier forests of the Amazon, and along its tributaries, both northern and southern; on the Rio Negro, throughout its course; also at the cataracts of the Orinoco; both wild and planted near villages. (Santarem, fl. Amazonum, Spruce, *Exsicc.* No. 828, etiam Janauarí, fl. Negro, No. 1786.) Native names: Paricá in Brazil; Niópo in Venezuela.

We owe our first knowledge of Niopo snuff, and of the tree producing it, to Humboldt and Bonpland, whose brief account of it is thus condensed by Kunth: "Ex seminibus tritis calci vivae admixtis fit tabacum nobile quo Indi Otomacos et Guajibos utuntur" (*Synopsis*, iv. p. 20). In the modern niopo, as I saw it prepared by the Guahibos themselves, there is no admixture of quicklime, and that is the sole difference. My specimens of the leaves, flowers, and fruit agree so well with Kunth's description of *Acacia Niopo* that I cannot doubt their being the same species; especially as I have traced the tree all the way from the Amazon to the Orinoco, and found it everywhere identical, although it bears a different name on the two rivers, as is commonly the case where the same plant or animal occurs on

both. Mr. Bentham believes my plant to be the old *Mimosa peregrina* of Linnæus (*Acacia peregrina*, Willd.); and if both opinions be correct, then the species must be called *Piptadenia peregrina* (L.), Benth.; and *Acacia Niopo*, Humb., will stand as a synonym.

I first gathered specimens of the Parica (or Niopo) tree in 1850, near Santarem, at the junction of the Tapajoz and Amazon, where it had apparently been planted. In the following year I gathered it on the little river Jauauarí—one of the lower tributaries of the Rio Negro—where it was certainly wild. But I did not see the snuff actually prepared from the seeds and in use until June 1854, at the cataracts of the Orinoco. A wandering horde of Guahibo Indians, from the river Meta, was encamped on the savannas of Maypures, and on a visit to their camp I saw an old man grinding Niopo seeds, and purchased of him his apparatus for making and taking the snuff, which is now in the Museum of Vegetable Products at Kew. I proceed to describe both processes.

The seeds being first roasted, are powdered on a wooden platter, nearly the shape of a watch-glass, but rather longer than broad (9¼ inches by 8 inches). It is held on the knee by a broad thin handle, which is grasped in the left hand, while the fingers of the right hold a small spatula or pestle of the hard wood of the Palo de arco (Tecomæ sp.) with which the seeds are crushed.

The snuff is kept in a mull made of a bit of the leg-bone of the jaguar, closed at one end with pitch, and at the other end stopped with a cork of marima bark. It hangs around the neck, and from it are

suspended a few odoriferous rhizomes of a sedge (*Kyllingia odorata*). Rhizomes of the same sedge, or of an allied species, are in use among the Indians throughout the Amazon and Orinoco. They render the wearer secure from the bad wish and evil eye of his enemies.

For taking the snuff they use an apparatus made of the leg-bones of herons or other long-shanked birds put together in the shape of the letter Y, or something like a tuning-fork, and the two upper tubes are tipped with small black perforated knobs (the endocarps of a palm). The lower tube being inserted in the snuff-box and the knobs in the nostrils, the snuff is forcibly inhaled, with the effect of thoroughly narcotising a novice, or indeed a practised hand, if taken in sufficient quantity; but this endures only a few minutes, and is followed by a soothing influence, which is more lasting.

The Guahibo had a bit of caapi hung from his neck, along with the snuff-box, and as he ground his niopo he every now and then tore off a strip of caapi with his teeth and chewed it with evident satisfaction. "With a chew of caapi and a pinch of niopo," said he, in his broken Spanish, "one feels so good! No hunger—no thirst—no tired!" From the same man I learnt that caapi and niopo were used by all the nations on the upper tributaries of the Orinoco, *i.e.* on the Guaviare, Vichada, Meta, Sipapo, etc.

I had previously (in 1851) purchased of a Brazilian trader at Manáos an apparatus for taking niopo snuff rather different from that of the Guahibos. He had brought it from the river Purús, where it had been used by the Catauixí Indians. My note

on it (as taken down from his account) is as follows :—

The Catauixís use niopo snuff as a narcotic stimulant, precisely as the Guahibos of Venezuela, and as the Muras and other nations of the Amazon, where it is called paricá. For absorbing paricá by the nose, a bent tube is made of a bird's shank-bone, cut in two, and the pieces joined by wrapping, at such an angle that one end being applied to the mouth, the other reaches the nostrils. A portion of snuff is then put into the tube and blown with great force up the nose. A clyster-pipe is made, on the same principle, of the long shank-bone of the tuyuyú (*Mycteria americana*). The effect of paricá, taken as snuff, is to speedily induce a sort of intoxication, resembling in its symptoms (as described to me in this instance) that produced by the fungus *Amanita muscaria*. Taken in injection, it is a purge, more or less violent according to the dose. When the Catauixí is about to set forth on the chase, he takes a small injection of paricá, and administers another to his dog, the effect on both being (it is said) to clear their vision and render them more alert!

Herndon (*Valley of the Amazon*, p. 318) gives the following account of the use of paricá among the Mundrucús, on the river Tapajoz, which he derived from an intelligent Frenchman (M. Maugin) who had traded among them. "They powder the seeds of paricá, make the powder into a paste, and repulverise a portion whenever they want to take it as snuff. Two quills of the royal heron, joined side by side, make a double tube, which is applied to the nostrils and the powder snuffed up with

a strong inspiration. M. Maugin thus describes its effects on an Indian whom he saw take it. "His eyes started from his head, his mouth contracted, his limbs trembled. It was fearful to see him. He was obliged to sit down or he would have fallen. He was drunk, but only for about five minutes; he was then gayer."

"Medicine-Men" and their Customs

Among the native tribes of the Uaupés and of the upper tributaries of the Orinoco, niopo or paricá is the chief curative agent. When the payé is called in to treat a patient, he first snuffs up his nose such a quantity of paricá as suffices to throw him into a sort of ecstasy, wherein he professes to divine the nature of the evil wish which has caused the sickness, and to gather force to counteract it. He next lights a very thick cigar of tobacco, inhales a quantity of smoke, and puffs it out over the sick man, over the hammock in which he is laid, and over everything he habitually uses, but especially over the food he is to eat. This done, the payé professes to suck out the ill, by applying his mouth to the seat of pain, or as near to it as practicable; and he spits out the morbid matter—most likely tobacco or coca juice—and sometimes produces from his mouth thorns and other substances, previously hidden there, but which he pretends to have extracted from the sick man's body. If the sickness ends fatally, he denounces the enemy whose evil wish has caused it, and not infrequently it is some rival payé, of the same or another nation. Hence I was told that the payés

never travel without an accompaniment of at least four or five well-armed men, their lives being in continual jeopardy from such denunciations.

I have never been so fortunate as to see a genuine payé at work. Among the civilised Indians the Christian padre has supplanted the pagan payé, who has besides been discountenanced and persecuted by the civil authorities; so that if any now exist, he must exercise his office in secret. With the native and still unchristianised tribes I have for the most part held only passing intercourse during some of my voyages. Once I lived for seven months at a time among them, on the river Uaupés, but even there I failed to catch a payé. When I was exploring the Jauarité cataracts on that river, and was the guest of Uiáca, the venerable chief of the Tucáno nation, news came to the mallóca one afternoon that a famous payé, from a long way up river, would arrive that night and remain until next day, and I congratulated myself on so fine a chance of getting to know some of the secrets of his "medicine." He did not reach the port until 10 P.M., and when he learnt that there was a white payé (meaning myself) in the village, he and his attendants immediately threw back into the canoe his goods, which they had begun to disembark, and resumed their dangerous voyage down the river in the night-time. I was told he had with him several palm-leaf boxes, containing his apparatus. (There is a similar box now in the Kew Museum, sent by me from the Uaupés.) I could only regret that his dread of a supposed rival had prevented the interview which to me would have been full of interest; the more so as I was prepared to barter

with him for the whole of his materia medica, if my stock-in-trade would have sufficed.

Rochefort (*Histoire Naturelle et Morale des Isles Antilles*, Rotterdam, 1665), says: "Their Boyés or medicine-men practise both medicine and devilry. They are resorted to: 1, to cause punishment to fall on some one who has wronged or injured the applicant; 2, to cure some disease; 3, to foretell the advent of a war; 4, to drive out the Maboya or Evil Spirit" (p. 472).

Their functions are very much the same at the present day among the native tribes of the mainland as they were two or three hundred years ago in the isles of the Caribbean Sea. I propose, in what follows, to review briefly the use made by the payés of their materia medica in the treatment of disease.

The apparatus and materia medica of the medicine-men of the region lying adjacent to the Upper Rio Negro and Orinoco, and extending thence westward to the Andes, are chiefly the following:—

The Maraca or Rattle.

Tobacco, juice and smoke.

Niopo (or Paricá), powdered seeds in snuff.

Caapi (or Aya-huasca), stems in infusion.

1. *The Maraca or Rattle.*—This is the hard globose or oval pericarp of the *Crescentia Cujete*, or sometimes of a gourd, tastefully engraved and perforated in geometrical or fantastic designs, and the lines usually coloured. To make it rattle, a few small bright-red or red-and-black beans are put into it; those most used on the Uaupés are seeds of *Batesia erythrosperma* (Spruce) and of *Ormosia coccinea* (Jack). I have seen the maraca used in

dances, but it is also employed by the payés in their divinations, and Bancroft's account of its use in Guayana corresponds so nearly with what was told to me on the Uaupés, that I cannot do better than transcribe it here.

"The medicine-men, called Peiís [Stedman says Peiis or Pagayers], unite in themselves the sacerdotal and medicinal functions. One of the implements of the peii is a hollowed calabash (cuya) through the centre of which an axis is passed projecting about a foot on each side, the thick end forming a handle, the thin end decorated with feathers; it is also carved and painted and perforated with small holes—some long, some round—and several quartz pebbles and red-and-black beans are put inside it, so that it forms a rattle. When the peii is called to a patient, he begins his exorcism at night, the lights being put out and he left alone with the patient. He rattles his maraca by turning it slowly round, singing at the same time a supplication to the Yawahoo. This goes on for say a couple of hours, when the peii is heard conversing with the Yawahoo—at least there are two distinct voices. Afterwards the peii makes a report in an ambiguous style, on what will be the event of the disorder. The exorcisms are repeated every night until after a favourable turn, when the peii pretends to extract the cause of the disorder by sucking the part affected, after which he pulls out of his mouth fish-bones, thorns, snake's teeth, or some such substance, which he has before concealed therein, but pretends to have been maliciously conveyed into the affected part by the Yawahoo. The patient then fancies himself cured, and the influence

of imagination helps his recovery. If the patient dies, the peii attributes it either to the implacable Yawahoo or to the influence of some inimical peii." (*An Essay on the History of Guayana*, by Dr. Edward Bancroft, 1769, p. 310.)

Long before Bancroft's time the use of the maraca and of tobacco by Brazilian payés was described by Thevet, as follows: "Existimant enim, cum hunc fructum (quem Maraka et Tamaraka nuncupant) manibus pertractant, crepitantemque ob Mayzi grana injecta audiunt, cum suo se Toupan, id est, Deo sermones conferre atque ab eo quodam responsa accipere, sic a suis Paygi (divinatorum genus est, qui suffitu herbae Petun, et quibusdam obmurmurationibus illorum Tamaraka divinam facultatem attribuunt tribuere perhibent) persuasi."[1]

The accounts given by the early missionaries of the doings of the payés are seldom full or reliable. Those pious men regarded them as the great obstacle to the reception of the Christian faith by the natives, and always wrote of them with a certain impatience and disgust, under the belief (no doubt sincere) that the payés had direct dealings with the devil. But the cure of disease by suction is alluded to by missionaries in every part of South America. In the *Lettres Édifiantes et Curieuses*, consisting of selections from the correspondence of missionaries in various heathen countries, published with the sanction of the holy see, there is this note about the medicine-men of the Moxos Indians: "L'unique soulagement qu'ils se procurent dans

[1] Thevetus, as quoted by Chusius, in *Aromatum et Simplicium aliquot . . . Historia*. Auctore Garcia ab Horto, Medico Lusitanico. Ed. Clusio. Antverpiæ, 1579.

leurs maladies, consiste à appeler certains enchanteurs, qu'ils s'imaginent avoir reçu un pouvoir particulier de les guérir ; ces charlatans vont trouver les malades, récitent sur eux quelque prière superstitieuse, leur promettent de jeûner pour leur guérison, et de prendre un certain nombre de fois par jour du tabac en fumée ; ou bien, ce qui est une insigne faveur, ils sucent la partie mal affectée, après quoi ils se retirent, à condition qu'on leur payera libéralement ces sortes de services" (tome viii. p. 83). And at p. 339 of the same volume, speaking of the enchanters of the Chiquitos, it is said: "Le médecin suce ensuite la partie mal affectée, et au bout de quelque temps il jette par la bouche une matière noire: Voilà, dit-il, le venin que j'ai tiré de votre corps."

It is not necessary to be a payé to "suck out a pain." Among the Barrés it is commonly practised, and I have seen a fellow hang on to his comrade's shoulder for half an hour together, "sucking out the rheumatism." But as they know the whites ridicule the practice, they avoid as much as possible being surprised in it. Formerly they had professional chupadores or suckers; but in my time there were none such, besides the payés, who were found only among the unchristianised tribes.

2. *Tobacco.*—This was possibly the first narcotic ever used in South America, and is likely to be the last. In one form or another it is a prime ingredient in the medicine of the payés. Rochefort says: "Each Boyé has his familiar demon, whom he evoques by a chant, accompanied by the smoke of tobacco, whose perfume is supposed to be attractive to devils" (*loc. cit.* p. 473). And it is

essential to the *making* of payés. Bancroft says: "The order of Peiis is inherited by the eldest sons. A young Peii is initiated with superstitious ceremonies lasting several weeks. Among other things, he is dosed with tobacco till it no longer operates as an emetic" (*loc. cit.*).

Tobacco-smoke is blown on the sick person by the payé in almost all methods of cure, whether the maraca, niopo, or caapi be the primary agent. In lieu of the two latter it would seem that in some nations the enchanters narcotised themselves by chewing tobacco and swallowing the juice. The large cigar used on the Uaupés is smoked in the ordinary way, and the smoke blown from the mouth; but in the country bordering the Pacific coast of Equatorial America the cigar—two or three feet long, but slenderer than that of the Uaupés—was held in the mouth *at the lighted end*, and the smoke blown from the opposite end upon the sick person, or, at a feast, in the faces of the guests, whereof Wafer has an amusing account and a rude picture (p. 327, *loc. cit.*). He calls the payés pawawers, evidently the same name, with a merely dialectic difference. It is curious that at the present day the Indians and negroes along that coast frequently hold the lighted end of a cigar in their mouths, as any one who has sojourned at Panama or Guayaquil may have observed.

The uses of niopo (or paricá) and of caapi (or aya-huasca) I have already indicated above. The former is the chief "medicine" of the payés on the affluents of the Amazon, both northern and southern, and on the Orinoco; but the latter in the roots of the Equatorial Andes. I have not learnt that they

are ever used in conjunction, except as an occasional stimulant, and in small quantity.

On Spirits or Demons amoug the Indians

I have never heard any mention among the native races with whom I have sojourned of a Spirit or Demon the payé was supposed to invoke, but there has been so much testimony to that effect, that it can hardly fail to be true. This demon—the Maboya of the Antilles, the Yawahoo of Guayana (according to Bancroft and Stedman)—is surely the Yamádu of the Casiquiari and Alto Orinoco. But when I made inquiry about the latter, I was always assured that it had a bodily, and not merely a ghostly existence. It is, in fact, a Wild Man of the Woods or Forest Devil—the Curupira or Diabo do mato of the Amazon, the Munyía of the eastern foot of the Equatorial Andes —a little hairy man, not more than four to five feet high, but so strong and wiry that no single Indian can cope with him. His great peculiarity is that, although his tracks are often met with, no one can tell which way he has gone. Either, as on some parts of the Amazon, he has a perfectly human foot, but set on the contrary way; or else, as on the Casiquiari, Uaupés, Napo, etc., he has two heels on each foot and never a toe. This little devil plays many pranks, of which the most serious is his carrying off women who venture alone into the forest; but he never attacks two people together, so that in some parts a man or woman will take a little child into the forest rather than go alone. If an Indian loses his way in the forest, he blames the

Curupira, and to find it again he twists a liana into a ring—or, if he be a Christian, into the form of a cross—in such a way that the points of the liana are completely hidden; he then throws it behind him, taking care not to look which way it goes, and afterwards picks it up and follows the direction in which it has fallen. I cannot here recount all the tales I have heard about this mysterious being, but I suppose they point to the former existence in the regions of some *homo primordialis*, and that the fact has come down by tradition from untold ages, coupled with the belief that the species is even yet not extinct. Meanwhile, until the animal, or its skeleton, be found—which I do not look on as impossible—I suppose we must consider the Curupira, or Munyía, or Yamádu, the analogue of the Barghaist of the north of England and Scotland, the Loup-garou of France, the Lobishomem of Portugal, and other similar mythical creatures.

A Strange Occurrence and its Explanation

In my voyage to the Upper Orinoco, by way of the Casiquiari, in 1853-54, when the river was so low at Christmas that I had great difficulty in getting my piragoa up as far as Esmeralda, and it was quite impossible to ascend farther, as I had at first intended, I afterwards explored its northern tributary, the Cunucunúma, and re-entered the Casiquiari, intending to go as far down as Lake Vasiva. The dry season should have held all through the months of January and February, and Vasiva was described to me as having at that time broad sandy beaches, sprinkled with curious little plants, and bordered

with flowering bushes, so that I reasonably hoped to make a fine collection there. But the first night of our downward voyage (Jan. 7) the rains came on, out of their time, and continued daily for many days, until the river had risen to its winter level, and the forest-margin was mostly flooded. There are only two small pueblos on the Casiquiari above the outlet of Lake Vasiva, and at the lower of these I halted nine days, hoping the floods might subside. This pueblo was of only recent formation, and was peopled by Pacimonari Indians, who had named it Yamádu-bani, that is, Wild Man's Land, because the adjacent forests were said to be haunted by the Yamádu. I explored them as much as the heavy rains permitted, and never encountered any Yamádu; but on the very first day I was myself taken for it by two girls whom I met suddenly at the turning of a large buttressed tree, on a forest trail, and who threw down their baskets, laden with manioc, and fled affrighted. At length the weather seemed to take up a little, although the river was still high, and I determined to go on to Vasiva. We accordingly re-embarked early on the 21st, and eight oars, aided by a strong current, brought us to the lake at 4 P.M.; but in vain we coasted along to find a bit of dry land whereon to encamp, for the trees and bushes were all in water up to 4 or 5 feet; so that we had to return to the narrow winding channel forming the outlet of the lake, where there was a scanty strip of terra firme and a rancho left by a party that had gathered turtles' eggs there the previous year. Here we remained four days, but the weather was dreadfully rainy, the sun never once appeared, and all I could do was to creep

about the margin of the lake and up its tributary creeks in my curiara, and gather specimens of the few trees that were in flower. On the 22nd, at 4 P.M., when we were cooking our dinner, we were startled by hearing the report of a musket in the forest on the opposite bank of the river, there not more than 80 yards wide. It is scarcely possible to conceive the strangeness of such a sound in savage, desolate forests which scarcely any human being could penetrate, especially one accustomed to firearms. A region of at least 10,000 square miles, of which we were the centre, had scarcely 400 inhabitants, and those chiefly half-wild Indians, whose weapon was the blowing-cane. The nearest settlement was that of Yamádu-bani, but we knew that none of their hunting tracks extended to Vasiva; and the half-dozen adult males had neither guns nor ammunition when we left them only the day before. There had been no inhabitants on Vasiva for very many years, and there were no traders or other travellers on the Casiquiari at that season beside ourselves. I was completely puzzled. The report was not exactly like that of either musket or rifle, nor was it any one of the accustomed sounds which at rare intervals break the silence of those vast solitudes, and with which I had become familiar. The crash of a huge tree falling from sheer age—the explosion, like distant cannon, of an old hollow Sassafras or Capivi tree, burst by the balsam accumulated in the cavity—the solitary thunderclap in an apparently cloudless sky—the roar of cataracts, and of the approaching hurricane—all these sounds I had previously heard, and had learnt to distinguish. My Indians, however, although even more startled

than myself, soon made up their minds about the origin of the unwonted sound. It was the Yamádu, *in propria persona*, hunting near us, and he would infallibly send us terrible rain or some other calamity to warn us off his territory. The soughing of the approaching tempest was already heard, and presently it burst upon us, with thunder and lightning and deluging rain that lasted until midnight. The two following days were dull and dropping, and a little later on in the day—that is, towards nightfall—we each day heard a single report, not quite so near at hand, and then we had heavy rain from 7 P.M. throughout the night. My people became silent and gloomy, were afraid, they said, to hunt or fish, and I believe if I had remained another night would have every one deserted me. So in the afternoon of the 25th I gave the order for resuming our voyage down the Casiquiari, to their very great content. When I came on deck shortly afterwards to see if everything was in readiness for starting, I saw some of the men in a tree that overhung our encampment, fastening to the branches a couple of scarecrows they had rigged up out of old shirts and trousers. "What does this mean, Antonio?" said I to one of them who was fond of talking to me in Lingua Tupí. "Yánerangáua" (our effigies), said he. "Oh, I see," said I. "You think to cheat the Yamádu. Seeing us up the tree, he will fancy we are still here, and will not pursue us down the river!" But I had a quiet laugh over it in the recesses of my cabin. It reminded me of a fellow pursued by a bull, who throws off hat and coat to detain the savage brute until he himself can gain a place of safety.

For years afterwards the solitary shots in the sombre forests of Lake Vasiva used to haunt my memory and my dreams. They were as mysterious to me, although not so alarming, as the single foot-print was to Robinson Crusoe. My ears were always open to some repetition of the sound which might lead to detecting its origin. In April 1857, I was on my voyage up the lonely Pastasa, at the eastern foot of the Andes. My companions were two Spaniards, two whitish lads who acted as our servants, and fourteen Cucáma Indians who paddled our two canoes. Five months before, there had been an uprising of the savage Jibaros and Huambisas, who had laid waste the Christian villages on the Amazon, below the Pongo de Manseriche, and the only village (Santander) on the Lower Pastasa. We travelled, therefore, in constant risk of being attacked, and were on the alert day and night. The Indians would never go on shore to cook until we had first landed with our arms and ascertained that the adjacent forest was clear. One morning we had cooked our breakfast, and were just squatting down, Turkish fashion, around the steaming pots, when what sounded like a gunshot—quite near—brought us all to our feet. But the Jibaros, we knew, had no firearms, and it at once struck me that it was the identical sound heard on Lake Vasiva. "What and where is that?" I exclaimed. "I will take you straight to it, if you like," said the old pilot of my canoe; and accepting his offer, I plunged into the bush with him, and in three minutes reached a heap of débris, like a huge haycock, the remains of a decayed Palm-trunk whose sudden fall it was that had startled us. It

had been a very tall, stout Palm, 80 or 100 feet high at the least. When the vitality of a Palm is exhausted, the crown of fronds first withers and falls, and then the soft interior of the trunk gradually rots and is eaten away by termites until nothing is left but a thin shell; and when that can no longer bear its own weight, it collapses and breaks up in an instant, with a crash very like a musket-shot.[1]

A few weeks later, I had to make my way on foot through the forest of Canelos, and it sometimes happened that when we had to cook our supper, after a day of soaking rain, we could find no wood that would burn but these shells of Palm-trunks. (The Palm was the curious *Wettinia Maynensis*, which abounded there.) A single stroke of a cutlass would often suffice to cause them to collapse and fall, in a mass of dust and splinters, repeating each time the report of the weapon of the mysterious hunter of Vasiva, and not without risk to the operator of being buried in the ruins.

Sometimes when I have been deep in the virgin forest, and could not see through the overarching foliage any sign of rain in the sky, or was heedless of it—when not a sound or a breath of air disturbed the solemn calm and stillness—a shiver would all at once pass through the tree-tops, and yet no wind at all be sensible below. Then all would be still again, and it was not until a few minutes later that a distant soughing announced the coming tempest. The preliminary shudder would bring down dead leaves and twigs, and such a one might have

[1] This strange sound is briefly described in Spruce's Journal. See vol. i. p. 423.

prostrated the decayed Palm on Lake Vasiva. Other dead Palms might fall when the full force of the squall caught them, but the crash of their fall would be drowned in the general roar of the tempest, and especially in the continuous roll of the thunder. The truth seems to be that it is nearly always during a storm such Palms do fall, and that their prostration during a season of calm is the rarest possible occurrence; which accounts for my having passed four years and a half in the forest before I ever heard it, and for others having lived the best part of their lives there either without noticing it, or without caring to ascertain the origin of the sound caused by it. It hardly needs mention that perfectly vigorous Palm trees, and trees of all kinds, may fall during a violent storm. Hurricanes that open out long lanes in the forest are only too frequent towards the sources of the Orinoco, but are exceedingly rare on and near the Amazon.

Rarity of Curative Drugs among the Indigenes

From what was said above, it will have been seen that, although the medicine-man doses himself with powerful narcotics, no drug whatever is administered to the patient; nor could I learn that it was ever done by a "regular practitioner." The Indians have a few household remedies, but by far the greater portion of these have come into use since the advent of the white man from Europe and the negro from Africa. Von Martius remarks nearly the same thing in the introduction to his *Systema Materiae Medicae vegetabilis Brasiliensis*

(1843, p. xvii.): "At valde fallerentur, qui putarent, Brasiliae plantas medicas omnes per autochthones colonis esse oblatas; potius multa me movent, ut dicam, totidem, quae nunc adhibentur, a nigris et albis incolis esse detectas et usu cognatas, quot ab illis." Of external applications, I have seen only the following. For a wound or bruise or swelling, the milky juice of some tree is spread thick on the skin, where it hardens into a sort of plaster, and is allowed to remain on until it falls of itself. Almost any milky tree may serve, if the juice be not acrid; but the Heveas (India-rubbers), Sapotads, and some Clusiads are preferred. Such a plaster has sometimes an excellent effect in protecting the injured part from the external air.

At Tarapoto, in the Eastern Peruvian Andes, where the people are all Christians, and some of them almost pure white, where there are churches and priests and schools, such medicine as they have is little more than necromantic practices of their curanderos. In all sicknesses the first curative operation is to sobar el espanto (rub out the fright), which is done thus: Chew a piece of the gum-resin called "sonitonio," place it in the hollow of the hand, and with it rub the legs of the sick person, from the knees downwards, and end by whistling between all the toes. There are other ridiculous and useless operations, but in some cases the rubbing is really beneficial. Take this mode of "rubbing out colic" as an example. Put a little fowl's grease in the hand, and rub it over the body of the patient, round and round, over the course of the colon, making every now and then a forcible twist and pressure on the navel, para soltar el

empacho (to loosen the indigestion). Rubbing with a dry hand is still better, and for lumbago and other forms of rheumatism has sometimes an excellent effect. There are persons who, by long practice, acquire what is called "a good hand," and are much sought after as sobadores or shampooers.

Nervous Stimulants used by the Indians

Several plants are used in South America as nervous stimulants, and all are more or less narcotic. Of these, the foremost place must be assigned to *Erythroxylon Coca* (Lam.)—Coca of the Peruvians, Ipadú of the Brazilians. Of its use in Peru, chiefly by miners and cargueros, Poeppig has already given an excellent account. There the entire leaf is chewed, with a small admixture of lime. But in North Brazil, where also its use is almost universal, I have always seen it used in powder. The plant itself, a slender shrub, with leaves not unlike tea-leaves, except that they are entire at the margins, is frequently planted near houses. In Peru, as is well known, there are large plantations of it, called cocales. I have gathered it truly wild on the rocky banks of the Rio Negro, near Tomo in Venezuela (hb. 3565); and an Erythroxylon (*E. cataractarum*, n. sp. hb. 2614), which I found growing abundantly on rocks in the cataracts of the Paapurís, a tributary of the Uaupés, which has small dark-green leaves only an inch and a half long, is considered by Mr. Bentham a variety of the same species.

In January 1851 I saw ipadú prepared and used on the small river Jauauarí, near the mouth of the

Rio Negro, and I sent a quantity of it to Kew for analysis. My account of it was published in Hooker's *Journal of Botany* for July 1853, and I here reproduce it. The leaves of ipadú are pulled off the branches, one by one, and roasted on the mandiocca-oven, then pounded in a cylindrical mortar, 5 or 6 feet in height, made of the lower part of the trunk of the Pupunha or Peach Palm (*Guilielmia speciosa*), the hard root forming the base and the soft inside being scooped out. It is made of this excessive length because of the impalpable nature of the powder, which would otherwise fly up and choke the operator; and it is buried a sufficient depth in the ground to allow of its being easily worked. The pestle is of proportionate length, and is made of any hard wood. When the leaves are sufficiently pounded, the powder is taken out with a small cuya fastened to the end of an arrow. A small quantity of tapioca, in powder, is mixed with it to give it consistency, and it is usual to add pounded ashes of Imba-úba or Drum tree (*Cecropia peltata*), which are saline and antiseptic. With a chew of ipadú in his cheek, renewed at intervals of a few hours, an Indian will go for days without food and sleep.

In April 1852 I assisted, much against my will, at an Indian feast in a little rocky island at the foot of the falls of the Rio Negro; for I had gone down the falls to have three or four days' herborising, and I found my host,—the pilot of the cataracts—engaged in the festivities, which neither he nor my man would leave until the last drop of cauim (coarse cane- or plantain-spirit) was consumed. During the two days the feast lasted I was nearly

famished, for, although there was food, nobody would cook it, and the guests sustained themselves entirely on cauim and ipadú. At short intervals, ipadú was handed round in a large calabash, with a tablespoon, for each one to help himself, the customary dose being a couple of spoonfuls. After each dose they passed some minutes without opening their mouths, adjusting the ipadú in the recesses of their cheeks and inhaling its delightful influences. I could scarcely resist laughing at their swollen cheeks and grave looks during these intervals of silence, which, however, had two or three times the excellent effect of checking an incipient quarrel. The ipadú is not sucked, but allowed to find its way insensibly into the stomach along with the saliva. I tried a spoonful twice, but it had little effect on me, and assuredly did not render me insensible to the calls of hunger, although it did in some measure to those of sleep. It had very little of either smell or taste, and in both reminded me of weak tincture of henbane. I could never make out that the habitual use of ipadú had any ill results on the Rio Negro; but in Peru its excessive use is said to seriously injure the coats of the stomach, an effect probably owing to the lime taken along with it.

The Use of Guaraná as a Tonic

Another powerful nervous tonic and subnarcotic is cupána or guaraná, which is prepared from the seed of a twining plant of the family of Sapindaceæ. The first definite information about it was obtained by Humboldt and Bonpland in the south of

Venezuela. Humboldt says: "A missionary seldom travels without being provided with some prepared seeds of the Cupána. The Indians scrape the seeds, mix them with flour of cassava, envelop the mass in plantain-leaves, and set it to ferment in water, till it acquires a saffron-yellow colour. This yellow paste, dried in the sun and diluted in water, is taken in the morning as a kind of tea. This beverage is bitter and stomachic, but appeared to me to have a very disagreeable taste." (*Personal Narrative*, v. 278, Miss Williams's translation.)

It was at Javita, near the head of the Atabapo, that Humboldt made trial of cupána. I first tasted the cold infusion, prepared nearly in the same way, except that no cassava had been added to the grated seeds, I think at Tomo, on the Guainia, only two days' journey from Javita, in 1853; and I afterwards drank it frequently on the Atabapo and Orinoco, where the inhabitants still take it commonly the first thing in a morning, on quitting their hammocks, and consider it a preservative against the malignant bilious fevers which are the scourge of that region. It is as bitter as rhubarb, and is always drunk unsweetened, so that at first one finds it absolutely repulsive; but it soon ceases to be so, and those who use it habitually get to like it much, and to find it almost a necessary of life. When the bowels are relaxed and coffee taken in the morning, fasting excites too much peristaltic action, then cupána is decidedly preferable, for it is less irritating than coffee and has quite the same stimulating effect on the nervous system.

Long before I saw cupána in Venezuela—indeed, ever since the end of 1849—I had been familiar with

it in Brazil, but under another name and prepared in a different way. There it is called guaraná, and is largely cultivated in the mid-Amazon region, especially on the river Mauhés, which is a little west of the Tapajoz, whence it is exported to all other parts of Brazil. Single plants of it may be seen in gardens and roças all the way up the Amazon, as far as to the Peruvian frontier; and throughout the Rio Negro. Martius's excellent account of the Guaraná of the Mauhés has been translated by Mr. Bentham in Hooker's *Journal of Botany* for July 1851. Martius called the plant *Paullinia sorbilis*, apparently not suspecting it to be the same as Humboldt's *Paullinia Cupana*; yet the two are absolutely identical, and Humboldt's name, being the elder, must stand.

The specimens distributed by Mr. Bentham in my Plantae Exsiccatae (No. 2055) were gathered at Uanauacá, a farm on the Rio Negro, a little below the cataracts. I subjoin the brief description I drew up on the spot.

PAULLINIA CUPANA, H. B. K., *Nov. Gen. Amer.* v. p. 117; *DC. Prodr.* i. 605.

Synon. *Paullinia sorbilis*, Mart., *Reise*, ii. p. 1098; ejusdem *Syst. Mat. Med. Brasil.* p. 59; Th. Mart. in Buchner's *Repert. d. Pharm.* xxxi. p. 370.

Description.—Stout woody twiner, kept down in cultivation to the size of a compact currant bush. Ramuli and petioles subpubescent. Leaves alternate, pinnate; leaflets two and a half pairs, $5\frac{3}{4} \times 2\frac{3}{8}$ inches, oval, sub-acuminate, grossly and obtusely serrate, the apical tooth retuse, nearly smooth. Racemes axillary, with small white flowers in stalked clusters. Fruit (capsule) yellow, passing to red at the top, obovato-pyriform, tapering below into long neck (quasi-stipitate), at apex shortly rostrate, $1\frac{7}{16}$ inch long (neck $\frac{3}{8}$ inch, beak $\frac{1}{4}$ inch); pericarp thinnish, soft, glabrous externally, densely tomentose on the inner surface, 3-valved, but dehiscing along only two of the sutures, the third remaining closed, by abortion 1-celled, 1-seeded. Seed ovato-globose,

$\frac{11}{16}$ inch in diameter, black, polished, nearly half-immersed in a cupuliform white aril, with undulato-truncate mouth, which is seated on an obconical torus.

Humboldt's description of his *Paullinia Cupana* (*loc. cit.*) tallies with the above as to number, form, and cutting of leaflets, and the only difference is that the fruits are called "ovate," having probably been described from immature dried specimens, in which the true form of the fruit is apt to be disguised by the shrinking of the soft, half-formed seed and of its enclosing pericarp. I have, besides, seen with my own eyes that the Guaraná of Brazil and the Cupána of Venezuela are one and the same plant, which is cultivated in villages and farms all the way up the Rio Negro, and is known as Guaraná in the lower, but as Cupána in the upper part of that river; while about the line of demarcation between Brazil and Venezuela it is called indifferently by both names. The very same plant is cultivated also at Javita, and in the villages of the Atabapo and Orinoco, as far north as to the cataracts of the latter. I have nowhere seen it wild.

I gathered the following information about Guaraná at Santarem, on the Amazon, and at the mouth of the river Uaupés. The fruit is gathered when fully ripe, and the seeds are picked out of the pericarp and aril, which dye the hands of the operators a permanent yellow. The seeds are then roasted, pounded, and made up into sticks, much in the same way as chocolate, which they rather resemble in colour. In 1850, a stick of guaraná used to weigh from one to two pounds, and was sold at about 2s. 4d. the pound at Santarem; but at Cuyabá, the centre of the gold and diamond

region, whither it was conveyed from Santarem and the Mauhés by the long and dangerous navigation of the Tapajoz, it was worth six or eight times as much. The usual form of the sticks was long oval or nearly cylindrical; but in Martius's time (1820) guaraná was "in panes ellipticos vel globosos formatum," and old residents at Santarem had seen it made up into figures of birds, alligators, and other animals. The intense bitterness of the fresh seed is almost dissipated by roasting, and a slight aroma is acquired. The essential ingredient of guaraná, as we learn from the investigations of Von Martius and his brother Theodore, is a principle which they have called guaranine, almost identical in its elements with theine and caffeine, and possessing nearly the same properties.

Guaraná is prepared for drinking by merely grating about a tablespoonful into a tumbler of water and adding an equal quantity of sugar. It has a slight but peculiar and rather pleasant taste, and it affects the system in much the same way as tea. I was told that at Cuyabá the thirsty miners used to resort to the tabernas, in the intervals of their toil, and call for a glass of guaraná, just as they would for one of lemonade, or of agoa doce. The brothers Martius strongly advocated the introduction of guaraná into the European pharmacopœias, and pointed out the maladies wherein its use seemed indicated. In South America I have frequently seen it of late years exhibited in nervous affections, and it has even come to be regarded as a specific against the jaquéca (*i.e.* hemicrania) which is the fashionable ailment of a Peruvian lady. It has had the reputation of a remedy for diarrhœa,

but I did not find it so, although I have tried it largely both on myself and others. The bitter unroasted seeds, as used in Venezuela, are probably more efficacious. The general notion on the Amazon was, however, that guaraná was rather a preventive of sickness, and especially of epidemics, than a cure for any, and Martius says of it "pro panacea peregrinantium habetur," which is precisely the estimate made of it in the south of Venezuela.

Guayúsa, a Tonic used in the Eastern Andes

Instead of Cupána or Guaraná, the Zaparos and Jibaros, who inhabit the eastern side of the Equatorial Andes, have Guayúsa, a plant of very similar properties, but used by them in a totally different way. The Guayúsa is a true Holly (Ilex), allied to the máte or Paraguay tea (*Ilex paraguayensis*), but with much larger leaves. I was unable to find it in flower or fruit, and cannot say if it be a described species. The tree is planted near villages, and small clumps of it in the forest on the ascent of the Cordillera indicate deserted Indian sites. The highest point at which I have seen it is at about 5000 feet above the sea, in the gorge of the Pastasa below Baños, on an ancient site called Antombós, a little above a modern cane-farm of the same name. There, in 1857, was a group of Guayúsa trees, supposed to date from before the Conquest, that is, to be considerably over 300 years old. They were not unlike old Holly trees in England, except that the shining leaves were much larger, thinner, and unarmed.

When I travelled overland through the forest

of Canelos, and my coffee gave out, I made tea of guayúsa leaves, and found it very palatable. The Jibaros make the infusion so strong that it becomes positively emetic. The guayúsa-pot, carefully covered up, is kept simmering on the fire all night, and when the Indian wakes up in the morning he drinks enough guayúsa to make him vomit, his notion being that if any food remain undigested on the stomach, that organ should be aided to free itself of the encumbrance. Mothers give a strong draught of it, and a feather to tickle the throat with, to male children of very tender age. I rather think its use is tabooed to females of all ages, like caapi on the Uaupés. Indians are not by any means so solicitous to empty the bowels early in the day as to clear out the stomach. On the contrary, all through South America I have noticed that when the Indian has a hard day's work before him, and has only a scanty supply of food, he prefers to go until night without an evacuation, and he has greater control over the calls of nature than the white man has. Their maxim, as an Indian at San Carlos expressed it to me in rude Spanish, is "Quien caga de mañana es guloso" (he who goes to stool in a morning is a glutton).

. . . . . .

From all that has been said, it may be gathered that the domestic medicine of the South American Indians is chiefly hygienic, as such medicine ought to be, it being of greater daily importance to preserve health than to cure disease. If their physicians be mere charlatans, their lack of skill may often be compensated by the ignorant faith of their patients; and their methods are scarcely more

ridiculous—certainly less dangerous to the patient—than those of the Sangrados, Purgons, Macrotons, etc., portrayed by Lesage and Molière. If, to procure for himself fleeting sensual pleasures, the poor Indian's "untutored mind" leads him to sometimes partake of substances which are either hurtful in themselves or become so when indulged in to excess, examples of similar hallucination are not wanting even among peoples that boast of their high degree of civilisation.

This does not profess to be a treatise on all known South American narcotics, or I should have to speak of a vast number more, such as (for instance) the numerous plants used for stupefying fish. Some of these, but especially the Timbó-açú (*Paullinia pinnata*), are said to be also ingredients in the slow poisoning which some Amazonian nations are accused of practising; and on the Pacific side of the Andes the same is affirmed of the Yuca-ratón, which is the thick soft white root of a Leguminous tree (Gliricidiæ sp.) frequent in the plain of Guayaquil. The Curáre also would require a chapter to itself, and must be reserved for another occasion.

CHAPTER XXVI

THE WARLIKE WOMEN OF THE AMAZON: A HISTORICAL STUDY

[THIS essay was written by Spruce as an appendix to his chapter on the Trombetas river, near the mouth of which the early discoverers first encountered the fighting women. But as the evidence adduced by Spruce for their existence is spread over a large part of Amazonia, it seems better to give it here. By doing so I have been enabled to divide the present work into two volumes of nearly equal size, each dealing with a well-defined geographical area.]

THE WOMEN WARRIORS

I cannot dismiss the Trombetas without saying a few words about the warlike women whom Orellana affirmed that he encountered on his voyage down the Great River, the site of the encounter having been identified by subsequent travellers with the mouth either of the Trombetas or of the Nhamundá (called also the Cunurís), which is the next tributary of the Amazon to westward. It is of little moment to which river we assign it, when (according to Baena) the Nhamundá has two mouths, 14 leagues apart, and the lower mouth is but 6 leagues above

the mouth of the Trombetas. That it was at no great distance above the mouth of the Tapajos is plain from Orellana's account that, two or three days after his fight with the "Amazons," he came to a pleasant country where there were Evergreen-oaks and Cork-trees (Alcornoques), the latter, as we have already seen, being the name the Spaniards still give to *Curatella americana*, and the former indicating probably the *Plumieria phagedænica*. (See vol. i. p. 67.) The country around Santarem is the only one which corresponds to this description throughout the whole course of the Amazon.

Orellana has been much ridiculed and called all sorts of hard names by people who have never taken the trouble to read his original Report to the Emperor Charles V., or the account of the voyage drawn up by F. Gaspar Carbajal, a Dominican friar who accompanied him. The voyagers heard rumours of the existence of the Amazons long before reaching them. Even before getting out of the Napo into the main river, we read that an Indian chief informed Friar Carbajal about the Amazons; and two hundred leagues below the mouth of that river, in the village where they built their brigantine, the friendly chief Aparia inquired of Orellana if he had seen the Amazons, whom in his language they called Coniapuyara (masterful women?). And when they actually encountered the real (or supposed) Amazons, what is their account of what befell them? That having landed at a place to traffic with the Indians, the latter attacked Orellana's party and fought bravely and obstinately. That ten or twelve women fought in front of the Indians, and with such vigour that the Indians did not dare to

turn their backs. "These women appeared to be very tall, robust, and fair, with long hair twisted over their heads, skins round their loins, and bows and arrows in their hands, with which they killed seven or eight Spaniards." This is all that they profess to have seen with their own eyes of those warlike women; and, as Herrera remarks on it, "it was no new thing in the Indies for women to fight, and to use bows and arrows, as has been seen on some of the Windward Islands and at Cartagena, where they displayed as much courage as the men."

In the account of the return of Columbus from his second voyage we read that when he arrived at Guadeloupe (having started from Hispaniola), numbers of women, armed with bows and arrows, opposed the landing of his men. This is one instance, of many such, recounted by the Spanish historians.

I have myself seen that Indian women can fight. At the village of Chasuta, on the malos pasos of the river Huallaga, which in 1855 had a population of some 1800 souls, composed of two tribes of Coscanasoa Indians, the ancient rivalry of those tribes generally breaks forth when a large quantity of chicha has been imbibed during the celebration of one of their feasts. Then, on opposite sides of the village, the women pile up heaps of stones, to serve as missiles for the men, and renew them continually as they are being expended. If, as sometimes happens, the men are driven back to and beyond their piles of stones, the women defend the latter obstinately, and generally hold them until the men are able to rally to the combat. At that epoch there was no permanent white resident at Chasuta,

and travellers who were so unfortunate as to be detained there during one of these fights were glad to keep themselves shut up until the stony storm had abated; and with reason, for there had been two instances, within a few years, of a white man being barbarously murdered by the Indians of Chasuta.

There is, therefore, no necessity for supposing that the Spaniards mistook men for women, either, according to the Abbé Raynal, because they were beardless, or, according to Wallace, because they were long-haired; for (1) American savages are generally beardless; and (2) the Spaniards had been for two whole years among Indians who wore their hair long, as they do to this day throughout the forest of Canelos, the scene of Orellana's wanderings with Gonzalo Pizarro; nay, the principal tribe among them, afterwards preached to by the most famous of the Quito missionaries and martyrs, F. Rafael Ferrer, were so notorious for the length to which they allowed their hair to grow as to have got the name of Encabellados. Moreover, on the Amazon itself, at the village of the chief Aparia, we read that "at this time four tall Indians came to the captain, dressed and adorned with ornaments, and with their hair reaching down to the waist."

As to the account given to Orellana by an Indian whom he captured some way farther down the river, about the whole country being subject to warlike women who were very rich in gold and silver, and had five houses of the sun plated with gold, while their own dwellings were of stone and their cities were fortified. Orellana merely repeats it as it was told to him, evidently, however, believing it himself; nor ought we to accuse him of credulity when we

call to mind that he had lately left in Peru a reality in some respects more wondrous than this report. Herrera remarks very judiciously on it: "The tales of Indians are always doubtful, and Orellana confessed he did not understand those Indians, so that it seems he could hardly have made, in so few days, a vocabulary correct and copious enough to enable him to comprehend the minute details given by this Indian." I may add, too, that the Spaniards would probably ask as they went along for gold under its Peruvian name of cúri, and as curí (with merely a difference in the accent) is the Tupí term for coloured earth, it is not surprising that they should have received constant assurances of its abundance throughout the Amazon.

It is worthy to be noted that F. Carbajal, although he has left on record his dissatisfaction with the conduct of Orellana, confirms instead of contradicting the account of the combat with the Amazons, having, in fact, been himself one of the wounded in it. Besides, as is well remarked by Velasco (*Historia de Quito*, i. 167), "he (Orellana) did not go alone to the court, but with fifty companions, many of them so disgusted with his conduct that they refused to accompany him on his return. He was giving information to his sovereign, who might utterly ruin him if he detected him in a falsehood, and it ought to have been easy to detect him, with so many witnesses unfavourably disposed towards him. Besides, it is incredible that fifty persons, and amongst them a religious priest, should agree in guaranteeing the truth of a lie, especially when nothing was to be gained by it."

We have also a very good and independent

account of this voyage from Gonzalo Fernandez de Oviedo, who was in the Island of St. Domingo when Orellano touched there on his way to Spain, in the ship he had purchased in the Isle of Trinidad. Oviedo relates what he was told by Orellana's companions, and it corresponds in all essential points with the navigator's own narrative; with the important addition that the women fought naked to the waist, and that they had *not* one of the breasts cut off, like the Asiatic Amazons—a question Oviedo had particularly asked of the Spaniards.

The little I had read before leaving England about the existence of a nation of women living apart from men, somewhere in the interior of South America, threw ridicule on the notion, and attributed its origin to lying Spanish chroniclers, so that I confess to have not thought it worth while to make a single inquiry on the spot as to whether the tradition were still extant; but when I afterwards came to read carefully the relations of those authors who had bestowed most attention on the subject, I was surprised to find them all agreed on the tradition having been based on fact. I allude especially to Acuña, Feijoo, Condamine, Velasco, Southey, and Humboldt; but it is nowhere more fully discussed than in a small treatise by Van Heuvel entitled *El Dorado*, to which, and to the writings of the celebrated authors just mentioned, I must refer the reader.

The ways by which the country of those women might be reached, as related by travellers and missionaries, seem to converge not to one, but to two points; the one to northward of the Amazon, a good distance below the Rio Negro; the other to

southward of it, above the Rio Negro, and somewhere between the rivers Coari and Teffé. In the very year of Orellana's encounter with the Amazons (1541), Cabeza de Vega headed an expedition which ascended the Plata and the Paraguay in search of gold. From the latter river he sent Hernando de Ribeiro ahead, in a brigantine, with fifty-two men, to explore the lake of Xarayes, a large tract of country periodically inundated, lying to eastward of what was afterwards the Province of Moxos. From the Xarayes Indians Ribeiro received information of the Amazons, whose country he was told lay two months' journey to the northward; and, disregarding the warning of the chief of the Xarayes, that it would be impracticable to traverse the forests at that season of floods, he and his party proceeded on foot for eight days, with the water up to their middle. This brought them to another nation, the Siberis; and a journey thence of nine days (the first four being still wading through the water) to the nation of Urtueses, who told them there was yet a month's journey to the Amazons, with much flooded ground to traverse. From this point they were compelled to regress by their provisions giving out; and the plantations of the Urtueses having been devastated for two successive years by some insect, no more food was to be had; but those Indians reiterated the assurance of the existence of a nation of women, governed by a woman, and possessing plenty of white and yellow metal, their seats and utensils [illegible] of them. They lived on the western [illegible] of a large lake, which they called the [illegible]un, because the sun sank into it [illegible] (*Brazil*, pp. 156-159).

Towards the close of the sixteenth century, F. Cyprian Bazarre, a Jesuit missionary to the Tapacura Indians (a tribe of Moxos), heard accounts similar to those related by Ribeiro, tending to place the Amazons in the country lying southward of the Great River and westward of the Purús, or very nearly where Condamine many years afterwards (in 1741) heard such circumstantial accounts of them. This traveller spoke at Coari with an Indian whose grandfather had met a party of those women at the mouth of the river Cuchinará (now the Purús). "Elles venoient de celle de Cayamé, qui débouche dans l'Amazone du côté du Sud entre Tefé et Coari; qu'il avoit parlé à quatre d'entr'elles, dont une avoit un enfant à la mamelle: il nous dit le nom de chacune d'elles; il ajouta qu'en partant de Cuchinará elles traversèrent le Grand Fleuve, et prirent le chemin de la rivière Noire. . . . Plus bas que Coari, les Indiens nous dirent partout les mêmes choses avec quelques variétés dans les circonstances; mais tous furent d'accord sur le point principal." For many other details, tending to the same conclusions, I must again refer the reader to the original.

The numerous missionaries on the Amazon during the seventeenth and eighteenth centuries all testify to the same traditions. It was no uncommon thing, they say, for Indians in confession to accuse themselves of having been of the number of those who were admitted to visit periodically the women living alone. Their testimony may be summed up in the words of an old Indian at San Regis de los Yameos (a village on the left bank of the Amazon above the mouth of the Ucayáli), as delivered to the

priest F. Sancho Aranjo, who was Condamine's host when he passed that way, and who afterwards repeated them to F. Velasco.

1. That respecting the first combat the Spaniards had had with the warlike women, there was no one in all the missions who did not know of it by tradition from father to son.

2. That he had heard his forefathers say those women had retired far into the interior, across the Rio Negro.

3. That, according to common report, they still existed, and that some Indians visited them every year, but not in their proper country; for the women always met the men at some place previously agreed on a long way from their homes (whose site the men were not permitted to know), and, after conversing with them as long as they listed, dismissed them with presents of gold and green stones, and of the male children that had been born and had reached the age of two or three years.

4. That these women were always governed by one, chosen on account of her valour, and who always marched to battle at their head (Velasco, *loc. cit.* p. 173).

The green stones spoken of here and elsewhere —called also Amazon stones—were formerly met with among nearly all the Indians of Tropical America, but seem now to have totally disappeared from the Amazon. I, at least, never either saw or heard of one there in the hands of the Indians; nor is that to be wondered at when we recollect how eagerly they were at one time bought up by Europeans on account of their supposed medicinal virtues. At the beginning of the present century

we learn from Humboldt that the price of a cylinder two inches long was from twelve to fifteen dollars in Spanish Guayana. He obtained a few of them from the dwellers on the Upper Rio Negro. According to Condamine they were once common articles on the site of the modern Santarem. "C'est chez les Topayos qu'on trouve aujourd'hui, plus aisément que partout ailleurs, de ces pierres vertes, connues sous le nom de Pierres des Amazones, dont on ignore l'origine, et qui ont été fort recherchées autrefois, à cause des vertus qu'on leur attribuoit de guérir de la Pierre, de la Colique néphrétique et de l'Épilepsie" (*Voyage*, p. 137). Even to this day their origin is doubtful, for it is said that no jade of the same kind as these stones has been found anywhere in South America, although it exists in Mexico. The notable thing about them is that the South American Indians in whose hands they have been seen by Europeans all agreed in asserting them to be obtained from the women without husbands, or, on the Orinoco, from the women living alone (Aikeambenanos in the Tamanac language, according to F. Gili).

Velasco cites also a conversation he had with a friar, F. José Bahamonte, who had been for forty years a missionary on the Marañon, to the effect that, being in 1757 in the village of Pevas, shortly after the Portuguese garrison of the fort of the Rio Negro had mutinied against their commandant, "those deserters, having left the major nearly dead and pillaged the warehouses and the royal treasury, fled up the Marañon, and reached Pevas a few at a time. Some of them remained in the mission: others went on to Quito. With one of those parties

there arrived at my village a very good-looking Indian of about sixty, inquiring for the nation of the Pevas and speaking their language, and yet not known to anybody there. After a while he came to me and besought me to hear in secret the motive of his coming thither. Having taken him apart, where we could be overheard of no one, he prostrated himself at my feet, and earnestly entreated me to receive him into my village and make him anew a Christian. I asked him if, being baptized, he had denied the Christian faith. He said no, but that, although he was already a Christian, he had always lived like a heathen." The Indian then tells his story in full to the priest; how he was a Peva by birth, and had been baptized at the mission when young; but that, as he grew up, having taken a great dislike to the severe discipline of the mission, he had fled from it down the Amazon, and finally established himself in a village on the river Teffé. There he was recommended by an Indian to enter on the office of one lately deceased who used every year to visit the women without husbands. Having followed this employ for thirty years, and received from the women many presents of gold and green stones, he was obliged to relinquish it on account of an injury he received, and also (as he asserted) by a remorseful conscience which continually tormented him. "The death of this Indian," adds the good missionary, "a few months afterwards, having lived during that period a penitent and holy life, was one of the greatest consolations that befell me in the missions, for I felt convinced, from his good conduct, that he was predestinated" (Velasco, *loc. cit.* p. 175).

The accounts heard by Raleigh on the Orinoco, in 1595, of a nation of female warriors existing on the Amazon, seem to combine both the above-specified sites. "I made inquiry," says he, "among the most ancient and travelled of the Orinokoponi [the Indian inhabitants of the Orinoco] respecting the warlike women, and will relate what I was informed of as truth about them, by a Cacique who said he had been on that river [the Amazon], and beyond it also. Their country is on the south side of the river, in the province of Tobago [Topayos], and their chief places are in the islands on the south side of it, some 60 leagues from the mouth. They accompany with men once in a year for a month, which is in April. . . . Children born of these alliances, if males, they send them to their fathers; if daughters, they take care of them and bring them up,"[1] etc. Another report he heard was that "there is a province in Guyana called Cunurís, which is governed by a woman"—plainly a Cuñá-puyára. It is to be noted that these reports were heard near the mouth of the Orinoco, or some 2000 miles away from the supposed country of the Amazons, from Indians who had them from one another and not from the Spaniards; and that the Cunurís is for the first time indicated by name in this relation of Raleigh's. We have the most complete account of the river and district of Cunurís, and of the extant traditions respecting the Amazons, in Acuña's description of his voyage down the Amazon in 1639. He mentions four nations who inhabit on the river Cunurís, the Cunurís (Indians) being nearest the mouth, and the Guacarás the highest up; while

[1] Cayley's *Life of Raleigh*, pp. 194-195.

beyond the last were the Amazons. "These man-like women," he says, "have their abodes in great forests and on lofty hills, amongst which that which rises above the rest, and is therefore beaten by the winds for its pride with most violence, so that it is bare and clear of vegetation, is called Yacamiaba" (*Yacamí*, the Tupí name of the Trumpeter bird or Agamí; *Aba* or *awa*, people).

When I read this account of Acuña's, some years after I had left the Amazon, I was struck with the connection of the name of the hill Yacamiaba with that of an Indian dance I had seen on the Upper Amazon in 1851. The dance was called Yacamí-cuñá (Agami woman), and the performers in it moved to the rude music of a pipe and tambour; and to the words of a song, which I unfortunately neglected to take down at the time. A lot of young people joined hands to form a ring, in which males and females alternated, and danced round and round, singing the song of the Yacamí. At the words "Yacamí-cuñá-cuñá!" the ring suddenly broke up—the partners turned tail to tail and bumped each other repeatedly, with such goodwill that one of the two (and as often the man as the woman) was frequently sent reeling across the room, amidst the uproarious laughter of the bystanders. The Yacamís or Agamís are, as is well known, birds without any tail-feathers, those appendages having disappeared from the birds continually rubbing their sterns together—so, at least, says Indian tradition, which has been embodied in the dance; and it is easy to understand its application to a rocky hill, shaggy below with woods, bare at the summit, such as I have seen many in both Brazilian and Spanish Guayana.

May not also both the names, Yacamí-women and Yacamí-people, allude to the women living alone?

Van Heuvel met with a Caribi chief at the head of the river Essequibo, who, when asked about the nation of women, said "he had not seen them, but had heard his father and others speak of them. That they live on the Wasa [the Ouassa of the French maps, a tributary of the Oyapock]. Their place of abode is surrounded with large rocks, and the entrance is through a rock" (*El Dorado*, p. 124).

Condamine was informed by a soldier in the garrison of Cayenne, that in 1726 he had accompanied a detachment which was sent to explore the interior of the country; in pursuance of which object they had penetrated to the country of the Amicouanes, a long-eared people, who dwell beyond the sources of the Oyapock, near to where another river takes its rise that falls into the Amazon [the Oyapock falling into the Atlantic in lat. about 4° N.]. The country lies high, and none of the rivers are navigable. There the soldier had seen on the necks of the women and girls certain green stones, which the Indians said they obtained from the women who had no husbands (*Voyage*, p. 102).

We have mention of the long-eared folk, and of the same kind of savage rocky country as all tradition assigns to the abiding-place of the Amazons, in Unton Fisher's relation of his voyage up the Mariwin (Marony). "The passage to the head of the Mariwin, from the men with long ears (which is the thirteenth town from the mouth), is very dangerous, by reason of the passage through hollow and concave rocks, wherein harbour bats of unreason-

able bigness, which, with their claws and wings, do wound the passengers shrewdly; yea, and oftentimes deprive them of life."[1]

Van Heuvel cites various accounts which he found still current in Guayana, all tending to collocate the warlike women on a site just beyond the sources of the Essequibo, Marony, and Oyapock, which lie apparently very near to each other, and also to the sources of the Trombetas and Nhamundá, the two latter rivers running in a contrary direction to the three former, *i.e.* southwards, or towards the Amazon.

I might adduce a great deal more evidence to show the universality of the traditions in Tropical America of a nation of women, whose permanent habitation was from 1° to 2° north of the Equator, and in long. 54° to 58° W.; and whose annual rendezvous with their lovers was held on a site in lat. about 5° S., long. 65° W.

Those traditions must have had some foundation in fact, and they appear to me inseparably connected with the traditions of El Dorado. I think I have read nearly all that has been written about the Gilded King and his city and country; and, comparing it with my own South American experience, I can hardly doubt that that country was Peru—possibly combined (or confused) with Mexico. The lake called the Mansion of the Sun, because the

[1] The whole of this curious relation is given in Purchas's *Collection of Voyages*, Bk. vi. ch. xvii., and is placed immediately after that of the voyage made by Robert Harcourt to Guayana in 1608. Purchas says of it: "I found this fairly written among Mr. Hakluyt's papers, but know not who was the author." But Van Heuvel adduces ample proof of its having been written by Fisher, cousin of Harcourt, whom the latter left behind him at the third town on the Mariwin, with instructions to complete the exploration of the river, which he himself had unsuccessfully attempted.

sun sank into it, is plainly the Pacific Ocean; but some accounts seem to point to Lake Titicaca, and others to the lakes of Mexico; probably the general notion of such lake was made up of all three. It is scarcely necessary to remind the reader that most Indian nations call the ocean and a lake (and in some cases even a river) by one and the same name. The confusion of town (or city) and country is also universal among them. I have been gravely told by a Jibaro Indian in the Andes that France and England were two towns, standing on opposite banks of a river, the people on the left bank being Christians and those on the right heathens: a piece of ethnology derived from the teaching of Catholic missionaries, and not at all flattering to myself as an Englishman.

I think I can trace the progress of the fame of the riches of Peru quite across South America, to the Atlantic coast and islands, whence it surged back into the interior, so disguised and disfigured, that the Spaniards did not recognise it as indicating an El Dorado with which they were already familiar. Now the accounts of the real El Dorado of Peru (and of Mexico) would infallibly be accompanied by others of the Vestal communities dedicated to the worship of the sun, *i.e.* of women living alone, or women without husbands. If we deny the existence of a nation, or nations, of warlike women on the Amazon, then the tradition could only have had its origin in the Virgins of the Sun; and some accounts, such as that of Cabeza de Vega and Ribeiro, possibly point to them alone. But if we concede the fact of the existence of these warlike women, then may not the latter have been

originally a community of Vestals, who, having fled in a body from their nunnery, carrying with them their ornaments of gold and green stones, established themselves in the forests of the plain? Or they may have accompanied one of those emigrations, led by chieftains who had revolted from the rule of the Inca, of which we read in the early historians. In either case they were probably at first respected by neighbouring savage tribes as a religious community; and they would gradually learn the use of the bow and other weapons, more as implements of the chase than of offence and defence; for we do not read that they were ever assaulted by other Indians. I put forward this as mere conjecture, my object in what precedes having been principally to vindicate the earlier travellers and historians, Spanish and English, from the charges of gross credulity, or even wilful falsehood, which have been wantonly brought against them. Is it to be wondered at that unlettered, or at best imperfectly educated, adventurers should have believed, and repeated as true, nearly every report they heard, when we find a man of so philosophic a turn of mind as Raleigh telling the most extravagant tales—just as they were told to him, no doubt, and not adding anything thereto, yet evidently believing them himself in the main?

No one has declared his convictions of the existence of a nation of Amazons more forcibly and eloquently than Acuña, and, without endorsing them fully myself, I close this long digression with his own words, recommending them to the candid consideration of my readers:—

"The proofs that give assurance that there is a

province of the Amazons on the banks of this river are so strong and convincing that it would be renouncing moral certainty to scruple giving credit to it. I do not build upon the solemn examinations of the sovereign court of Quito, in which many witnesses were heard, who were born in these parts and lived there a long time, and who, of all matters relating to the countries bordering on Peru, as one of the principal, particularly affirmed that one of the provinces near the Amazon is peopled with a sort of warlike women, who live together and maintain their company alone, without the company of men; but at certain seasons of the year seek their society to perpetuate their race. Nor will I insist on other information, obtained in the new kingdom of Grenada, in the royal city of Pasto, where several Indians were examined; but I cannot conceal what I have heard with my own ears, and concerning the truth of which I have been making inquiries from my first embarking on the Amazon; and am compelled to say that I have been informed at all the Indian towns in which I have been, that there are such women in the country, and every one gave me an account of them by marks so exactly agreeing with that which I received from others, that it must needs be that the greatest falsehood in the world passes through all America for one of the most certain histories." [1]

[1] *Voyages and Discoveries in South America*, by Christopher d'Acugna, London, 1698.

CHAPTER XXVII

INDIAN ROCK-PICTURES: ENGRAVED ROCKS ON THE RIO NEGRO AND CASIQUIARI (COMMONLY CALLED INDIAN PICTURE-WRITING)

[WHILE residing at Piura on the sea-coast of Peru in 1863, and being incapacitated by illness for outdoor work, Spruce wrote out a description of these curious works of art illustrated by the drawings he was able to make of some of them, and with an explanation of their meaning given him by the Indians who were with him and to whom they were familiar. He also gives his own view as to their probable age, and as to the causes that led to their production. In this paper he does not refer to the best known of these Picture-writings on the rocks of Pedra Island, near the mouth of the Rio Branco, which are briefly described in his Journal. (See vol. i. p. 260.) This paper refers solely to the examples of which he made drawings on the Casiquiari and Uaupés rivers.]

INDIAN PICTURE-WRITING[1]

When I ascended the Casiquiari in December 1853, I charged my pilot, an intelligent Indian of

[1] In his Journal (1851), when describing the figures on Pedra Island (Lower Rio Negro), he protested against the use of the term "picture-writing" as conveying the erroneous idea that they are in any sense writings or hieroglyphics. Twelve years later he uses the popular term, though showing that it is an incorrect one.

the Barré nation, to point out to me any engraved rocks which lay in our way. On reaching the Pedra de Culimacari, a bed of granite a little beyond the mouth of the Pacimoni, we found it still under water, so that the figures seen there and copied by Humboldt in the beginning of the century were not visible. The pilot consoled me by saying that when we reached the Laja de Capibara he would show me there ten times more figures than I had missed seeing at Culimacari. On the 9th of December we passed the mouth of Lake Vasiva, and on the 11th reached a modern Indian village called Yamádubani (Wild Man's Land), or more commonly Pueblo de Ponciano, having been founded by an Indian named Ponciano, who was not long dead. Early on the morning of the 13th we came upon the deserted site of another village called Capibara, being the *nom de guerre* of its founder, after whose death it has become depopulated. It is on the left (S.E.) side of the Casiquiari. Leaving here part of the crew to cook our breakfast, I took with me the rest, and under the guidance of the pilot struck into the forest in quest of picture-writing. After walking about half a mile, we came out on large flat sheets of granite rock, naked save where in fissures of the rock there were small oases of vegetation, the first plants to establish themselves there being a few lichens and mosses, and, rarely, some stunted shrubs. The bare places, one of which was an acre in extent, were covered with rude figures, the outlines of which were about half an inch wide, and were graven in the rock to nearly an inch deep. The figures were in perfect preservation except that in rare cases they were obliterated by the shaling of

the rock, the granite of that region having often three or more thin coats comparable to those of an onion, as if the cooling down had not been equable.[1] I immediately set to work to copy, and the Indians of their own accord cleared out the earth and lichens which had filled up some of the lines. As it was impossible to copy all, I selected those figures which were most distinct, and those which, by their frequent repetition, might be considered typical. That marked A (Fig. 17), for instance, varying only slightly in the details, was repeated several times. It was not possible to draw all by hand to the same scale, but as I measured most of the figures, that defect can easily be remedied in recopying them.

In all the drawings which illustrate this chapter, the small figures give the dimensions in feet and inches. When underlined they show the entire length of the object copied, as $\underline{3/10}$ in the centre figure of Fig. 17 means that it is 3 feet 10 inches long; otherwise they indicate the length of the line at which they are written. Thus 2/5 on the right side of A shows that the longer side of the oblong is 2 feet 5 inches long, and the cross line on the right is 4 feet long.

As I sketched, I asked the Indians, "Who had made those figures, and what they represented?" but received only the universal reply of the Indian when he cares not to tell or will not take the trouble to recollect, "Quien sabe, patron?" ("Who knows?"). But I understood enough of Barré to note that in

[1] [For drawings of such onion-like rocks see Plate x. in my *Amazon and Rio Negro*. It occurs on every scale from that of moderate-sized boulders up to whole mountains. It is seen on a great scale in the huge domes of the Yosemite valley, and is now believed to be the result of a process of aerial decomposition due to the action of sun and rain.—ED.]

their talk to each other they were saying, "This is so-and-so, and this so-and-so." "Yes," I struck in, "and don't you think this is so-and-so?" Thus led on, I got them to give their opinion of most of the figures. About some they were quite certain; about

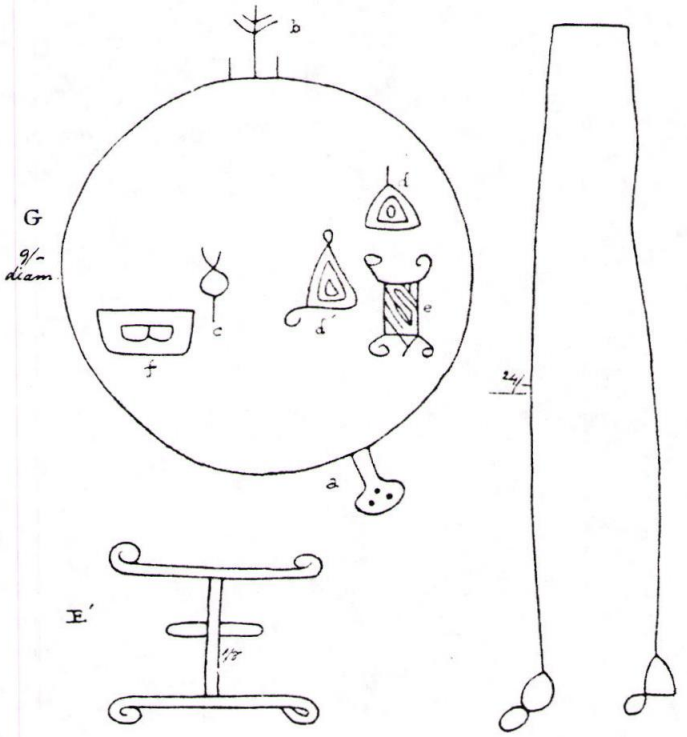


FIG. 16.—GROUP OF PICTURES AT LAJA DE CAPIBARA, RIVER CASIQUIARI.

others they would only speculate. Of all the figures the one marked G (Fig. 16) was that whose origin seemed clearest both to them and to me. It represents a mandiocca-oven (called budári in Barré)—a large circular dish of fireproof pottery, supported on a wall of mud-masonry, which has an opening

on one side (rudely figured at *a*), into which fire is put, and another at the opposite (as at *b*), which serves as a flue. Of the articles laid on the budári, *c* is the brush of piassaba tied tightly round at midway, which serves for sweeping the oven before the cassava cake or farinha is spread out to bake; *d* is the palm-leaf fan for blowing the fire; and my Indians would have it that *d'* was another fan, but the hook at one corner (which, whenever it occurs in these figures, indicates a bit of liana-rope by which the utensil is hung up) renders it probable that something else was meant; *e* is a stage (or shelf) such as may be seen of various sizes hung from the roof of an Indian's hut, but especially over the oven and hearth, the smoke from which acts as an antiseptic to the dried fish and other viands kept on the stages, and also partially keeps off the cockroaches; *f* is either the mandiocca-grater or, more probably, a flat piece of board, sometimes with a hole to insert the fingers, which is used to raise the edges of the cassava cake and to aid in turning it over. All these articles are in use to this day throughout a vast extent of country on the Orinoco and Casiquiari. Even in the Andes, a triangular or square fan, plaited by the Indians of the leaves of maize or wild cane, is the only bellows used by the Quitonian housewife.

The figures marked B (Fig. 17) were declared by my Indians to be dolphins, whereof two species abound in the Amazon and Orinoco.

C they said was plainly the same sort of thing as the big papers (maps) I was continually poring over. For *a* is the town—often consisting of a single annular house, with a road from it leading

down to the caño (or stream leading into the main river, *c*), while *b* is a track leading through the forest to another tributary stream which here and there expands into lakes, while other lakes send their waters to it. There were other figures apparently geographical, but the one I copied was the most complicated and perfect.

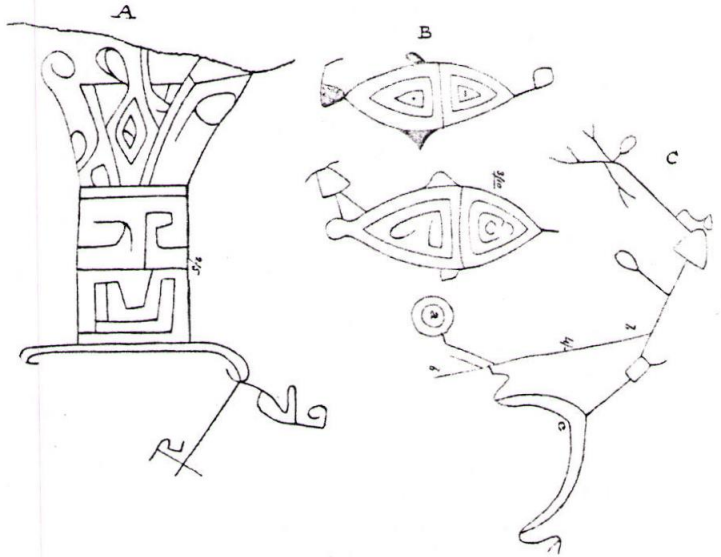


FIG. 17.—GROUP OF PICTURES AT LAJA DE CAPIBARA, RIVER CASIQUIARI.

D (Fig. 18) are ray-fishes, which are found of enormous size in the Casiquiari and Rio Negro, and sometimes inflict deadly wounds on incautious bathers.

E on Figs. 16 and 18 and perhaps A on Fig. 17 was thought by my companions to be the quiver for holding the darts of the blowing-cane.

By the time I had covered three sheets with figures, the sun began to beat hot on my head, protected by only a light cap, and although my

pilot told me that farther away in the forest there were more granite sheets covered with pictures. I was obliged to content myself with what I had

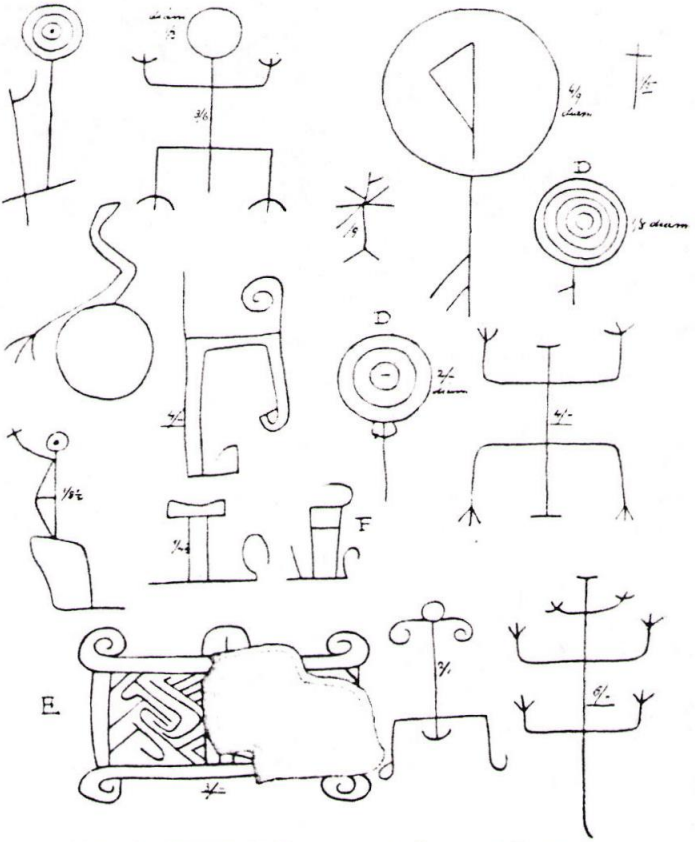


FIG. 18.—GROUP OF PICTURES AT LAJA DE CAPIBARA, RIVER CASIQUIARI.

already seen and done; for I had engaged to meet the Comisario of San Fernando at Esmeralda on Christmas Day, and to get there I had still a long voyage before me, going slowly along as I did in my large boat and gathering plants all the way.

A few miles from the upper mouth of the Casiquiari a stream called Calipo enters it where there is some picture-writing that was covered with water when I passed up; but when I returned (on January 6, 1854) the Casiquiari had lowered 2 feet, and at the mouth of the Caño Calipo a good many figures were laid bare, all of which I copied. The figures on Fig. 19 have the same relative positions and distances as on the rock, and apparently

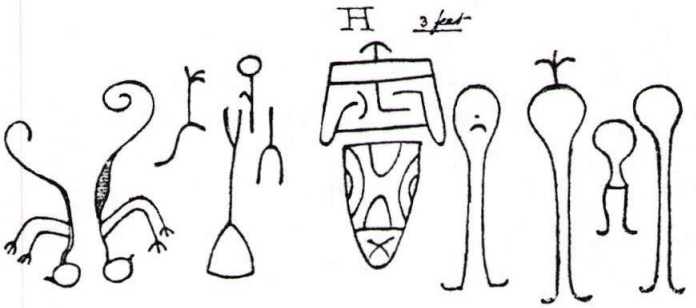


Fig. 19.—Group of Pictures on Right Bank of the Casiquiari, a little above the Caño de Calipo.

represent a family group, whereof my interpreter assured me that H symbolised a chief, and that the figures on the right were his three wives and a child, the principal wife being distinguished by the plume worn on her head. The curious figures on the left may perhaps be meant for the prehensile-tailed Iguanas, which being very good food would be of especial interest.

The other group (Fig. 20) repeats the symbol of a chief (at H H), with some four-footed animal, perhaps a dog, on the left. The rest are probably household goods of some kind.

Picture-writing is frequent throughout the granite district of the Casiquiari, but I have nowhere seen

so much of it together as at the Laja de Capibara. The best executed figures, however, I have met with, and the only ones about which I could make out any extant tradition, are in the river Paapurís, which enters the Uaupés from the south at Jauarité caxoeira, and is inhabited by Fish and Mosquito Indians (Pira-Tapuyas and Carapanás). The Paa-

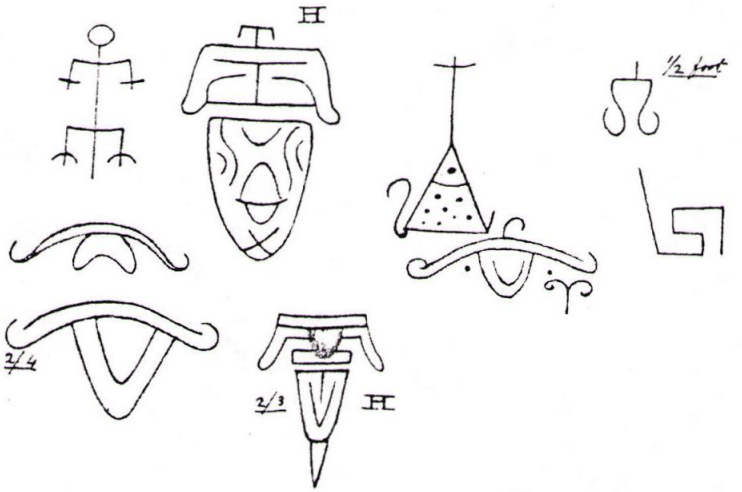


FIG. 20.—GROUP OF PICTURES ON RIGHT BANK OF THE CASIQUIARI, A LITTLE ABOVE THE CAÑO DE CALIPO.

purís in its lower part is an uninterrupted and dangerous rapid; and at Aracapá caxoeira, a few miles up, two islands divide it into three narrow channels, each of which is a nearly perpendicular cascade of about 15 feet high. At this point canoes have to be unladen and dragged over one of the islands, which are masses of granite having on them much picture-writing, where not clad with shrubs. The most distinct figures are on the top of a rock which rises perpendicularly by

the highest fall, and cannot be reached without risk. They were engraved by a young woman who was lamenting the death of her mother, for whose epitaph they were probably intended. Day by day she sat on the rock engaged in her task, while her fast-falling tears ceased not to mingle with the cataract. Thus months passed away, until one day the maiden, worn with grief and fading almost to a shadow, fell over the rock and disappeared among the roaring breakers at its base.

I had not with me pencil or paper of any kind, and I was obliged to content myself with a hasty glance at the figures, some of which represented human beings; nor was I able to revisit the spot. On the top of the same rock there are shallow impressions, apparently the work of nature, which bear some resemblance to a human form, and are called by the Indians Tupana-rangaua (the figure of God). The damsels of the Paapurís visit the spot on stated occasions, and kneeling down on the knees of the figure, perform some kind of devotion —what, I could not learn.

I copied a few rude figures on the rocks near the village of Jauarité. Those on Fig. 21 seem to represent very rudely various types of trees, as seen in the three figures on the right. The two upper ones indicate a buttressed stem or aerial roots, with flowers or fruits on the three terminal branches; while the lower one has a tap-root, and diverging branches of a more usual type. The lower middle figure is probably the very rudest symbol of a human form; while the remainder seem to be merely fanciful geometrical patterns.

The large figure on Fig. 22 is called by the Indians

track indicated by Valverde, but no one had succeeded in reaching its terminus; and I spoke with two men at Baños who had accompanied such expeditions, and had nearly perished with cold and hunger on the paramos of Llanganati, where they had wandered for thirty days. The whole story seemed so improbable that I paid little attention to it, and I set to work to examine the vegetation of the adjacent volcano Tunguragua, at whose north-eastern foot the village of Baños is situated. In the month of September I visited Cotaló, a small village on a plateau at about two-thirds of the ascent of Guayrapáta, the hill in front of Tunguragua and above the confluence of the rivers Patate and Chambo. From Cotaló, on a clear night of full moon, I saw not only Tunguragua, El Altar, Condorasto, and the Cordillera of Cubilliú, stretching southwards towards the volcano Sangáy, but also to the eastward the snowy peak of Llanganati. This is one of the few points from which Llanganati can be seen; it appears again, in a favourable state of the atmosphere, a good way up the slopes of Tunguragua and Chimborazo.

At Baños I was told also of a Spanish botanist who a great many years ago lost his life by an accident near the neighbouring town of Patate, and that several boxes belonging to him, and containing dried plants and manuscripts, had been left at Baños, where their contents were finally destroyed by insects.

In the summers of the years 1858 and 1859 I visited Quito and various points in the Western Cordillera, and for many months the country was so insecure, on account of internal dissensions, that

I could not leave Ambato and Riobamba, where my goods were deposited, for more than a few days together. I obtained, however, indisputable evidence that the "Derrotero" or Guide to Llanganati of Valverde had been sent by the King of Spain to the Corregidors of Tacunga and Ambato, along with a Cedula Real (Royal Warrant) commanding those functionaries to use every diligence in seeking out the treasure of the Incas. That one expedition had been headed by the Corregidor of Tacunga in person, accompanied by a friar, Padre Longo, of considerable literary reputation. The Derrotero was found to correspond so exactly with the actual localities, that only a person intimately acquainted with them could have drawn it up; and that it could have been fabricated by any other person who had never been out of Spain was an impossibility. This expedition had nearly reached the end of the route, when one evening the Padre Longo disappeared mysteriously, and no traces of him could be discovered, so that whether he had fallen into a ravine near which they were encamped, or into one of the morasses which abound all over that region, is to this day unknown. After searching for the Padre in vain for some days, the expedition returned without having accomplished its object.

The Cedula Real and Derrotero were deposited in the archives of Tacunga, whence they disappeared about twenty years ago. So many people were admitted to copy them that at last some one, not content with a copy, carried off the originals. I have secured a copy of the Derrotero, bearing date August 14, 1827; but I can meet with no one who recollects the date of the original documents.

I ascertained also that the botanist above alluded to was a Don Atanasio Guzman, who resided some time in the town of Pillaro, whence he headed many expeditions in quest of the gold of Llanganati. He made also a map of the Llanganatis, which was supposed to be still in existence. Guzman and his companions, although they found no deposit of gold, came on the mouths of several silver and copper mines, which had been worked in the time of the Incas, and ascertained the existence of other metals and minerals. They began to work the mines at first with ardour, which soon, however, cooled down, partly in consequence of intestine quarrels, but chiefly because they became disgusted with that slow mode of acquiring wealth when there was molten gold supposed to be hidden close by; so the mines were at length all abandoned. This is said to have taken place early in the present century, but the exact date I can by no means ascertain. Guzman is reported to have met with Humboldt, and to have shown his drawings of plants and animals to that prince of travellers. He died about 1806 or 1808, in the valley of Leytu, about four leagues eastward of Ambato, at a small farmhouse called now Leytillo, but marked on his map San Antonio. He was a somnambulist, and having one night walked out of the house while asleep, he fell down a steep place and so perished. This is all I have been able to learn, and I fear no documents now exist which can throw any further light on the story of his life, though a botanical manuscript of his is believed to be still preserved in one of the archives of Quito. I made unceasing inquiries for the map, and at length ascertained

that the actual possessor was a gentleman of Ambato, Señor Salvador Ortega, to whom I made application for it, and he had the kindness to have it brought immediately from Quito, where it was deposited, and placed in my hands; I am therefore indebted to that gentleman's kindness for the pleasure of being able to lay the accompanying copy of the map before the Geographical Society.

The original map is formed of eight small sheets of paper of rather unequal size (those of my copy exactly correspond to them), pasted on to a piece of coarse calico, the whole size being 3 feet 10½ inches by 2 feet 9 inches. It is very neatly painted with a fine pencil in Indian ink—the roads and roofs of houses red—but it has been so roughly used that it is now much dilapidated, and the names, though originally very distinctly written, are in many cases scarcely decipherable: in making them out I have availed myself of the aid of persons familiar with the localities and with the Quichua language. The attempt to combine a vertical with a horizontal projection of the natural features of the country has produced some distortion and dislocation, and though the actual outline of the mountains is intended to be represented, the heights are much exaggerated, and consequently the declivities too steep. Thus the apical angle of the cone of Cotopaxi (as I have determined it by actual measurement) is 121°, and the slope (inclination of its surface to the horizon) 29½°; while on Guzman's map the slope is 69¼°, so that the inclination is only three-sevenths of what he has represented it, and we may assume a correspond-

ing correction needed in all the other mountains delineated.[1]

The whole map is exceedingly minute, and the localities mostly correctly named, but there are some errors of position, both absolute and relative, such that I suppose the map to have been constructed mainly from a simple view of the country, and that no angles and very few compass-bearings have been taken. The margins of the map correspond so nearly with the actual parallels and meridians, that they may be assumed to represent the cardinal points of the compass, as on an ordinary map, without sensible error.

The country represented extends from Cotopaxi on the north to the base of Tunguragua on the south, and from the plain of Callo (at the western foot of Cotopaxi) on the west to the river Puyu, in the forest of Canelos, on the east. It includes an area of something less than an equatorial degree, namely, that comprised between 0° 40′ and 1° 33′ S. lat., and between 0° 10′ W., and near 0° 50′ E. of the meridian of Quito. In this space are represented six active volcanoes (besides Cotopaxi), viz.—

1. El Volcan de los Mulatos, east a little south from Cotopaxi, and nearly on the meridian of the Rio de Ulva, which runs from Tunguragua into the Pastasa. The position of this volcano corresponds to the Quilindaña of most maps—a name which does not occur on Guzman's, nor is it known to any of the actual residents of the country. A group of mountains running to north-east, and terminating in

[1] The apical angle of Tunguragua—the steepest mountain I ever climbed—is 92½°, and the slope 43¼°.

the volcano, is specified as the Cordillera de los Mulatos: it is separated from Cotopaxi by the Valle Vicioso.

2. El Volcan de las Margasitas, south-east by east from Los Mulatos, and a little east of north from the mouth of the Rio Verde Grande. "Margasitas" (more properly Marquesitas) corresponds nearly to the term "pyrites," and is a general name for the sulphates of iron, copper, etc.

3. Zunchu-urcu, a smaller volcano than Margasitas, and at a short distance south-south-east of it. "Zunchu" is the Quichua term for mica or talc.

4. Siete-bocas, a large mountain, with seven mouths vomiting flame, south-west by south from Margasitas, west by south from Zunchu. Its southern slope is the Nevado del Atilis.

5. Gran Volcan del Topo, or Yurag-Llanganati, nearly east from Siete-bocas and south-west from Zunchu. A tall snowy peak at the head of the river Topo, and the same as I saw from Cotaló. It is the only one of the group which rises to perpetual snow, though there are many others rarely clear of snow; hence its second name Yurag (White) Llanganati.[1]

[This mountain is partly shown on the extreme right margin of the map here given.]

The last four volcanoes are all near each other, and form part of what Guzman calls the Cordillera de Yurag-urcu, or Llanganatis of the Topo.

North-east from the Volcan del Topo, and running from south-east to north-west, is the Cor-

[1] Villavicensio gives its height as 6520 varas (17,878 English feet) in his *Geografia del Ecuador*, from a measurement (as he says) of Guzman, but does not inform us where he obtained his information.

dillera de Yana-urcu, or the Llanganatis of the Curaray, consisting chiefly of a wooded mountain with many summits, called Rundu-uma-urcu or Sacha-Llanganati.

6. Jorobado or the Hunchback, south-south-west half west from Yurac-Llanganati, and between the river Topo and the head of the greater Rio Verde.

I have conversed with people who have visited the Llanganati district as far as forty years back, and all assure me they have never seen any active volcano there; yet this by no means proves that Guzman invented the mouths vomiting flame which appear on his map. The Abbé Velasco, writing in 1770,[1] says of Tunguragua, "It is doubtful whether this mountain be a volcano or not," and yet three years afterwards it burst forth in one of the most violent eruptions ever known. I gather from the perusal of old documents that it continued to emit smoke and flame occasionally until the year 1780. Many people have assured me that smoke is still seen sometimes to issue from the crater. I was doubtful about the fact, until, having passed the night of November 10, 1857, at the height of about 8000 feet on the northern slope of the mountain, I distinctly saw at daybreak (from $5\frac{1}{2}^{h}$ to $6\frac{1}{2}$ A.M.) smoke issuing from the eastern edge of the truncated apex.[2] In ascending on the same side, along the course of the great stream of lava that overwhelmed the farm of Juivi and blocked up the

[1] *Historia de Quito.*

[2] The same morning (Nov. 11), at 4 A.M., I observed a great many shooting-stars in succession, all becoming visible at the same point (about 40° from the zenith), proceeding along the arc of a great circle drawn through Orion's Belt and Sirius, and disappearing behind the cone of Tunguragua.

Pastasa, below the mouth of the Patate, for eight months, we came successively on six small fumaroli, from which a stream of thin smoke is constantly issuing. People who live on the opposite side of the valley assert that they sometimes see flame hovering over these holes by night. The inhabitants of the existing farm of Juivi complain to me that they have been several times alarmed of late (especially during the months of October and November 1859) by the mountain "bramando" (roaring) at night. The volcano is plainly, therefore, only dormant, not extinct, and both Tunguragua and the Llanganatis may any day resume their activity.

[Here follows a rather elaborate description of the various rivers and their tributaries as shown on the map, which, being of little interest to the general reader, are omitted. Of the map generally, Spruce makes the following observation :—]

As the great mineral districts of Llanganati, occupying the northern half of the map, was repeatedly travelled over by Guzman himself, it is fuller of minute detail than the rest ; and I am assured by those who have visited the actual localities that not one of them is misplaced on the map ; but the southern portion is much dislocated ; and, as I have traversed the whole of it, I will proceed to make some remarks and corrections on this part of the map.

[As these corrections are accessible to all specially interested, and will no doubt be made use of in compiling future maps of Ecuador, I omit these also, and pass on to a description of the map itself, and to the remarkable document which it illustrates.]

the buta or dolphin. On these and other rocks

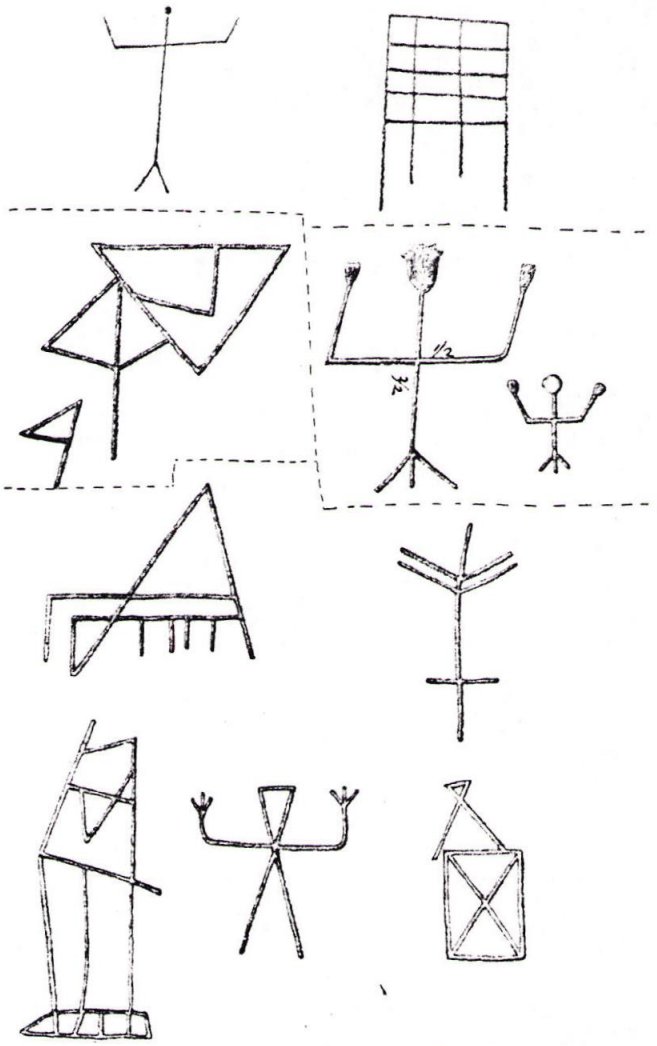


FIG. 21.—GROUP OF PICTURES AT JAUARITÉ CAXOEIRA, RIO UAUPÉS.

of the Uaupés there are impressions called Pé de Anta (Tapir's foot), which look as if some three-

toed foot had trod on the rock while still soft; but they are scattered, not consecutive. It is not so

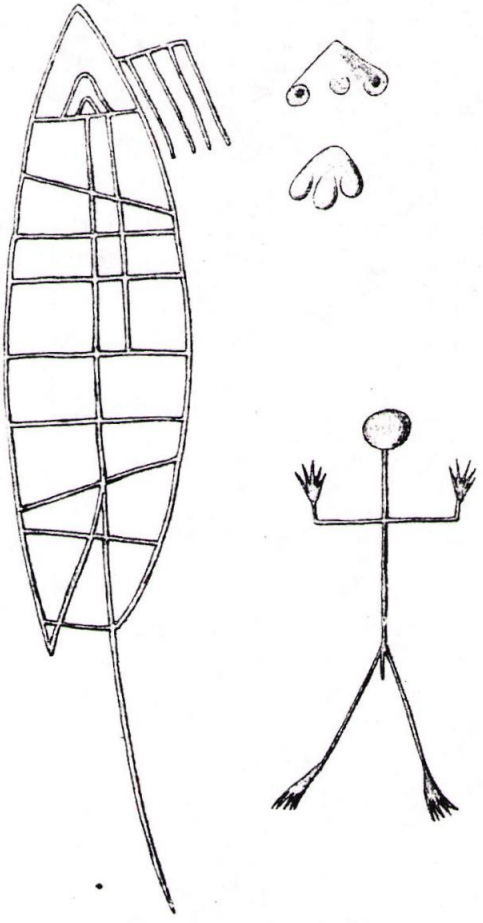


FIG. 22.—GROUP OF PICTURES AT JAUARITÉ CAXOEIRA, RIO UAUPÉS.

easy to explain these by natural causes as it is that of the panellas or pots, which are cylindrical holes frequently met with on the rocks of the falls of the Rio Negro and Uaupés; these have been worn—

from any accidental hollow at first—and then continually deepened by the pebbles and sand whirled round and round in them by the surging and eddying waves of the cataracts during the season of flood.[1]

Although we have no elements wherefrom to determine positively the date and mode of execution of the picture-writings, those questions seem to me to have been involved in unnecessary mystery. The instruments used in scraping such deep lines in the granite were probably chips of quartz crystal, which were the hardest cutting-instruments possessed by the aborigines of South America. In the Amazonian plain I know of but two extensive deposits of large rock-crystals—one of which is a good way up the Rio Branco, and the other is at the foot of Mount Duida, near the village of Esmeralda, therefore in the immediate neighbourhood of the Casiquiari. I know also of but one such deposit on the Pacific side of the Andes, namely, in the hills of Chongon near Guayaquil; yet pieces of quartz, some of which have served as knives, others as lance- or arrow-heads, are found strewed about the sites of ancient towns and settlements through several degrees of latitude. Whatever the instrument used by the Indians of the Casiquiari, it is difficult to assign any limit to the time required for the execution of the figures; but any one who has seen an Indian patiently scraping away for months at a bow or a lance before bringing it to the desired symmetry and perfection, or who knows that it has taken a lifetime to fashion and bore the white

[1] [The supposed tracks of animals are doubtless works of art like the other figures, probably due to a desire to imitate the well-formed impressions of feet that the hunter must continually meet with during his search for game.—ED.]

stone which the Uaupés Indian wears suspended from his neck, will understand that *time* is no object to an Indian. I can fancy I see the young men and women sitting in the cool of the morning and evening, but especially in the moonlight nights, and amusing themselves by scratching on the rock any figure suggested by the caprice of the moment. A figure once sketched, any one, even a child, might aid in deepening the outlines. Indeed, the designs are often much in the style of—certainly not at all superior to—those which a child of five years old in a village school in England will draw for you on its slate; and the modern inhabitants of the Casiquiari, Guainia, etc., paint the walls of their houses with various coloured earths in far more artistic designs.

Having carefully examined a good deal of the so-called picture-writing, I am bound to come to the conclusion that it was executed by the ancestors of Indians who at this day inhabit the region where it is found; that their utensils, mode of life, etc., were similar to those still in use; and that their degree of civilisation was certainly not greater—probably less—than that of their existing descendants. The execution of the figures may have ranged through several centuries, a period which in the existence of a savage people is but a year in that of the highly-civilised nations of modern Europe. In vain shall we seek any chronological information from the Indian, who never knows his own age, rarely that of his youngest child, and who refers all that happened before his own birth to a vague antiquity, wherein there are no dates and rarely any epochs to mark the sequence of events.

[Among Spruce's miscellaneous notes, written during his voyage up the Rio Negro, the following passages serve to illustrate the questions above discussed:—]

I have never yet met with an Indian who knew his own age or how many years he had lived in his present house. My pilot on the Trombetas very gravely stated his age at a hundred years (he was evidently not more than fifty). I have asked an Indian the age of his daughter. "She may be twelve—she may be twenty—who knows? What matter do our ages make to us?"

. . . . . .

These picture-writings in Brazil and Spanish Guiana cannot be considered of remote antiquity, for (1) they sometimes show rude figures of lions and other objects belonging to the Old World; (2) some of them (and especially the Brazilian ones, *e.g.* at Monte Alegre, as stated by Mr. Wallace) have dates affixed, painted with the same colour and obviously of the same age as the pictures, which correspond very nearly with the dates of the establishment of the Portuguese towns of the Amazon, and not going back above a century or two.

CHAPTER XXVIII

A HIDDEN TREASURE OF THE INCAS

[THE following narrative forms one of the most curious pieces of genuine history in connection with the never-ceasing search for buried treasure in the territory of the Incas. We owe to the persevering exertions of Richard Spruce the discovery and the translation of one of the few remaining copies of the official order of the Spanish king to search for this treasure, with the accompanying detailed "Guide" to its locality. Still more are we indebted to his generally esteemed character and ingratiating manners for obtaining permission to copy the unique map of the district containing the treasure, and for undertaking the considerable labour of copying in the minutest detail so large and elaborate a map, without which both the "Guide" and the story of the search for the treasure would be unintelligible.

The essential portions of this map, containing the whole of the route described in the "Guide," as well as the routes of the various explorers (marked in red), have been reproduced here (see end of chapter). The portions farther east and south, which have no immediate relation to the quest for the treasure, having been omitted in order to make

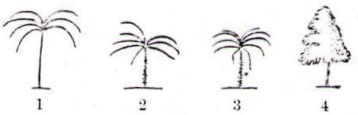
it more convenient for reference here. The scale of the map is, approximately, six miles to an inch.

In Dr. Theodore Wolff's *Geografia et Geologia de Ecuador* (1892), the region of Llanganati is still referred to as the most unknown part of the whole of Ecuador.]

A Hidden Treasure of the Incas, in the Mountains of Llanganati, Ecuador; an authentic Guide to its Locality; illustrated by a Map. The Map copied and the Guide translated by Richard Spruce

In the month of July 1857 I reached Baños, where I learnt that the snowy points I had observed from Puca-yacu, between Tunguragua and Cotopaxi, were the summits of a group of mountains called Llanganati, from which ran down to the Pastasa the densely-wooded ridges I saw to northward. I was further informed that these mountains abounded in all sorts of metals, and that it was universally believed the Incas had deposited an immense quantity of gold in an artificial lake on the flanks of one of the peaks at the time of the Spanish Conquest. They spoke also of one Valverde, a Spaniard, who from being poor had suddenly become very rich, which was attributed to his having married an Indian girl, whose father showed him where the treasure was hidden, and accompanied him on various occasions to bring away portions of it; and that Valverde returned to Spain, and, when on his death-bed, bequeathed the secret of his riches to the king. Many expeditions, public and private, had been made to follow the

The parts of the map covered with forest are represented by scattered trees, among which the following forms are easily recognisable:—



No. 1 is the Wax palm (Palma de Ramos of the Quitonians; *Ceroxylon andicola*, H. et B.), which I have seen on Tunguragua up to 10,000 feet. Nos. 2 and 3 are Tree-ferns (Helechos)—the former a Cyathea, whose trunk (sometimes 40 feet high) is much used for uprights in houses; the latter an Alsophila with a prickly trunk, very frequent in the forest of Canelos about the Rio Verde. No. 4 is the Aliso (*Betula acuminata*, Kunth), one of the most abundant trees in the Quitonian Andes; it descends on the beaches of the Pastasa to near 4000 feet, and ascends on the paramos of Tunguragua to 12,000. But there is one tree (represented thus ), occupying on the map a considerable range of altitude, which I cannot make out, unless it be a Podocarpus, of which I saw a single tree on Mount Abitagua, though a species of the same genus is abundant at the upper limit of the forest in some parts of the Western Cordillera. A large spreading tree is figured here and there in the forest of Canelos which may be the Tocte—a true Walnut (Juglans), with an edible fruit rather larger than that of the European species. The remaining trees represented, especially those towards the upper limit of the forest, are mostly too much alike to admit of the supposition that any particular species was intended by them.

The abbreviations made use of in the map are: C° for Cerro (mountain), Cord^a for Cordillera (ridge), Mont^a for Montana (forest), A° for Arroyo (rivulet), L^a for Laguna, and C^a for Cocha (lake), Far^n for Farallón (peak or promontory), H^a for Hacienda (farm), and C^l for Corral (cattle or sheep-fold).

Mule-tracks (called by the innocent natives "roads") are represented by double red lines, and footpaths by single lines. I have copied them by dotted lines.

Having now passed in review the principal physical features of the district, let us return to the Derrotero of Valverde, of which the following is a translation. The introductory remark or title (not in very choice Castilian) is that of the copyist:

"The 'Derrotero' or Guide to the Hidden Treasure of the Incas. Translated by Richard Spruce."

Title

Guide or Route which Valverde left in Spain, where Death overtook him, having gone from the Mountains of Llanganati, which he entered many times, and carried off a great quantity of Gold; and the King commanded the Corregidors of Tacunga and Ambato to search for the Treasure: which Order and Guide are preserved in one of the Offices of Tacunga

The Guide

"Placed in the town of Pillaro, ask for the farm of Moya, and sleep (the first night) a good distance above it; and ask there for the mountain of Guapa,

from whose top, if the day be fine, look to the east, so that thy back be towards the town of Ambato, and from thence thou shalt perceive the three Cerros Llanganati, in the form of a triangle, on whose declivity there is a lake, made by hand, into which the ancients threw the gold they had prepared for the ransom of the Inca when they heard of his death. From the same Cerro Guapa thou mayest see also the forest, and in it a clump of Sangurimas standing out of the said forest, and another clump which they call Flechas (arrows), and these clumps are the principal mark for the which thou shalt aim, leaving them a little on the left hand. Go forward from Guapa in the direction and with the signals indicated, and a good way ahead, having passed some cattle-farms, thou shalt come on a wide morass, over which thou must cross, and coming out on the other side thou shalt see on the left hand a short way off a jucál on a hill-side, through which thou must pass. Having got through the jucál, thou wilt see two small lakes called "Los Anteojos" (the spectacles), from having between them a point of land like to a nose.

"From this place thou mayest again descry the Cerros Llanganati, the same as thou sawest them from the top of Guapa, and I warn thee to leave the said lakes on the left, and that in front of the point or 'nose' there is a plain, which is the sleeping-place. There thou must leave thy horses, for they can go no farther. Following now on foot in the same direction, thou shalt come on a great black lake, the which leave on thy left hand, and beyond it seek to descend along the hill-side in such a way that thou mayest reach a ravine, down which

comes a waterfall: and here thou shalt find a bridge of three poles, or if it do not still exist thou shalt put another in the most convenient place and pass over it. And having gone on a little way in the forest, seek out the hut which served to sleep in or the remains of it. Having passed the night there, go on thy way the following day through the forest in the same direction, till thou reach another deep dry ravine, across which thou must throw a bridge and pass over it slowly and cautiously, for the ravine is very deep; that is, if thou succeed not in finding the pass which exists. Go forward and look for the signs of another sleeping-place, which, I assure thee, thou canst not fail to see in the fragments of pottery and other marks, because the Indians are continually passing along there. Go on thy way, and thou shalt see a mountain which is all of margasitas (pyrites), the which leave on thy left hand, and I warn thee that thou must go round it in this fashion ᘓ. On this side thou wilt find a pajonál (pasture) in a small plain, which having crossed thou wilt come on a cañon between two hills, which is the Way of the Inca. From thence as thou goest along thou shalt see the entrance of the socabón (tunnel), which is in the form of a church porch. Having come through the cañon and gone a good distance beyond, thou wilt perceive a cascade which descends from an offshoot of the Cerro Llanganati and runs into a quaking-bog on the right hand; and without passing the stream in the said bog there is much gold, so that putting in thy hand what thou shalt gather at the bottom is grains of gold. To ascend the mountain, leave the bog and go along to the

right, and pass above the cascade, going round the offshoot of the mountain. And if by chance the mouth of the socabón be closed with certain herbs which they call 'Salvaje,' remove them, and thou wilt find the entrance. And on the left-hand side of the mountain thou mayest see the 'Guayra' (for thus the ancients called the furnace where they founded metals), which is nailed with golden nails.[1] And to reach the third mountain, if thou canst not pass in front of the socabón, it is the same thing to pass behind it, for the water of the lake falls into it.

"If thou lose thyself in the forest, seek the river, follow it on the right bank; lower down take to the beach, and thou wilt reach the cañon in such sort that, although thou seek to pass it, thou wilt not find where; climb, therefore, the mountain on the right hand, and in this manner thou canst by no means miss thy way."

[Having read this remarkable document, we shall better understand Spruce's account of the various attempts to discover the treasure, the chief routes followed being marked by red lines.]

With this document and the map before us, let us trace the attempts that have been made to reach the gold thrown away by the subjects of Atahuallpa as useless when it could no longer be applied to the purpose of ransoming him from the Spaniards.

Pillaro is a somewhat smaller town than Ambato, and stands on higher ground, on the opposite side

[1] [Query—sprinkled with gold.—ED.]

of the river Patate, at only a few miles' distance, though the journey thither is much lengthened by having to pass the deep quebrada of the Patate, which occupies a full hour. The farm of Moya still exists; and the Cerro de Guapa is clearly visible to east-north-east from where I am writing. The three Llanganatis seen from the top of Guapa are supposed to be the peaks Margasitas, Zunchu, and el Volcan del Topo. The "Sangurimas" in the forest are described to me as trees with white foliage; but I cannot make out whether they be a species of Cecropia or of some allied genus. The "Flechas" are probably the gigantic arrow-cane, *Gynerium saccharoides* (Arvoré de frecha of the Brazilians), whose flower-stalk is the usual material for the Indian's arrows.

The morass (Cienega de Cubillín), the Jucál,[1] and the lakes called "Anteojos," with the nose of land between them, are all exactly where Valverde places them, as is also the great black lake (Yana-cocha) which we must leave on the left hand. Beyond the lake we reach the waterfall (Cascada y Golpe de Limpis Pongo), of which the noise is described to me as beyond all proportion to the smallness of the volume of water. Near the water-fall a cross is set up with the remark underneath, "Muerte del Padre Longo"—this being the point

[1] Júco is the name of a tall, solid-stemmed grass, usually about 20 feet high, of which I have never seen the flower, but I take it to be a species of Gynerium, differing from *G. saccharoides* in the leaves being uniformly disposed on all sides and throughout the length of the stem, whereas in *G. saccharoides* the stem is leafless below and the leaves are distichous and crowded together (almost equitant) near the apex of the stem. The Júco grows exclusively in the temperate and cool region, from 6000 feet upwards, and is the universal material for laths and rods in the construction of houses in the Quitonian Andes.

from which the expedition first spoken of regressed in consequence of the Padre's sudden disappearance. Beyond this point the climate begins to be warm; and there are parrots in the forest. The deep dry quebrada (Quebrada honda), which can be passed only at one point—difficult to find, unless by throwing a bridge over it—is exactly where it should be; but beyond the mountain of Margasitas, which is shortly afterwards reached, no one has been able to proceed with certainty. The Derrotero directs it to be left on the left hand; but the explanatory hieroglyph puzzles everybody, as it seems to leave the mountain on the right. Accordingly, nearly all who have attempted to follow the Derrotero have gone to the left of Margasitas, and have failed to find any of the remaining marks signalised by Valverde. The concluding direction to those who lose their way in the forest has also been followed; and truly, after going along the right bank of the Curaray for some distance, a stream running between perpendicular cliffs (Cañada honda y Rivera de los Llanganatis) is reached, which no one has been able to cross; but though from this point the mountain to the right has been climbed, no better success has attended the adventurers.

"Socabón" is the name given in the Andes to any tunnel, natural or artificial, and also to the mouth of a mine. Perhaps the latter is meant by Valverde, though he does not direct us to enter it. The "Salvaje" which might have grown over and concealed the entrance of the Socabón is *Tillandsia usneoides*, which frequently covers trees and rocks with a beard 30 or 40 feet long.

Comparing the map with the Derrotero, I should

conclude the cañon, "which is the Way of the Inca," to be the upper part of the Rivera de los Llanganatis. This cañon can hardly be artificial, like the hollow way I have seen running down through the hills and woods on the western side of the Cordillera, from the great road of Azuáy, nearly to the river Yaguachi. "Guayra," said by Valverde to be the ancient name for a smelting-furnace, is nowadays applied only to the wind. The concluding clause of this sentence, "que son tachoneados de oro," is considered by all competent persons to be a mistake for "que es tachoneado de oro."

If Margasitas be considered the first mountain of the three to which Valverde refers, then the Tembladál or Bog, out of which Valverde extracted his wealth, the Socabón and the Guayra are in the second mountain, and the lake wherein the ancients threw their gold in the third.

Difference of opinion among the gold-searchers as to the route to be pursued from Margasitas would appear also to have produced quarrels, for we find a steep hill east of that mountain, and separated from it by Mosquito Narrows (Chushpi Pongo), called by Guzman "El Peñon de las Discordias."

If we retrace our steps from Margasitas till we reach the western margin of Yana-cocha, we find another track branching off to northward, crossing the river Zapalá at a point marked Salto de Cobos, and then following the northern shore of the lake. Then follow two steep ascents, called respectively "La Escalera" and "La Subida de Ripalda," and the track ends suddenly at the river coming from the Inca's Fountain (La Pila del Inca), with the

remark, "Sublevacion de los Indios — Salto de Guzman," giving us to understand that the exploring party had barely crossed the river when the Indians rose against them, and that Guzman himself repassed the river at a bound. These were probably Indians taken from the towns to carry loads and work the mines; they can hardly have been of the nation of the Curarayes, who inhabited the river somewhat lower down.

A little north and east of the Anteojos there is another route running a little farther northward and passing through the great morass of Illubamba, at the base of Los Mulatos, where we find marked El Atolladero (the Bog) de Guzman, probably because he had slipped up to the neck in it. Beyond this the track continues north-east, and after passing the same stream as in the former route, but nearer to its source in the Inca's Fountain, there is a tambo called San Nicolas, and a cross erected near it marks the place where one of the miners met his death (Muerte de Romero). Another larger cross (La Cruz de Romero) is erected farther on at the top of a basaltic mountain called El Sotillo. At this point the track enters the Cordillera de las Margasitas, and on reaching a little to the east of the meridian of Zunchu-urcu, there is a tambo with a chapel, to which is appended the remark, "Destacamento de Ripalda y retirada per Orden Superior." Beyond the fact thus indicated, that one Ripalda had been stationed there in command of a detachment of troops, and had afterwards retired at the order of his superiors, I can give no information.

There are many mines about this station, especially those of Romero just to the north, those

of Viteri to the east, and several mines of copper and silver which are not assigned to any particular owner. Not far to the east of the Destacamento is another tambo, with a cross, where I find written, "Discordia y Consonancia con Guzman," showing that at this place Guzman's fellow-miners quarrelled with him and were afterwards reconciled. East-north-east from this, and at the same distance from it as the Destacamento, is the last tambo on this route, called El Sumadal, on the banks of a lake, near the Rio de las Flechas. Beyond that river, and north of the Curaray, are the river and forests of Gancaya.

Another track, running more to the north than any of the foregoing, sets out from the village of San Miguel, and passes between Cotopaxi and Los Mulatos. Several tambos or huts for resting in are marked on the route, which ends abruptly near the Minas de Pinel (north-east from Los Mulatos), with the following remark by the author—"Conspiracion contra Conrado y su accelerado regreso," so that Conrado ran away to escape from a conspiracy formed against him, but who he was, or who were his treacherous companions, it would now perhaps be impossible to ascertain.

Along these tracks travelled those who searched for mines of silver and other metals, and also for the gold thrown away by the subjects of the Inca. That the last was their principal object is rendered obvious by the carefulness with which every lake has been sounded that was at all likely to contain the supposed deposit.[1]

[1] The soundings of the lakes are in Spanish varas, each near 33 English inches.

The mines of Llanganati, after having been neglected for half a century, are now being sought out again with the intention of working them; but there is no single person at the present day able to employ the labour and capital required for successfully working a silver mine, and mutual confidence is at so low an ebb in this country that companies never hold together long. Besides this, the gold of the Incas never ceases to haunt people's memories; and at this moment I am informed that a party of explorers who started from Tacunga imagine they have found the identical Green Lake of Llanganati, and are preparing to drain it dry. If we admit the truth of the tradition that the ancients smelted gold in Llanganati, it is equally certain that they extracted the precious metal in the immediate neighbourhood; and if the Socabón of Valverde cannot at this day be discovered, it is known to every one that gold exists at a short distance, and possibly in considerable quantity, if the Ecuadoreans would only take the trouble to search for it and not leave that task to the wild Indians, who are content if, by scooping up the gravel with their hands, they can get together enough gold to fill the quill which the white man has given them as the measure of the value of the axes and lance-heads he has supplied to them on trust.

The gold region of Canelos begins on the extreme east of the map of Guzman, in streams rising in the roots of Llanganati and flowing to the Pastasa and Curaray,[1] the principal of which are the Bombonasa and Villano. These rivers and their smaller tributaries have the upper part of their course in

[1] The name Curaray itself may be derived from "curi," gold.

deep ravines, furrowed in soft alluvial sandstone rock, wherein blocks and pebbles of quartz are interspersed, or interposed in distinct layers. Towards their source they are obstructed by large masses of quartz and other rocks; but as we descend the stones grow fewer, smaller, and more rounded, until towards the mouth of the Bombonasa, and thence throughout the Pastasa, not a single stone of the smallest size is to be found. The beaches of the Pastasa consist almost entirely of powdered pumice brought down from the volcano Sangáy by the river Palora. When I ascended the Bombonasa in the company of two Spaniards who had had some experience in mining, we washed for gold in the mouth of most of the rivulets that had a gravelly bottom, as also on some beaches of the river itself, and never failed to extract a few fragments of that metal. All these streams are liable to sudden and violent floods. I once saw the Bombonasa at Pucayacu, where it is not more than 40 yards wide, rise 18 feet in six hours. Every such flood brings down large masses of loose cliff, and when it subsides (which it generally does in a few hours) the Indians find a considerable quantity of gold deposited in the bed of the stream.

The gold of Canelos consists almost solely of small particles (called "chispas," sparks), but as the Indians never dig down to the base of the wet gravel, through which the larger fragments of gold necessarily percolate by their weight, it is not to be wondered at that they rarely encounter any such. Two attempts have been made, by parties of Frenchmen, to work the gold-washings of Canelos systematically. One of them failed in consequence

of a quarrel which broke out among the miners themselves and resulted in the death of one of them. In the other, the river (the Lliquino) rose suddenly on them by night and carried off their canoes (in which a quantity of roughly-washed gold was heaped up), besides the Long Tom and all their other implements.

I close this memoir by an explanation of the Quichua terms which occur most frequently on the map.

Spanish authors use the vowels *u* and *o* almost indiscriminately in writing Quichua names, although the latter sound does not exist in that language; and in some words which have become grafted on the Spanish, as spoken in Peru and Ecuador, the *o* has supplanted the *u* not only in the orthography but in the actual pronunciation, as, for instance, in Pongo and Cocha, although the Indians still say "Chimbu-rasu," and not "Chimborazo"—"Cutu-pacsi" or "Cutu-pagsi," and not "Cotopaxi." The sound of the English *w* is indicated in Spanish by *gu* or *hu*; that of the French *j* does not exist in Spanish, and is represented by *ll*, whose sound is somewhat similar; thus "Lligua" is pronounced "Jiwa." "Llanganati" is now pronounced with the Spanish sound of the *ll*, but whether this be the original mode is doubtful. An unaccented terminal *e* (as in Spanish "verde") is exceedingly rare in Indian languages, and has mostly been incorrectly used for a short *i*; thus, if we wish to represent the exact pronunciation, we should write "Casiquiari," "Ucayáli," and "Llanganati"—*not* Casiquiare, Ucayale, Llanganate.

"Llanganáti" may come from "llánga," to touch, because the group of mountains called by that name touches on the sources of the rivers all round; thus, on Guzman's map, we find "Llanganatis del Rio Verde"—"Llanganatis del Topo"—"Llanganatis del Curaray," for those sections of the group which respectively touch on the Rio Verde, the Topo, and the Curaray. The following are examples of the mode of using the verb "llanga." "Ama llangáichu!"—"Touch it not!" "Imapág llancángui?"—"Why do you touch it"; or "Pitag lláncaynírca?"—"Who told you to touch it?" And the answer might be "Llancanatág chári-cárca llancarcáni."—"[Thinking] it might be touched, I touched it."

It is to be noted that the frequent use of the letter *g*, in place of *c*, is a provincialism of the Quitonian Andes, where (for instance) they mostly say "Inga" instead of "Inca." But in

Maynas the *c* is used almost to the exclusion of the *g*; thus "yúrag," white, and "pítag," who, are pronounced respectively "yurac" and "pitac" in Maynas.

"Tungurágua" seems to come from "tungúri," the ankle-joint, which is a prominence certainly, though scarcely more like the right-angled cone of Tunguragua than the obtuse-angled cone of Cotopaxi is like a wen ("coto" or "cutu").

Of the termination "agua" (pron. "awa") I can give no explanation.

"Cungúri," in Quichua, is the knee; thus an Indian would say "Tungúri-mánta cungúli-cáma llustirishcáni urmáshpa," *i.e.* "In falling ('urmáshpa') I have scrubbed off the skin from the ankle to the knee."

Among rustics of mixed race, whose language partakes almost as much of Quichua as of Spanish, it is common to hear such expressions as "De tunguri á cunguri es una cola llaga."—"From the ankle to the knee is a continuous sore."

The following words occur repeatedly on the map:—

"Ashpa" (in Maynas "Allpa"), earth. "Urcu," mountain. "Rumi," stone. "Cócha (cucha)," lake.

"Yácu," river. "Ucsha," grass or grassy place ("Pajonál," Sp.). "Póngo (pungu)," door or narrow entrance.

"Cúchu," corner. "U'ma," head. "Paccha," cataract.

"Cúri," gold. "Cúlqui," silver. "Alquímia," copper. "Ushpa," ashes.

"Chíri," cold. "Yúnga," warm, from which the Spaniards have formed the diminutive "Yungúilla," warmish, applied to many sites where the sugar-cane begins to flourish.

"Yúrag," white. "Yána," black. "Púca," red. "Quílla," yellow.

"I'shcai," two; ex. "I'shcai-guáuqui," the Two Brothers, a cloven peak to the east of Los Mulatos. "Chunga," ten; ex. "Chunga-uma," a peak with ten points, a little to south of "Ishcai-guauqui." "Parca," double; thus a hill which seems made up of two hills united is called "Parca-urcu."

"Angas," a hawk. "Ambátu," a kind of toad.

"Sácha," forest. "Cáspi," tree. "Yúras," herb. "Quínua," the "Chenopodium Quinoa," cultivated for its edible seed. "Pujín," hawthorn (various species of Cratægus); thus "Montaña de Pujines," Hawthorn Forest; "Cerro Pujin el chico," Little Hawthorn-hill. "Cubiliín," a sort of Lupine, found only on the highest paramos. It gives its name to a long ridge of the Eastern Cordiliera, mostly covered with snow, extending from Condorasto and El Altar towards Sangáy. "Totorra," a large bulrush from which mats are made: hence "Totorrál," a marsh full of bulrushes. "Sara," maize.

"Tópo" is the name given in Maynas to the Raft-wood trees.

species of Ochroma (of the N.O. Bombaceæ). They begin to be found as soon as we reach a hot climate, say from 3000 feet elevation downwards.

"Rundu," sleet; thus "Rundu-uma," Sleety Head. "Rásu" is snow, and occurs in "Chimbu-rasu," "Caraguai-rasu" (Carguairago), and many other names. The vulgar name for snow as it falls is "Papa-cara," *i.e.* potato peelings.

"Pucará" indicates the site of a hill-fort of the Incas, of which a great many are scattered through the Quitonian Andes.

Critical Note by the Editor

The preceding account of the various routes of the gold-seekers among the Llanganati Mountains leads to the conclusion that only the earliest—that led by the Corregidor of Tacunga and the friar Padre Longo—made any serious attempt to follow the explicit directions of the "Guide," since the others departed from it so early in the journey as the great black lake "Yana Cocha," going to the left instead of to the right of it. No doubt they were either deceived by Indian guides who assured them that they knew an easier way, or went in search of rich mines rather than of buried treasure. The first party, however, and those who afterwards followed it, kept to the route, as clearly described, to the sleeping-place beyond the deep ravine where Padre Longo was lost; but beyond this point they went wrong by crossing the river, and thus leaving the district of the three volcanoes, which twice at the beginning of the "Guide" are indicated as the locality of the treasure.

Although no route to these mountains is marked on the map, Spruce tells us that other parties did

take the proper course, and found the "deep dry ravine" (marked on the map as "Quebrada honda"), and after it the mountain of Margasitas; but here they were all puzzled by the "Guide" directing them to leave the mountain on their left while the hieroglyph seems to leave it on the right, and following this latter instruction they have failed afterwards to find any of the other marks given by Valverde in his "Guide." Spruce himself suggests that the upper part of the Rivera de los Llanganatis (which is outside the portion of the map here given) is the "way of the Inca" referred to in the "Guide." But this is going quite beyond the area of the three mountains, so clearly stated as the objective of the "Guide."

It seems to me, however, that there is really no contradiction between the "Guide" and the map, and that the route so clearly pointed out in the former has not yet been thoroughly explored to its termination, as I will now endeavour to show. After crossing the deep dry ravine ("Quebrada honda" of the map), we are directed to "go forward and look for the signs of another sleeping-place." Then, the next day—"Go on thy way, and thou shalt see a mountain which is all of margasitas, the which leave on thy left hand." But looking at the map we shall see that the mountain will now be on the right hand, supposing we have gone on in the same direction as before, crossing the deep ravine. The next words, however, explain this apparent contradiction: they are—"and I warn thee that thou must go round it in this fashion," with the explanatory hieroglyph, which, if we take the circle to be the mountain and the right-hand termination of

the curve the point already reached, merely implies that you are to turn back and ascend the mountain in a winding course till you reach the middle of the south side of it. So far you have been going through forest, but now you are told—"On this side thou wilt find a pajonál (pasture) in a small plain" (showing that you have reached a considerable height), "which having crossed thou wilt come on a cañon between two hills, which is the way of the Inca." This cañon is clearly the upper part of the "Chushpi pongo," while the "Encañado de Sacha pamba" is almost certainly the beginning of the "way of the Inca." The explorers will now have reached the area bounded by the three volcanoes of the "Guide"—the Margasitas will be behind them, Zunchu-urcu on his right, and the great volcano Topo in front, and it is from this point only that they will be in a position to look out for the remaining marks of the "Route"—the socabón or tunnel "in the form of a church porch," and evidently still far above them, the cascade and the quaking-bog, passing to the right of which is the way to "ascend the mountain," going "above the cascade" and "round the offshoot of the mountain" to reach the socabón. Then you will be able to find the Guayra (or furnace), and to reach the "third mountain," which must be the Topo, you are to pass the socabón "either in front or behind it, for the water of the lake falls into it." This evidently means the lake mentioned in the first sentence of the "Guide" as being the place where the gold prepared for the ransom of the Inca was hidden. The last sentence of the "Guide" refers to what must be done if you miss the turning shown by the hieroglyph, in which case you have

to follow the river-bank till you come to the cañon (on the map marked "Chushpi pongo"), up the right-hand side of which you must climb the mountain, "and in this manner thou canst by no means miss thy way"; which the map clearly shows, since it leads up to the "Encañado," which is shown by the other and more easy route to be the "way of the Inca."

I submit, therefore, that the "Guide" is equally minute and definite in its descriptions throughout, that it agrees everywhere with Guzman's map, and that, as it is admitted to be accurate in every detail for more than three-fourths of the whole distance, there is every probability that the last portion is equally accurate. It will, of course, be objected that, if so, why did not Guzman himself, who made the map, also complete the exploration of the route and make the discovery? That, of course, we cannot tell; but many reasons may be suggested as highly probable. Any such exploration of a completely uninhabited region must be very costly, and is always liable to fail near the end from lack of food, or from the desertion of the Indian porters when there was doubt about the route. Guzman had evidently been diverted from the search by what seemed the superior promise of silver and gold mines, from which he may have hoped to obtain wealth enough to carry out the other expedition with success. This failing, he apparently returned home, and may have been endeavouring to obtain recruits and funds for a new effort when his accidental death occurred.

It is to be noted that beyond the point where the hieroglyph puzzled all the early explorers there is a

complete absence of detail in Guzman's map, which contains nothing that might not have been derived from observations made from the heights north of the river, and from information given by wandering Indians.

It is also to be noted that only four sleeping-places are mentioned in the "Guide," so that the whole journey occupied five days. The last of the four sleeping-places is before reaching the spot where he path turns back round the Margasitas Mountain, so that the whole distance from this place to the "lake made by hand" must be less than twenty miles, a distance which would take us to the nearer slopes of the great Topo Mountain. In this part of the route the marks given in the "Guide" are so many and so well-defined that it cannot be difficult to follow them, especially as the path indicated seems to be mostly above the forest-region.

For the various reasons now adduced, I am convinced that the "Route" of Valverde is a genuine and thoroughly trustworthy document, and that by closely following the directions therein given, it may still be possible for an explorer of means and energy, with the assistance of the local authorities, to solve the interesting problem of the Treasure of the Incas. The total distance of the route, following all its sinuosities, cannot exceed ninety or a hundred miles at most, fully three-fourths of which must be quite easy to follow, while the remainder is very clearly described. Two weeks would therefore suffice for the whole expedition.

I have written this in the hope that some one who speaks Spanish fluently, has had some experience

of the country, and is possessed of the necessary means, may be induced to undertake this very interesting and even romantic piece of adventurous travel. To such a person it need be but a few months' holiday.

GLOSSARY OF NATIVE NAMES[1]

ABACATE, AGUACATE. An oily fruit; cats fond of it; good for epilepsy.
ABILLA, JABILLA. A twiner with large seeds producing a bitter oil for lamps on the Huallaga river.
ACARICUARÁ. *Swartzia callistemon.* Curious perforated trunks; a dye from the bark.
AGUACATE. A tree (undetermined) of the fruit of which cats and many wild animals are very fond. It is very nutritious, and the seeds produce an oil very similar to that of olives.
AJARI. *Tephrosia toxicaria* (Leguminosæ).
ALCORNOQUES (cork trees). *Curatella Americana.*
ALDEA. A village.
ALGARROBO (Venez.) = JUTAHI (Braz.). Hymenæa sp. (Leg.). Fruit a remedy in asthma; seeds give a fine varnish; and incense.
ANAPÉ. The Jacaná, a long-toed water-fowl (*Parra jacana*).
ANAPÉ-YAPONA. *Victoria regia* (Nymphæaceæ). Jacaná's oven.
ANDIROBA OIL. From *Carapa Guianensis* (Meliaceæ).
ANGELIM. Andira sp. An excellent timber-tree.
ANIL. *Indigofera anil.* Produces blue colour used in painted cuyas.
APIRANGA. A fruit. *Mouriria Apiranga* (Melastomaceæ).
ARAPARI (tree). Fine wood for cabinet work, but small (*Nauclea guianensis*).
AREÇA. An acid berry. *Psidium ovatifolium* (Myrtaceæ).
ARIPECURÚ. A branch of the Trombetas river.
ARVORE DE CHAPETE. *Gustavia Brasiliensis.*
ASSAÍ. A drink from fruit of *Euterpe oleracea* (Palmaceæ).

BACÁBA. Œnocarpus sp. (Palmaceæ). Fruits yield a nutritious drink or food.
BACUARI-ASSU. *Platinia insignis* (Clusiaceæ). Edible fruit.
BAUNÁ. Root of a climber (Menispermaceæ), called also "maniocca açu" (great mandiocca), larger and more poisonous than mandiocca, but makes equally good farinha and cakes, and is much used on the Purús and Upper Amazon (see vol. i. p. 215).
BLACK PITCH. Clusiaceæ.
BOGA-BOGA (Peru), CAIWA (Maynas). Cucurbitaceæ. A gourd with seeds of an extraordinary rectangular shape.
BOMBONAJÉ. Carludovica sp. (Pandanaceæ). Leaves used for making Panama hats.
BRÉO BRANCO. White pitch. Icica sp.
BRUSCA (Venez.). *Cassia occidentalis.* Bitter root: good in fevers.

[1] This list comprises all the names I have met with in Spruce's Journals and MSS. They may be useful to other explorers or collectors.—ED.

CAAPÍ. *Banisteria caapi* (Malpighiaceæ). An intoxicant.
CAARURU. Podostemon sp. Used for food by the Indians; ashes give salt.
CAATINGA. Low forest—white forest.
CACHIMBO. A pipe.
CADÍ. Phytelephus sp. (Palmaceæ). Vegetable Ivory nut.
CAIMBÉ. *Curatella Americana* (Dilleniaceæ).
CAJU (= MEREY, Venez.). *Anacardium occidentale.* Cashew nut.
CAPOEIRAS. Second growth woods, on deserted farms, etc., in virgin forest.
CARAIPÉ. Licania sp. (Chrysobalaneæ). Pottery tree.
CARAJURÚ. *Bignonia chica.* A red dye.
CARAJURÚ PIRANGA. Bignonia sp. Produces red colour for cuyas.
CARANÁ. *Mauritia carana* (Palmaceæ).
CARANAÍ. *Mauritia aculeata* (Palmaceæ).
CARAPANÁS (L.G.). Mosquitoes.
CARIAQUITO. *Lantana Camara.* Leaves, root, and flowers medicinal.
CARIBÉ (Braz.). Cassava beer, on the Rio Negro.
CARIZA. A musical pipe.
CARTELHANA. *Yangua tinctoria* (Spruce). Gives a dye like that of indigo.
CASCARIA. Samydaceæ.
CASTANHA (Port.). *Bertholletia excelsa.* Brazil-nut tree.
CAURÉ. Perhaps *Kyllinga odorata*, from the roots of which a scented water is distilled by the Indians.
CAXIRÍ (L.G.). Mandiocca beer.
CEDAR. Icica sp. (Amyridaceæ). On the Amazon.
,, Phyllanthus sp. (Euphorbiaceæ). Quito.
CHICHA (Ven.). Cassava beer.
COCA. *Erythoxylon coca.*
COCUI. Agave sp. Root diuretic.
COCÚRA. Pourouma sp. (Artocarpeæ). Edible fruit.
COROZITO. Tree at Maypures.
CORUSI-CAÁ. *Calocophyllum coccineum* (Rubiaceæ). Sun-leaf. Very handsome flower-bracts.
COW-TREE. Mimusops sp. (Sapotaceæ). Produces wholesome milk.
,, Callophora sp. (Apocynaceæ). Produces wholesome milk.
,, Loureira sp. (Euphorbiaceæ). Yields milk.
CUIARÉ. *Elais melanococca* (Palm). Oil-producing.
CUMAÍ, CUMA-AÇU. Callophora (Apocynaceæ). Cow-trees.
CUMANDA-AÇU. *Campsiandra laurifolia* (Leg.). Beans grated used as an emetic.
CUMARÚ. *Dipteryx odorata* (Leguminosæ). Tonga bean, scent.
CUMARÚ-RANA. *Andira oblonga* (Leg.).
CUMATI. Myrcia sp. (hb. 1916) (Myrtaceæ). Bark gives a varnish used on cuyas.
CUNAMBI. *Ichthyothera cunambi* (Compositæ). Roots used to stupefy fish.
CUNÚCO (Ven.). Mandiocca field in Venezuela.
CUNURÍ. Euphorbiaceæ. Seeds give an edible oil.
CUPANÁ (Ven.). *Paullinia cupana* (Sapindaceæ). An intoxicant.
CUPA-ÚBA. *Copaifera Martii* (Leg.). Yields balsam capivi.
CUPIM̃. Termites, white ants.
CUPU-ASSU. Theobroma sp. Pulp of fruit eatable.
CURAUÁ. *Bromelia Karatas* (Bromeliaceæ). Leaf fibres used in making hammocks.
CURUÁ. *Attalea spectabilis* (Palmaceæ).
CUSPARIA = CHUSPA. Galipea sp. Bark tonic and febrifuge.

CUYAS. Calabash basins.
CUYEIRA. Crescentia sp. Calabash tree.

EHEN (Ven.). A minute biting fly.
ESPIA (Braz.). A cable.

GAMALOTES. Panicum sp. Grasses in the Cinchona forests.
GAPÓ (L.G.). The flooded banks of rivers.
GENIPAPA. *Genipa Americana* (Cinchonaceæ). Fruit gives a black dye.
GUACO. Mikania sp. Supposed antidote to snake-bites.
GUAJARÁ. Lucuma sp. (Sapotaceæ). Cooked fruits eatable.
GUANABANO. *Anona muricata.* Said to be a powerful remedy in bilious fevers, dysentery, etc.
GUARANÁ. *Paullinia cupana*, stimulant from seeds of.

HOBO = JOVO. Same as Tapiriba (*q.v.*).

IGARAPÉ (L.G.). A small stream.
IMBAÚBA. Cecropia sp. Small white-leaved trees.
INAJÁ. *Maximiliana regia.* A lofty palm.
INGÁ (L.G.). Inga sp. (Mimoseæ). Small trees, produce varnish.
IPADÚ (L.G.). *Erythroxylon coca* (Erythroxylaceæ). Leaves stimulant.
IRAPAI. Carludovica sp. (Pandanaceæ). Peru.
ITA-ÚBA. Acrodiclidium sp. (Lauraceæ). Stone tree, hard wood, finely scented.
ITUÁ, ITUÁN. Gnetum sp. Fibre makes strong fishing-lines.
IÚ. *Astrocaryum acaule* (Palmaceæ).

JACITARA (L.G.). *Desmoncus macroacanthus.* A climbing palm.
JAPURA, YAPURA. *Erisma japura* (Vochysiaceæ).
JARÁ. Leopoldinia sp. Small graceful palms.
JARARACA-TUYA. Dracontium sp. (Araceæ). Stems snake-like.
JAUACÁNA. *Epeira falcata* (Cæsalpiniæ). Infusion of bark good for ague.
JAUARI (L.G.). *Astrocaryum jauari.* A tall prickly palm.
JUÇARA. Narrow strips or planks of shell of palms.
JUPATI. *Rhaphia tædigera.* A short-stemmed but noble palm with immense leaves.
JURUPARI (L.G.). Devil or demon of the Indians.
JUTAHI. Hymenæ sp. (Fabaceæ), Algaroba (Venez.), edible.

LAUREL AMARILLO. *Ocotea cymbarum* (Lauraceæ).
LECHEROTE. Asclepiadea? A twiner, with sweet, milky, wholesome juice, useful in coughs.

MACERANDÚBA. Mimusops sp. (Sapindaceæ). The Pará cow-tree.
MARAJÁ. *Bactris maraja.* Small palm; fruit edible.
MARAYÁ. *Astrocaryum aculeatum* (Palmaceæ).
MARIMA. Trees producing eatable grubs.
MASUTO. Fermented yucas.
MATINHO. Second growth forest.
MATO VIRGEM (Port.). Virgin forest.
MAYACA, MAHICA. Mayacaceæ. Small bog plants.
MAYNAS. A province of N.E. Peru.

MIRA PIXUNA. *Swartzia grandiflora* (Cæsalpiniæ). Black wood.
MIRITI. Palms of the genus Mauritia.
MONKEY-PODS. Pithecolobium (Mimoseæ).
MOSQUITO (Span.). Sand-flies, etc.
MUCUIN. A small red tick.
MUCUJÁ. *Acrocomia lasiospatha.* Palm with eatable fruit.
MULATTO TREE. *Enkylista Spruceana* (Cinchonaceæ).
MULONGO. *Hancornia laxa* (Apocynaceæ). Cork wood.
MUMBACA. *Astrocaryum mumbaca.* Palm; fruit eatable.
MURIKITICA. A climber. Stem gives drinkable water.
MURIXI. *Byrsonima Poppigiana* (Malpighiaceæ). Bark for tanning.
MURUMURÚ. *Astrocaryum murumuru.* Palm; very spiny. Cattle eat the fruit.
MURURÉ. Floating plants.
MUTÚCA. Small biting flies.

NAMAÕ. *Carica Papaya* (Papayaceæ). The Papaw; fruit eatable.
NIOPO (Ven.). *Piptadenia Niopo.*

OANÁNI. Moronobœa sp. (Clusiaceæ). Black pitch.
OCUMO. Arum sp. Powder used in asthma; root contains half its bulk of fine starch.

PAACUA-RANA. Urania sp. An edible root.
PACÓVA. *Musa sapientiæ* (Musaceæ). Plantain fruit.
PACOVA-SOROROCA. *Alpinia Paco-seroca* (Jacq.). Gives a purple dye, not permanent.
PAJA MANIBA. *Cassia occidentalis.* Root bitter; good in fevers.
PAJUARÚ. Mandiocca beer, also called "caxirí."
PAO D' ARCO. Tecoma sp. Bows and cigar-holders made of this wood.
PAO DE LACRE. *Vismia guianensis* (Hypericaceæ). Yields sealing-wax.
PAO MULATTO. *Eukylista Spruceana* (Cinchonaceæ).
PAPAW. *Carica Papaya* (Papayaceæ). A fruit.
PARANA-MIRI. Side channels of the Amazon, small rivers.
PARATURÍ. Lauraceæ. Hard wood, on Upper Orinoco.
PARICA (L.G.). *Piptadenia Niopo* (Mimoseæ). Seeds make snuff.
PATAWÁ. *Œnocarpus Batawa* (Palm). Spines of leaf-stems used to make arrows for blowing-canes.
PAXIÚBA. *Iriartea exorhiza* (Palmaceæ).
PAXIÚBA-I. *Iriartea setigera* (Palm). Stem used for blowing-canes.
PIASSABA. *Leopoldinia piassaba* (Palmaceæ).
PIHIGUA. Eatable grub.
PINDÓBA. *Attalea compta* (Palmaceæ).
PIQUIÁ. Caryocar sp. (Rhizobolaceæ). Fruit with kernels like almonds.
PIRANHA-SIPO. A climber yielding drinkable water.
PIRARUCÚ. *Sudis gigas.* A large fish. When salted, a chief food on the Amazon.
PIRI-MEMBECKA. *Paspalum pyramidale* (Graminaceæ).
PITOMBA. *Sapindus cerasinus* (Sapindaceæ). Edible fruit.
PIUM̃ (L.G.). Small biting flies.
PUPUNHA. *Guilielma speciosa* (Palmaceæ). Peach palm.
PURU-PURU (L.G.). A leprous skin disease.
PUSKU-POROTO. A shrub with edible fruit (Papilionaceæ) cultivated in Tarapoto district.

RAIZ DE MATO. Aristolochia sp. A powerful tonic.
RETÁMA. *Thevetia neriifolia* (Apocynaceæ). Fruit eatable; seeds used for rattles.

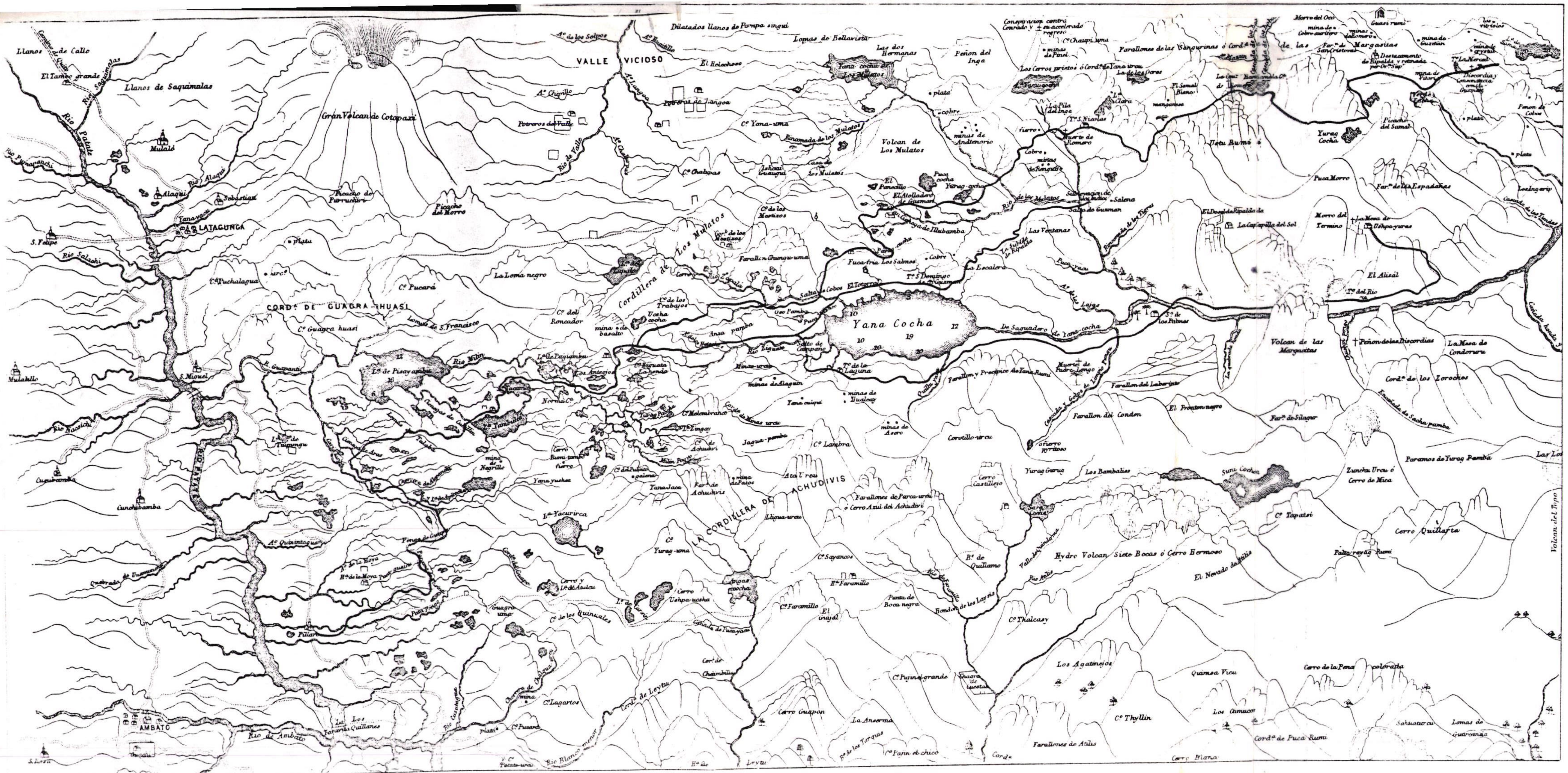
SAMAÚMA. Eriodendron sp. (Sterculiaceæ). The Silk-cotton tree.
SAPUCAIA. Lecythis sp. Good ship timber.

TABATINGA. White earth, used in painting cuyas.
TABOCAL. A bamboo thicket.
TACUARI. *Mabea fistulosa* (Euphorbiaceæ). Stems make pipe-tubes.
TAMACOARÍ. Caraipa sp.? Produces a fine balsam; specific for itch.
TAMSHE. A liana used in the Andes.
TAPIIRA GUAYABA. Bellucia sp. (Melastomaceæ). A fruit.
TAPIRIBA. *Mauria juglandifolia* (Anacardiaceæ). A fruit, bark medicinal.
TAPUYAS. Indians semi-civilised.
TAUARÍ. Bark cloth. Tecoma sp. (Bignoniaceæ).
TERRA FIRME. Dry land, above floods.
TIMBO. *Paullinia pinnata* (Sapindaceæ). Roots used to stupefy fish.
TIMBO-TITICA. Heteropsis sp. Shields of Uaupés Indians made of this wood.
TRAGO (Barré). Native spirit, in the Rio Negro.
TUÇHAUA (L.G.). The chief of an Indian tribe.
TUCUM. *Astrocaryum vulgare* (Palmaceæ).
TUCUMÁ. *Astrocaryum tucuma* (Palmaceæ).
TUCUNDÉRA (L.G.). The large severely stinging ant.
TUPÍ. Indians who speak Lingoa Geral.
TURURI. Thick bark cloth.

UACÚ. Leguminosæ. Produces a bitter oil from seeds.
UARAMA. Marantaceæ. An edible root.
UARCA. Marantaceæ. An edible root.
UARÚMA. Maranta sp. Leaves used in making mats, baskets, etc.
UAUASSÚ. *Attalea speciosa*. Palmaceæ.
UBA, UBADA. Large dug-out canoes.
UBIM. Geonoma sp. Small forest palms.
UBUSSU. *Manicaria saccifera* (Palmaceæ).
UCU-ÚBA. *Myristica fatua* (Myristicaceæ). Fruit very oily.
UIRA (L.G.). *Gynerium saccharoides* (Granimeæ). Wild cane, much used in native houses in the Andes, and for arrows, etc.
UIRARI-RANA. *Strychnos Brasiliensis* (Loganiaceæ). A fruit, edible.
UMARÍ. Poraqueiba sp. Kernel eaten after steeping in water.
UMIRI. Humirium sp. Edible fruit.
UNI-BINI. Bignonia? Roots cure for ophthalmia.
URUBU. The Turkey-buzzard: a black vulture.
URUBU MARACAJÁ. *Passiflora fœtida*, fruit of.
URUCÚ. *Bixa orellana* (Flacourtiaceæ). Anatto, a dye.
URUCURÍ. *Attalea excelsa* (Palmaceæ). The fruit is burnt to smoke india-rubber.
URUPÉ. An edible agaric at Pará.

VIJAU. *Maranta Vijau*. Leaves used for making lids of baskets waterproof (on Pastasa river).

XERINGUE. Siphonia sp. (Euphorbiaceæ). India-rubber trees.
XIRIUBA. A tree at Tarapoto (*Ucuba chillca*), the ashes of which make the best lye for soap.



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MAP OF THE MOUNTAINS OF LLANGANATI, IN THE QUITONIAN ANDES.

by Don Atanasio Guzman.–

To illustrate a Paper by Richard Spruce Esqʳᵉ

(Journal of R.G. Society)

YACITÁRA. Desmoncus. Climbing palms.
YANGUA. *Yangua tinctoria* (Bignoniaceæ). Leaves produce a blue dye; bark a remedy for syphilis.
YENIPAPA. *Genipa macrophylla* (Cinchonaceæ). A fruit.
YUMURA CEEMI. Clusiaceæ. Sweet tree.
YUTAHI. Hymenæa sp., Peltogyne sp. (Fabaceæ). Seeds edible.

ZAMBO. A negro and Indian half-breed.
ZANAHOVIA. An edible root, like parsnips; near our carrot (*Daucus carota*).
ZANCUDOS. Mosquitoes.

NOTE.—The following terms also occur in Spruce's Journals or Notes, but I have been able to find no explanation of them :—

CAMAZAS (in Venezuela).
ISHPINGO.
JEBARIE.
RONDIN (see vol. ii. p. 114).
WINGO.

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THE END

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