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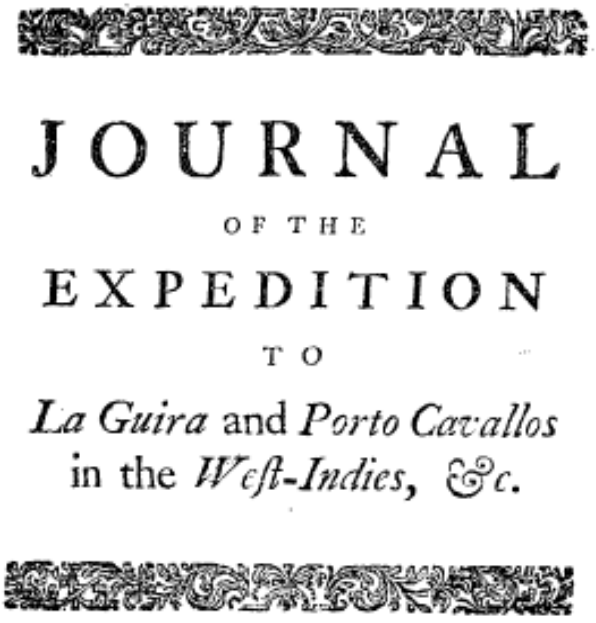
BOLETÍN DE HISTORIA DE LAS GEOCIENCIAS EN VENEZUELA

Número 101
Diciembre 2007


JOURNAL
OF THE
EXPEDITION
TO
La Guira and *Porto Cavallos*
in the *West-Indies*, &c.

Ediciones de la Sociedad Venezolana de Historia de las Geociencias
Apartado 47.334, Caracas 1041A, Venezuela

BOLETÍN DE HISTORIA DE LAS GEOCIENCIAS EN VENEZUELA

Número 101, Diciembre 2007

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Daniell Ellffryth's Guide to the Caribbean, 1631

Stanley Pargellis; Ruth Lapham Butler

The William and Mary Quarterly, 3rd Ser., Vol. 1, No. 3 (Jul., 1944), 273-316.

DANIELL ELLFFRYTH'S GUIDE TO THE CARIBBEAN, 1631

Edited by STANLEY PARGELLIS and RUTH LAPHAM BUTLER*

The successful planting of seventeenth-century English colonies was the joint work of capitalists, sober colonists and hard-boiled adventurers. Ellffryth[1] is a good representative of the last group. Temperamentally he belonged to the age of Drake. He liked nothing better than picking off a lone Spanish ship weaker than his own, or boasting of what he could do. In happier days for pirates his penchant for roving might have made him a minor hero. But Fate and the times were against him. In the third and fourth decades of the century a sporadic foreign policy of peace with Spain and the diversion of capital to colonizing ventures forced him to try his unwilling hand at settlement if he was to get ahead. He failed in the effort. The temptation of sailing tantalizingly profitable seas, always more than he could resist for long, finally eased him off the historical scene as it had brought him upon it.

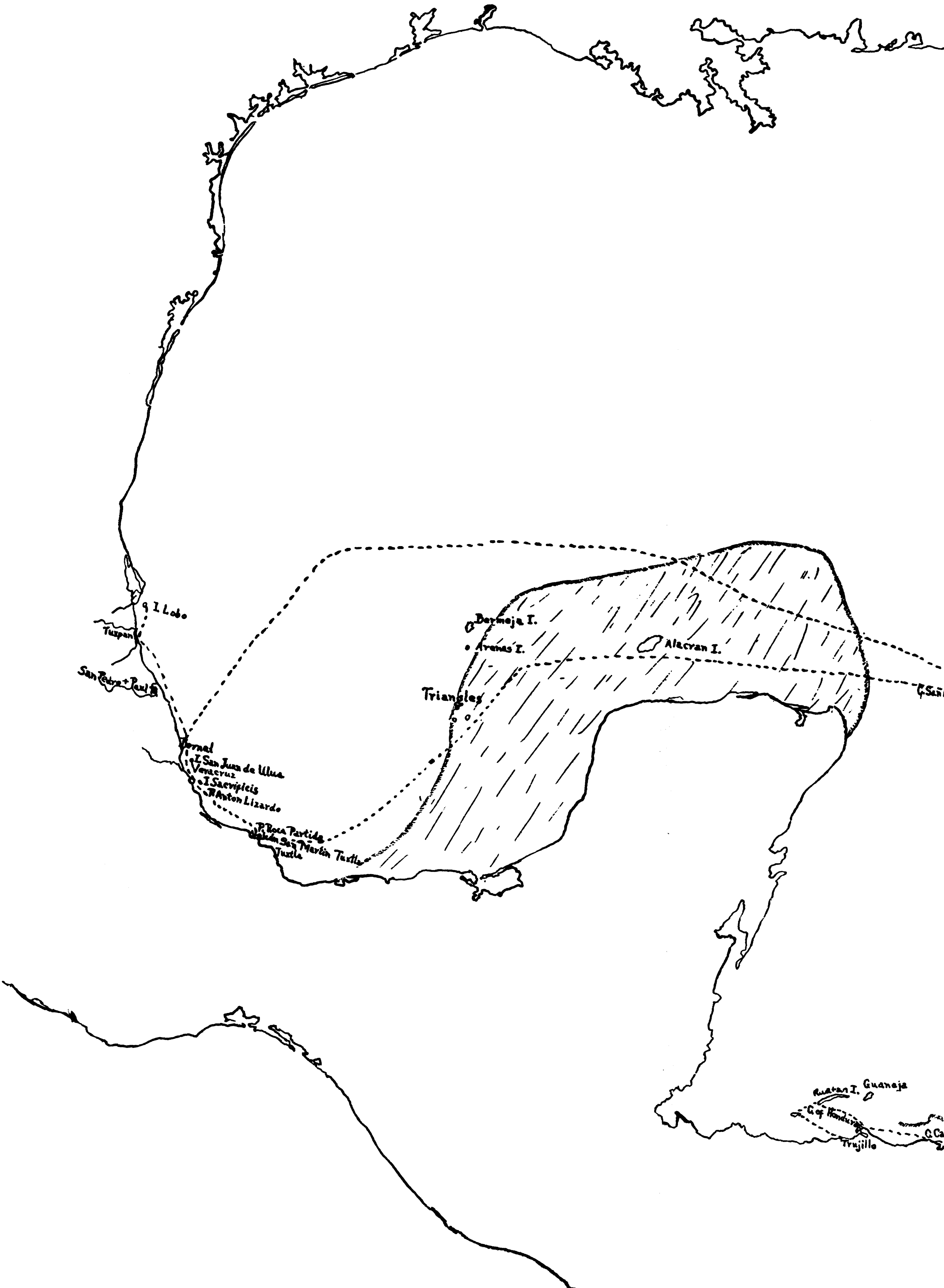
Of Ellffryth's earlier and later life, if he had one, the records disclose nothing. What is known of him, and that is little enough, falls between 1608 and 1640, and into three main parts.[2] In the first, from 1608 to 1621, he was the adventurer pure and simple. He himself says that he first entered the Caribbean in 1607, and because he does turn up in 1613 in connection with a Captain Edward Fisher who accompanied Robert Harcourt in 1608 on an abortive expedition to found a settlement in Guiana, he can be presumed to have served his apprenticeship in that ill-conceived, gold-hunting colony, which ended after three or four years in unknown disaster.[3] John Smith himself tells how Ellffryth, slipping off in a captured Spanish caravel with which Fisher had entrusted him, turned up at Bermuda in 1613 with a providential cargo of meal for the starving settlers, and with rats enough to boot

*Stanley Pargellis is Librarian at the Newberry Library, Chicago, Illinois. Ruth Lapham Butler is in charge of the Ayer Collection in that institution.

[1] The name is found as Elfrith, Elfred, Elfree, Elfrey, Aelfryth and Allfryth. He himself signed with the double consonant.

[2] The usual facts about Ellffryth can be found in Alexander Brown, *The Genesis of the United States* (Boston, 1890), II, 885-886, 980; Henry Wilkinson, *The Adventurers of Bermuda* (Oxford, 1933) and A. P. Newton, *The Colonizing Activities of the English Puritans* (New Haven, 1914). Newton's entire book is devoted to the story of the Old Providence Company.

[3] *Hakluytus Posthumus* (Glasgow, 1906), XVI, 358 ff; Robert Harcourt, *A Relation of a Voyage to Guiana* (London, 1928), Hakluyt Soc., ser. II, 60; J. A. Williamson, *English Colonies in Guiana* (Oxford, 1922); Nathaniel Butler, *The Historye of the Bermudaes* (London, 1882), Hakluyt Soc., 65, 33.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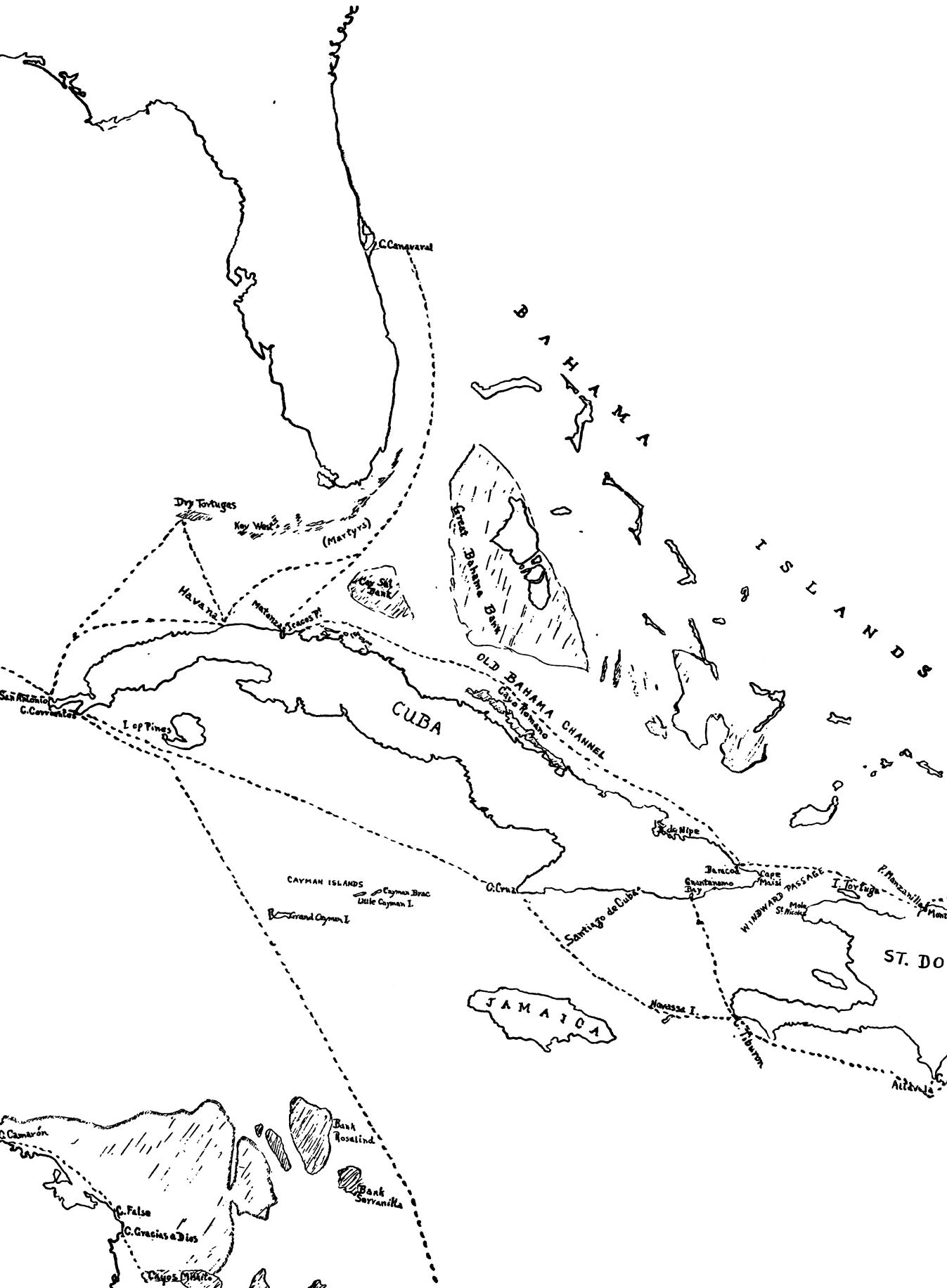
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Dry Tortugas
Key West
(Martyrs)
Great Bahama Bank
Cay Sal Bank
Havana
Matanzas
Tracas Pt.
OLD BAHAMA CHANNEL
Caya Romano
San Antonio
C. Corrientes
I. of Pines
CUBA
Nipe
Baracoa
Cape Maisi
Guantanamo Bay
WINDWARD PASSAGE
I. Tortuga
P. Manzanillo
CAYMAN ISLANDS
Cayman Brac
Little Cayman I.
Grand Cayman I.
C. Cruz
Santiago de Cuba
Mole St. Nicolas
ST. DO
JAMAICA
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C. Gracias a Dios
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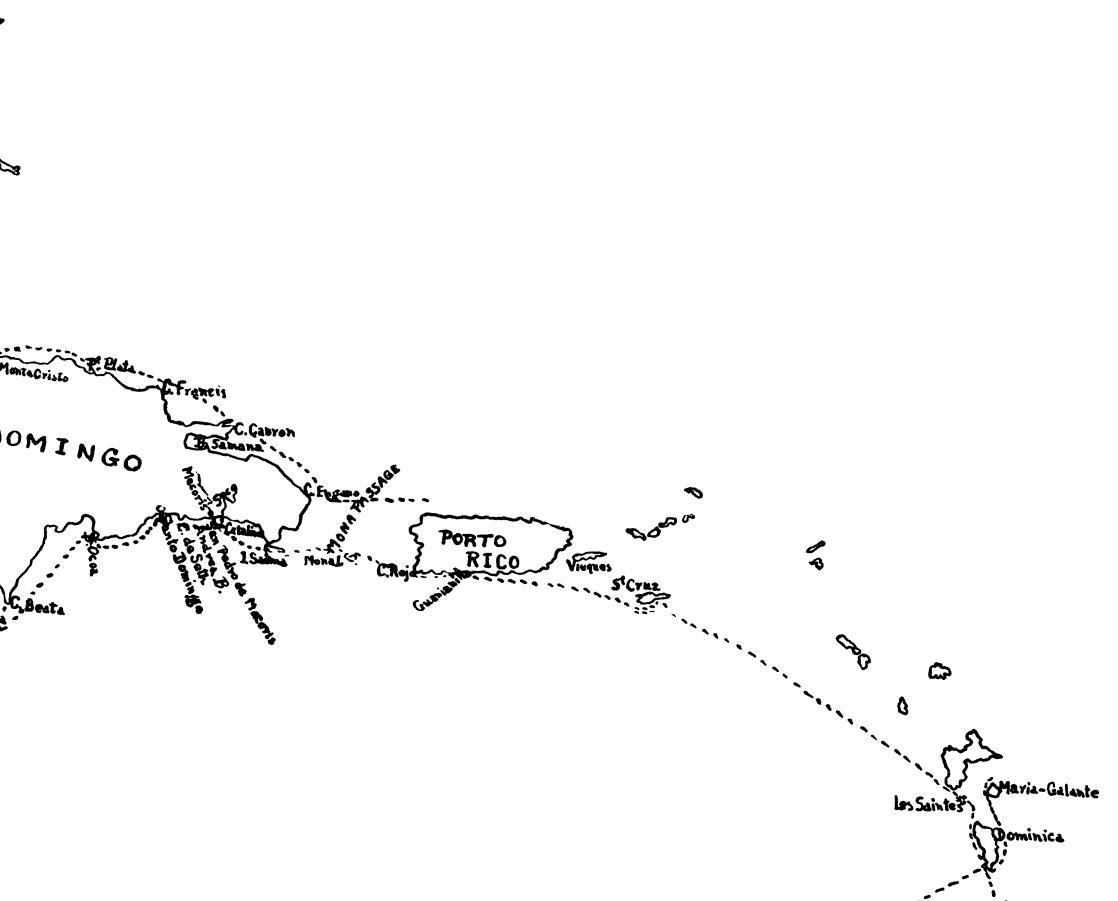
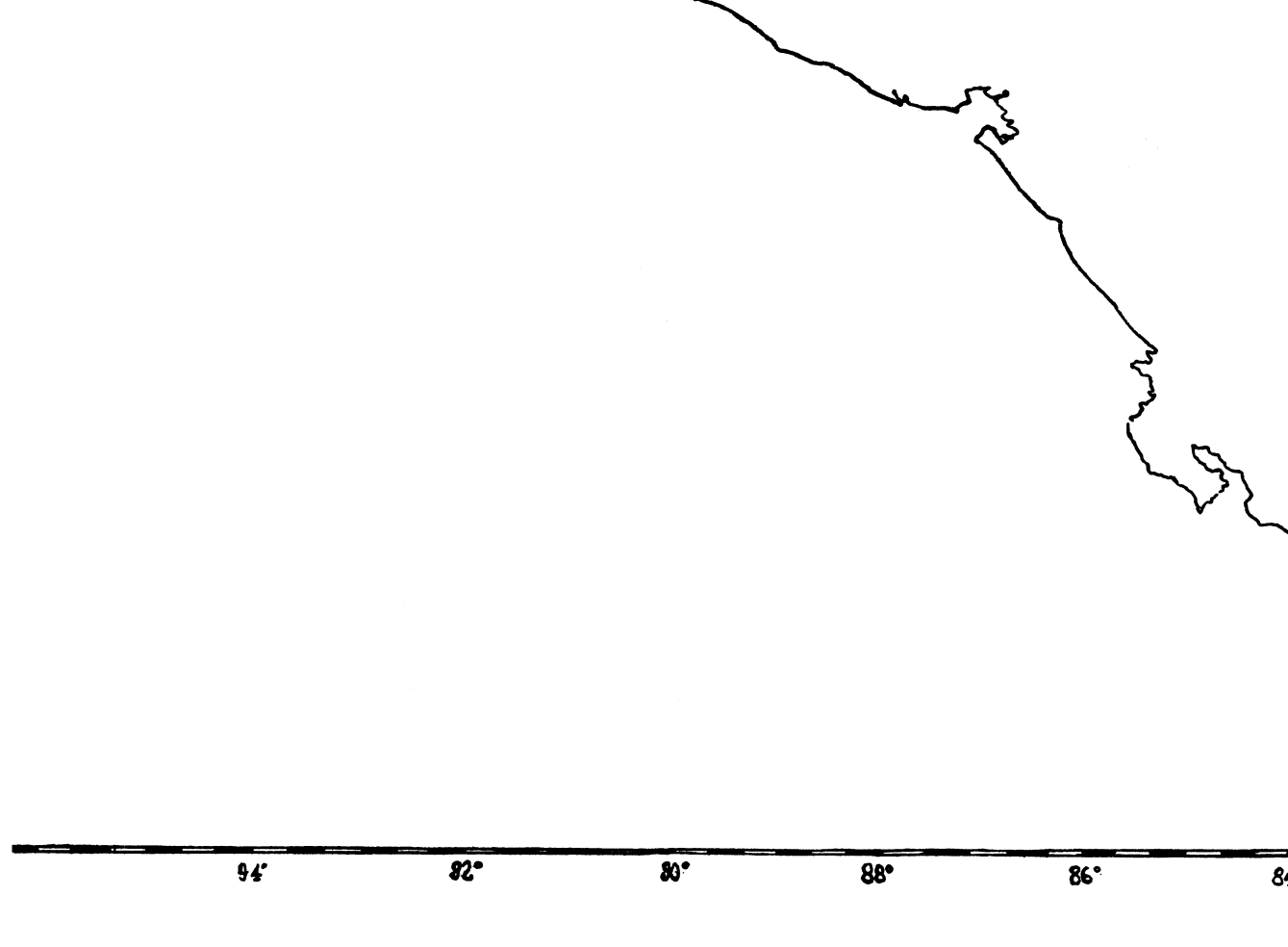
Ellffryth's Routes in the Caribbean

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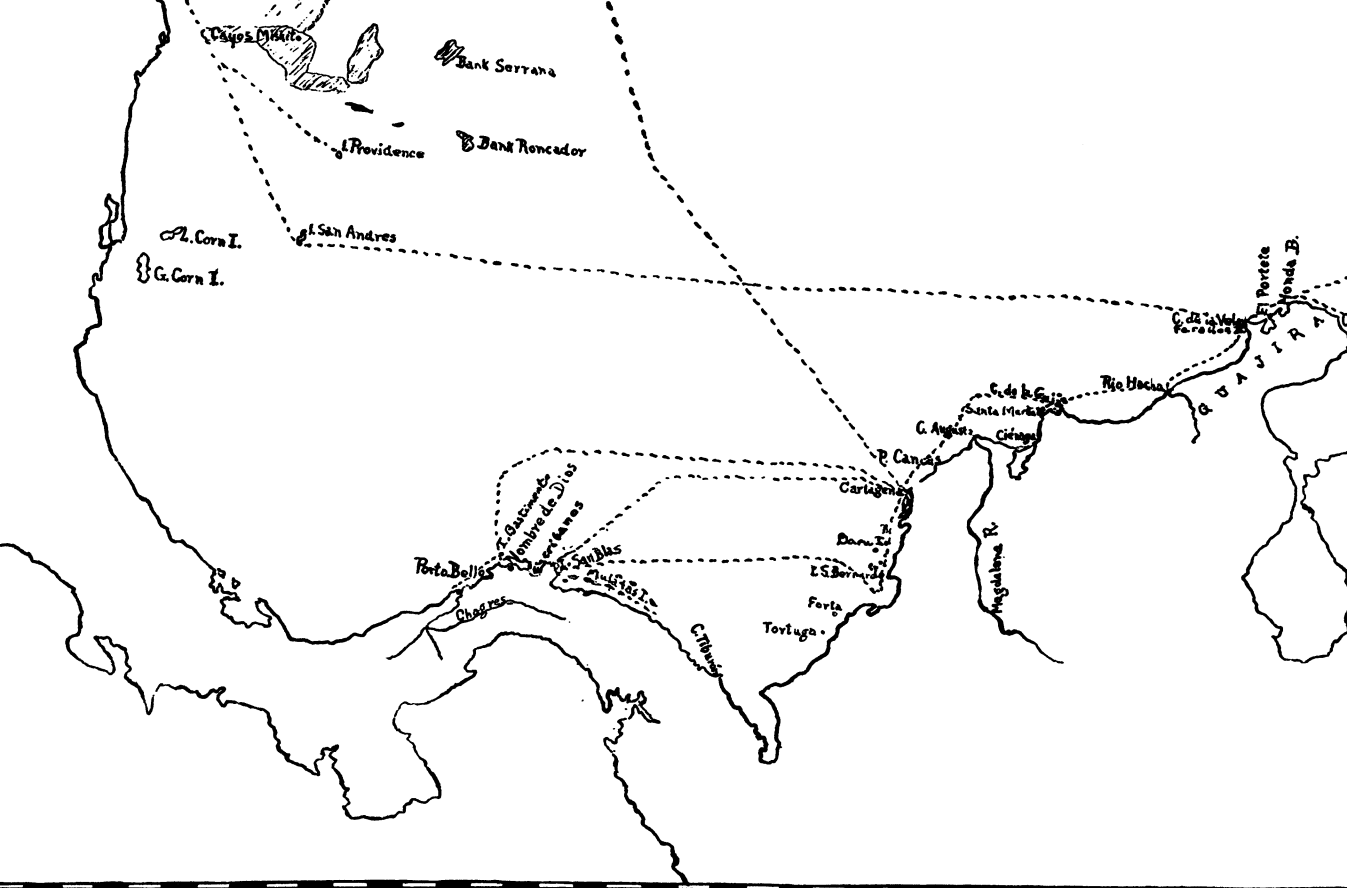

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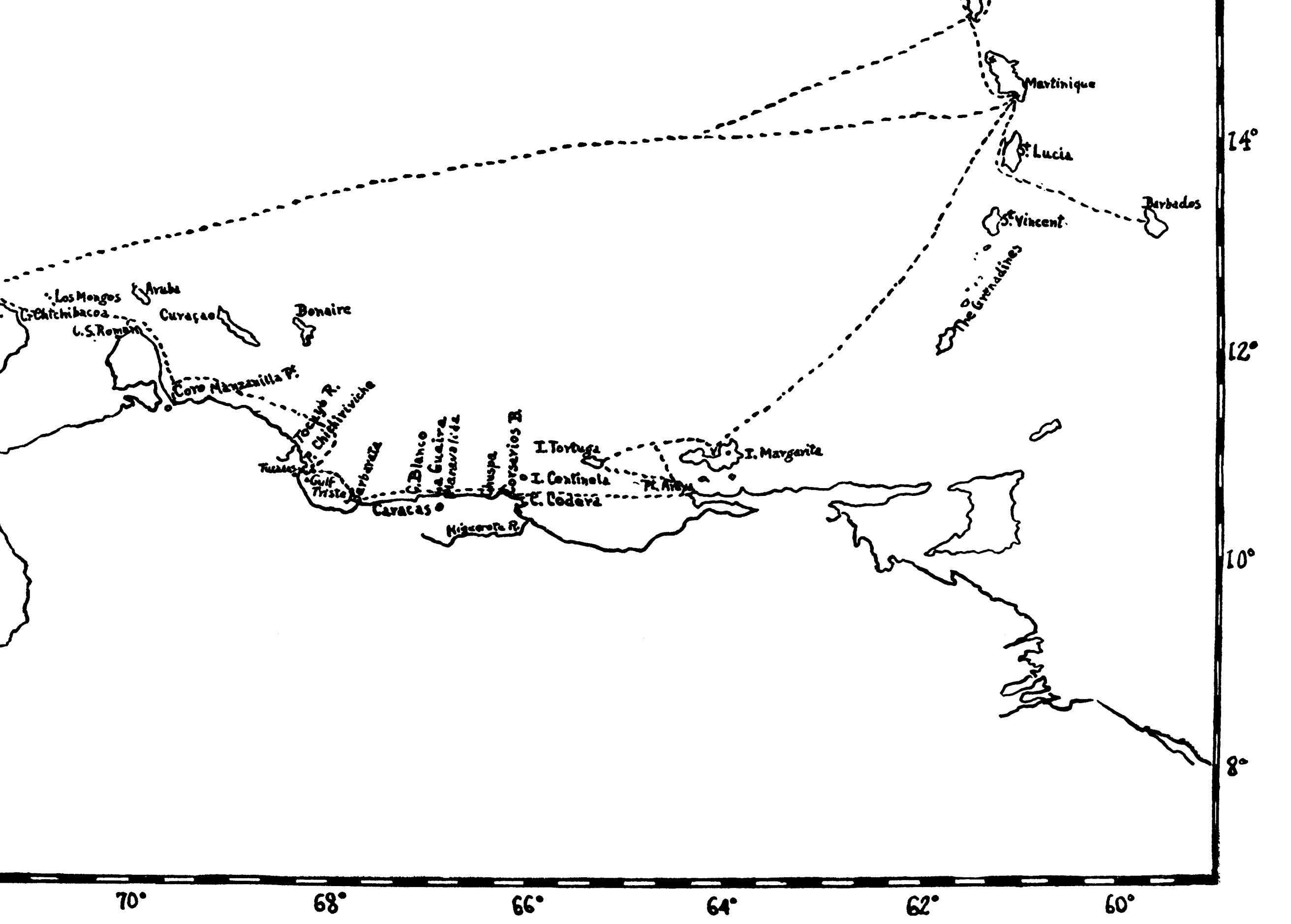
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St. Vincent
The Grenadines
Los Mongos
Aruba
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C. S. Roman
Curaçao
Bonaire
Coro
Manzanilla Pt.
Tocuyo R.
P. Chichiriviche
Tucacas
Gulf Triste
Caracas
C. Blanco
La Guaira
Higuerote R.
Chuspa
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I. Tortuga
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to overrun the island for two years.[4] Ellffryth must have been in his mid-twenties then, old enough, as he hints, to have been brought up on the great tales of Drake and Raleigh.

In 1614 he went to England, and about this time he must also have married, for in 1631 he had a daughter old enough for marriage herself, and in 1636 a son who inherited and satisfied a taste for Spaniards. During these years too he became the man of Robert Rich, later Earl of Warwick, who had an eye out for just such captains. It was the only loyalty, not completely untainted, which Ellffryth ever formed, and he kept that connection until Warwick himself severed it in 1638. Warwick gave him a privateering commission for the West Indies and a ship, the *Treasurer,* which became as well-known as any ship of its day. The *Treasurer's* piracies, in 1618-19, caused a scandal at court, a rift between Warwick and Sandys, and eventually contributed to the dissolution of the Virginia Company. And incidentally it was Ellffryth and the battered *Treasurer,* returning from this fateful trip, who share with an accompanying Dutchman the dubious glory of carrying the first slaves to Virginia.[5]

In the second of these three periods of his known life, from 1621 to 1628, Ellffryth tried to settle down in Bermuda, where Warwick was the largest shareholder. His reputation worked against him; the suggestion that he became a landsman only when he finally lost his ship to a "Turkish corsair" helped to accentuate political and religious bickerings which, as a Warwick adherent, he could not escape. Once arrested for asking too many questions about the condition of the Castle, he became its governor, an assemblyman, and—when Philip Bell, a highly-connected Warwick partisan, was sent out as governor—Bell's firm friend and prospective father-in-law. Despairing of Bermuda, the two laid plans, based on Ellffryth's experience and knowledge, for a better, a livelier, and a richer colony.[6]

Sometime during his roving days Ellffryth had chanced upon and had kept to himself the whereabouts of an island off the Mosquito Coast of Nicaragua, in the very heart of the Spanish

[4] John Smith, *Travels and Works,* ed. by E. Arber (Edinburgh, 1910), II, 646.

[5] Edward D. Neill, *History of the Virginia Company of London* (Albany, 1889), p. 120; W. F. Craven, *Dissolution of the Virginia Company* (N. Y., 1932). These Negroes, however, became technically indentured servants on reaching Virginia.

[6] The best summary of Bermuda in the 1620's is in Wilkinson's *Adventurers of Bermuda* and in George L. Kittredge, "George Stirk, Minister," Col. Soc. Mass. *Pub.,* XIII (1912), 16-59, an account drawn largely from the Manchester Papers, which are imperfectly calendared in HMC Rept. 8, App.

empire itself, Santa Catalina or Providence. He and Bell worked out the great scheme, to found on Providence and its neighbor Henrietta, or St. Andrews, both of them healthy, well-situated and easily defended islands, settlements of chosen souls who might mix together agriculture, peaceful trading with natives and conniving Spaniards, and other kinds of profitable activity. Events followed rapidly once this plan, in 1628, was decided upon. Ellffryth went to London, got another privateering commission and two ships from Warwick, and sailed to Henrietta, where he left Captain Sussex Camock and seventy men. On the way home he and Bell drafted at Bermuda the letter to Sir Nathaniel Rich, of the Somers Islands Company, which was the basis and incentive for the eventual chartering of "The Governor and Company of Adventurers for the Plantation of the Islands of Providence, Henrietta, and the adjacent islands, between 10 and 20 degrees of North Latitude and 290 and 310 degrees of longitude". These limits took in the whole of the Caribbean sea. It was a well-couched letter which Ellffryth carried to England.[7] It cleverly played up the discovery of Providence, the location of which is not given, and mentions a mysterious Fonseca, a wholly imaginary Paradise, which Ellffryth was sure he could discover. During the summer of 1629 news spread in London that one of Warwick's captains had found a new island, and that schemes were afoot. Ellffryth left in October with a new commission to occupy Providence, began his colony there about Christmas, and in the following spring, with Bell's aid, collected more settlers in Bermuda. The charter was finally issued in December, 1630. The following February Bell was made Governor and Ellffryth Admiral of the islands, and in May the *Seaflower* with English settlers reached Providence and the new venture was thoroughly launched. As far as the great Puritan leaders of the Company in England were concerned—and their names were among the greatest of Puritan leaders—this settlement was to be as sober and as law abiding as any could be. They reckoned without Ellffryth. After a few months in his new dignity, he sailed away ostensibly to find sugar cane and fruit trees for planting in the island. He wrote also that he was eager to Christianize the poor Indians of the Mosquito Coast. He returned, however, with a Spanish frigate. The evidence is scanty, but Bell seems to have had no other alternative than to refuse him permission to leave the island until the Company had considered and passed judgment upon this act of marauding, with its dangerous implications for the future safety of the young colony.

[7] Newton, *op. cit.*, pp. 31-34, quotes this letter in full.

The undated manuscript,[8] which is printed below for the first time, is connected with this incident. It was plainly written at Providence. It is in two parts: the first, in a mixed Roman and Gothic secretary hand, is in the form of a "rutter" or sailing directions along the coasts and islands of the Caribbean and the Gulf of Mexico; the second, in Ellffryth's own scrawl, describes briefly Henrietta, Providence, the Mosquito Bank and the route to Trujillo, and ends with a plea that he be permitted to continue his explorations along the whole Nicaraguan coast. The Company's reply of May 10, 1632 reprimanded him severely for his indiscretion, dismissed his "former errors" in consideration of his good services, and approved his proposals for discovery of shoals to the leeward of the islands.[9]

The first part of the manuscript was clearly written before the Mosquito coast venture and was intended to be exactly what it says it is, a guide to other captains for navigation within the limits of the Company's widespread grant. The latter part would seem to have been added in haste after the affair of the Spanish frigate, and the whole shipped to the Company in Ellffryth's defense.

This document has some significance, then, in the early history of the Providence Company. It confirms the importance of Ellffryth's role in the Company's subsequent decision to concentrate upon trading with the Mosquito Coast Indians, which was to grow in time into the dream of establishing a great English colony in Central America. It has further importance in two respects: it provides a very clear notion of the kind of information which a 17th century navigator had to have, lets us into the secrets of his craft, as it were; and it paints a thin but suggestive picture of the extent to which an English captain, in spite of official Spanish prohibitions, could trade in and learn the whole area of the Spanish Caribbean Sea.

Ellffryth's information is in general remarkably precise. Although various circumstances have prevented the editors from undertaking a Newberry Ellffryth Expedition, and have compelled them to depend instead upon several hundred large-scale maritime charts and upon modern as well as earlier pilots, they have succeeded in identifying most of the natural features he names, and in following the routes he lays down. "Rutters" or "ruttiers" of course were more available

[8] The original manuscript, 37 octavo pages, is in the E. E. Ayer Collection of The Newberry Library, Chicago. In its transcription no alterations have been made beyond the expanding of common abbreviations. Spelling and punctuation remain as in the original.

[9] *Cal St. Pap. Col.*, I, 150.

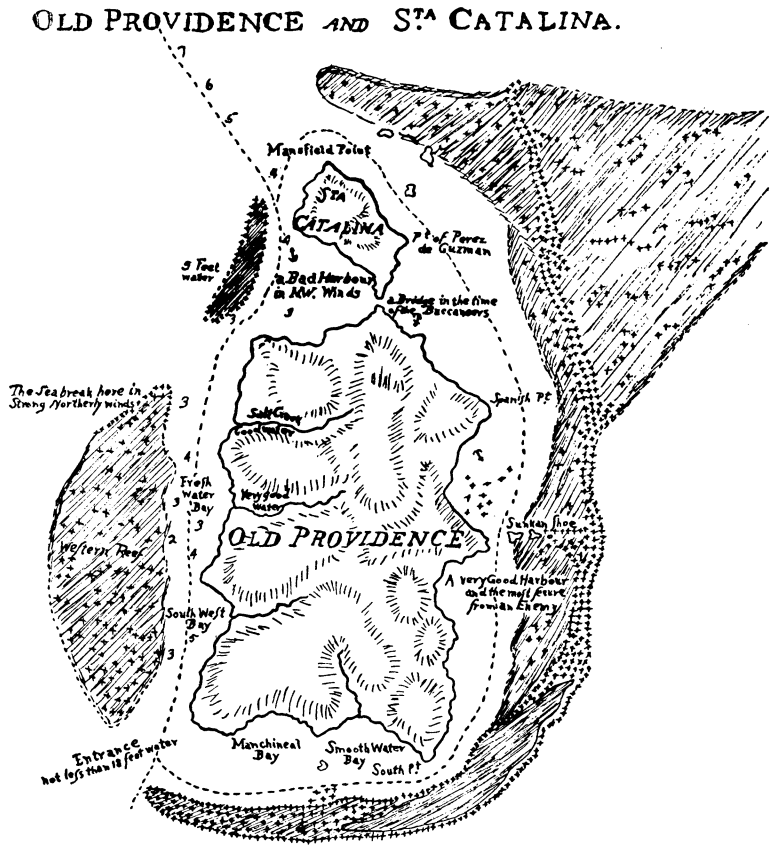
than Ellffryth admits. Two fine ones to this same region had been printed in Hakluyt, and there must have been many others circulating in manuscript.[10] Much of the information in the Hakluyt "rutters" is paralleled in Ellffryth, to such an extent that one can see existing even at this time a lore of the sea which must have been orally passed around among seamen and committed to memory. Some of it, indeed, in almost the same language, is found in eighteenth-century pilots and in modern ones. But Ellffryth's "rutter" is his own. If some of his directions are less full than the Hakluyt ones, others are vastly better and more accurate. And they are couched, incidentally, in words which have to be read aloud to be appreciated as authentically Elizabethan in style: "You may run fair by the shore, and coasting along, you shall see a point low and full of trees, which show like masts of ships showing white in the sea".

Ellffryth navigated by compass and dead reckoning. His compass directions are invariably exact, and his distances are usually so. Longitude, of course, he could not figure; his latitudes err often as much as a degree or two. He had to remember what the land looked like, at a distance and close to, currents, shoals, and soundings. It is no small feat for a man to set down from memory, as he seems to have done in this manuscript, detailed and reasonably precise information about 8000 miles of coast.

He had been sailing these seas off and on for twenty years when he put these directions down. He knew intimately the approaches to every considerable Spanish port in the Caribbean, to Santa Domingo, Santiago de Cuba, Vera Cruz, Cartagena and Porto Bello. He knew scores of lesser places; from Cape Codera on the Venezuelan coast to Cartagena he mentions over a dozen harbors, most of them unusable today, where a ship might lie. Such knowledge would seem to argue that he had acquired it in trade and in peace, and that Spanish officials were not displeased to have him make an appearance. His favorite stretch of coast was the southern one of eastern Santo Domingo, which he describes as if he were completely at home there. Jamaica, strangely enough also, he does not even mention, nor Tortuga which was included in the Company's revised charter of 1631.

[10] Richard Hakluyt, *The Principal Navigations* (Glasgow, 1904), X, 280-305, 306-337. E. G. R. Taylor in *Late Tudor and Early Stuart Geography* (London, 1934) mentions many still in manuscript; for the single year, 1590, a collection of 22 for Brazil and the West Indies in the possession of T. H.

For six more years Ellffryth remained at Providence, but with his wings clipped. It was Captain Camock whom the Company chose to begin the Indian trade around Gracias á Dios,[11] and when finally in 1636 the deliberate taking of Spanish prizes became Company policy, it was Ellffryth's son John who was assigned to command a ship for that purpose. Admiral though he was, Daniell was ordered to build fortifications at Black Rock, to grow cotton and tobacco and to look after Camock's experiments with flax culture. The Company



[11] Instructions from The Company of Providence Island to Captain Sussex Camock, July 1, 1633, *Cal. St. Pap., Col.*, I, 168.

even sent him a "cotton engine" to play with.[12] Like most letters from England to the colonies for a century and a half to come, their letters to him were remarkably patient. Ellffryth continued to be in the thick of quarrels, as he had been in Bermuda. Bell's supersession as governor provided his enemies on the island a handle to remove him, of course without authority, as councillor and Admiral, and though the Company reinstated him, it was glad enough to acquiesce, in 1638, in his own request that he be permitted to leave the island. He was not to be depended upon, they wrote. His last appearance in the records is an ineffectual petition to the Company in 1640 for compensation for his services. One year later a powerful Spanish force captured Providence and put an end to the dramatic but ill-conceived venture which had been the child of Ellffryth's brain.[13]

To the Right Honorable Companye of Aduenturers of the Cittye of Westminster for the Island of Providence; your humble servant wisheth all health and prosperitie in this life, & euerlastinge happiness in the life to Come.

Wheras your humble servant hath beene manye yeares formerly ymployed, both in discouerye of the West Indies, as also imployed in Man of Warr affayres and in these my Imployments haue gathered & Searched out the most principall places of all the West Indies with ther Courses, and Latituds, and soundings of most daingerous places, and hath hetherto kept the knowledge of it vnto my selfe, for the aduantage of my owne Imployments; now takeinge this seriously into consideration, your Lordships imployments in these parts and also Consideringe that the most Anncient Seamen, which formerly trauelled these parts are dead. & that to my knowledge all the draughts & platts which are made in England are verye false, both in Lyeinge of the Land & also in ther Latituds; moueth me to present these my Labours vnto your Lordships view, wherby your Lordships shall haue good occasion not

[12] This is probably the Dutch smallwares loom, the use of which was prohibited in England in 1638. See A. P. Wadsworth and Julia De L. Mann, *The Cotton Trade of Industrial Lancashire, 1600-1780* (Manchester, 1931), p. 101.

[13] The career of the Providence Company is set forth in detail in the *Cal. St. Pap., Col.*, 1574-1660, although, as Newton first pointed out, its editor confuses old and New Providence Islands.

onely to examine those men, whom you shall Imploye to proue them whether they are sufficient or no, to vndertake that charge which your Lordships shall imploye ther In; but shall also be able to giue them Instructions, as your Lordships shall finde here as followeth—

> Although I doe not followe that Method which manye men doe in writinge of books. I beseech your Lordships to Conceiue that I haue written as seuerall voyages hath given me occasion and so begin with my first enterance, which was in the yeare of our Lord. Anº. 1607.

Signes and marks of the Cariba Ilands, with their Latitudes.

Dominica[1] is an Iland very high, with mountaynes, it lyes Northeast, & Southwest,[2] and when you are of, it shewes like two Ilands, and when you are neere it to the Eastward, it shewes ragged, and by it is 3 little Ilands, the middlemost[3] of them is the highest; vpon the topp of the Iland it shewes white, and on the Northeast side it shewes with a hommocke,[4] like to a bell, but on the Southwest side, it is low Land and it makes with a hommocke, and behinde this hommocke is fresh

---

[1] Both of the main voyages Ellffryth outlines, one to Cartagena, Nombre de Dios, and out through the Florida Channel, the other to Santo Domingo and Vera Cruz, begin at Dominica. In the direct path of the trade winds, and with no outlying dangers of shoals and rocks, it marked the easiest and safest access to the islands and coasts of the inner sea. An error in judging latitude of little less than a degree would bring the mariner either to the north or south of Dominica, and in a single paragraph, therefore, Ellffryth names such landmarks of the island as the towering cloud-screened Mt. Diablotin, and describes the "3 little islands" of the Saints and Mariegalante. His latitudes are wrong; Mariegalante is in 16°, and Soufrière Bay at the southwest corner of Dominica is 15°13′.

[2] The axis of Dominica is less than 10′ off a true north and south line. The second Hakluyt rutter (Hakluyt, *The Principal Navigations,* X, 308) also talks of a northwest and southeast axis, of the island appearing as two from "full sea," of the mountain like "a steeple" in the north, and of the cloud-sheeted summits.

[3] Terre d'en haut in the Saints.

[4] "Hummock" was a generic term which 16th and 17th century navigators used to describe any kind of an eminence with fairly steep sides. A "sugarloaf" is a distinctly cone-shaped hummock. "Making like a galley" meant a series of terraces sloping to a crowning summit.

water where you maye water, but take heed of the Indians,[5] this Iland Lyes in 14 degrees, 40 minitts.

Marigalanto: Is an Iland Lyeinge East & West, & it makes like a galley very high, & the highest Land is on the wester side, then shall you see a valley & a hommocke which is of the same Iland, and you maye runn fayre by the shoore, and coastinge alonge, you shall see a point Low,[6] and full of trees, which shewes like masts of ships, shewinge white in the sea, & it stands in 15 degrees of Latitude.

S[t] Lucea. is a round Iland, and the Westerne side is high, and full of hammocks, and the Southwest side riseth like two Lands, and round like two Sugar Loaues, you maye goe close to this Iland, for it is all cleare ground and hath a river of ffresh water, and a good Roade.[7]

The Barbadoes. is an Iland that lyes North & South and hath in Length 8 Leagues, and on the Easternside and Northerne side there is shoales a League of, and better, this Iland stands in 13 degrees.[8]

S[t] Vincent is a round Iland, and on the Norther end it riseth with a very high Land, from this Iland Lyes a leadge of Rockes which reacheth to the Granathes, this Iland Lyes from the granathes Northeast & Southwest.[9]

Mataleno. lyes East & West, and you shall knowe it by the highnes of it, shewes with 5 broken hammocks, the highest of them, is on the North side, it sheweth in the middle of the Iland with a pipe like to a bullcane, and on the East side, two Leagues of, are shoales, & a point small & Longe, and in the same pointe, shewes two hammocks, the one of them is great, & shewes like to Charichiego: and coastinge alonge the shore, on the west side, makes a small baye run alonge the Coast till you make the high Land on the Northside rise with

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[5] Man-eating Caribs frightened sailors away for two centuries after Columbus, and Ellffryth does not suggest an anchorage along this western shore. He may refer to Soufrière Bay, lying by the distinctive promontory of Scots Bluff at the southwest tip, where 18th century ships put in for water and careening.

[6] The trees on Cemetery Point are still a landmark.

[7] The finest sugarloaves in the Caribbean are the Pitons, Gros and Petit, of St. Lucia, and Port Castries, once called The Carenage, is one of its most secure harbors.

[8] Ellffryth got the latitude of Barbados nearly right, but its length is nearer 6 than 8 leagues, and only at Cobble Reef does the barrier reef lie more than half a mile offshore.

[9] Sight the Soufrière mountains in St. Vincent, says Ellffryth in effect, and then keep well away. It was good advice; the Grenadines, between St. Vincent and Grenada, are 50 miles of more than a hundred islets and rocks.

two hills, then shall you see two smale hammocks that shewes blacke, behind these hammocks is a fine white sandye baye, and there is the riuer of fresh-water, & good ridinge, there you maye water at pleasure.[10]

Margaretta. Is an Iland that Lyes East & West, and is in Length 12 Leagues, when you come from the North-ward, it showeth like two high Ilands, by reason that on the North side of this Iland, ther is a great deepe baye, and the middle of the Land is all Low, ther is onely one hommocke showeth like a Sugar Loafe. neere vnto it is the Towne, all this Baye is deepe water, and good rydeinge in diuers places, but on the South side of this Iland, it is all flatt not aboue 3 fathom water in the best. of the channell betweene it and the maine. at the wester end of this Iland it is shoales a League of & better. ther the pearle bootes doe vse to fishe for pearle. this Iland stands in a: 11: degrees of Latitude.[11]

Tartoudies is a little flatt Iland Lyeinge East & West and is from Margaretta 16: Leagues, and lyeth from thence west halfe a pointe Southerley, vpon the East end of this Iland ther lyeth a great salt Pan, wher you maye Layd salte, and at the Northwest end of this Iland, ther lyeth another little Iland which hath two salt pannes in it, where you maye load salt in the drye moneths. which is March, Aprill, Maye & June.[12]

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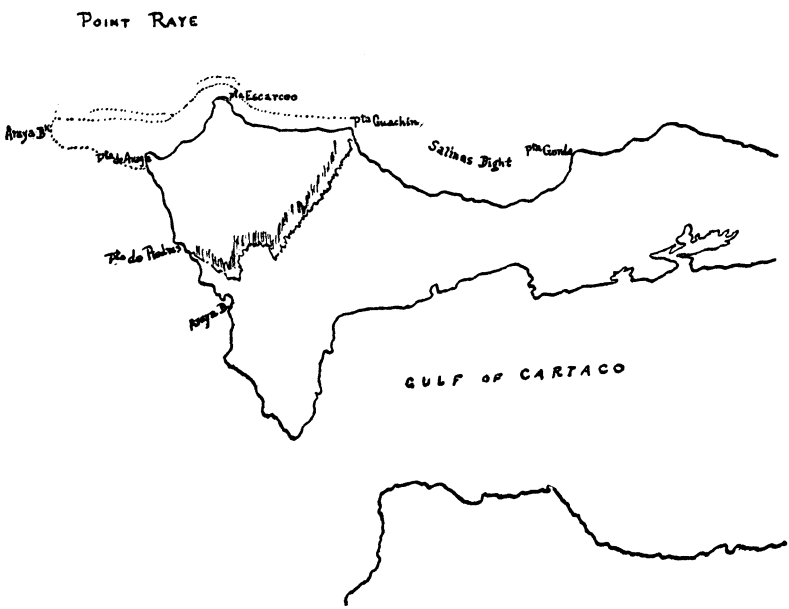
[10] Ellffryth approaches Martinique, which Columbus had named Matinino, from the north, sights the volcano (vullcane) of Mt. Pelée, 4428 feet, and on the eastern coast Caravelle peninsula, passes by the Roadstead of St. Pierre on the west coast, and apparently comes to Flamand's anchorage and Madame River in Fort de France Bay. What Charichiego may be the editors do not know.

[11] Except for the depth of the channel between Margarita and Coche or Cubagua Islands, which lie between it and the Venezuelan coast, this description is exact. 18th century charts show 10 to 12 fathoms in that channel, and modern ones 14 or more. The deep bay is North or San Juan Griego Bay; the sugarloaf, with the town of Asunción founded in 1524, lying inland at its foot, is Cerros de la Vega; and from the Ostial shoals, 4½ fathoms deep, the Spaniards carried shiploads of pearls. Ellffryth knew more about this island than he legitimately should, for there was no excuse of water, salt, food or trade to anchor then in North Bay, nor is there now.

[12] A modern *West Indies Pilot* warns all vessels but "those with local knowledge" away from Tortuga, which was better known to 17th and 18th century navigators. The *English Pilot,* 1783, p. 54, describes the "great salt-pan," but not the ones on the Tortuguillas a mile to the northwest. Ellffryth's compass direction of W by ½ S and his distance of 12 leagues are exact.



Poynt Raye is a longe low point, it shewes like two coasts, the one East and West, the other North & South within this poynt, in the Baye is the Saleenes, & you shall see much salt, but you must come no neerer the point, then one League, because it lyes all shoald of, & when you are to the Westward of the shoalry point, you maye luff into the sandye Baye, & ther ancker in 4 or 5 fatham and cleare ground.[13]

[13] Salinas Bight, on the north shore of Peninsula de Araya, the mainland south of Margarita Island, has been famous for salt for five centuries. Around 1600 Dutch and English ships carried on a salt trade of considerable dimensions from "Point Raye," and as many as 60, in January 1603, were loading at one time. Newton, *The Colonizing Activities of the English Puritans,* p. 14. *The English Pilot,* 1783, p. 54, has a map of both the Great and Little Salt ponds, "more salt than a thousand ships can carry." The "sandye Baye" may be Araya Bay south of Araya Bank; it is probably not the Gulf of Cariaco. Ellffryth mentions no harbors along this entire coast from which escape is difficult.

Now followeth the Course from Cape de la Cordera to Crackers[14] goeinge from Ray: steere awaye West for Cape Cordera.

Cape Cordera: is a high ragged land, and the Coast lyes East & west till you come to the Barburata & on the East side of this, is a great Baye, but all a bould shore the best marke for this Cape is this, that North & south lyes a little Iland white, which shewes like a shipp vnder sayle,[15] vpon this Cape is (as it were) a table plaine, ther is a harbour in this Cape, and a river of fresh water, And foure Leagues to Leeward, is another Port called the Panello, it makes plaine, & white, that the sea doth breake in the verye white, this parte hath a riuer of freshe water, and manye Indians that are Caribees, From this port to Haraualida: is 8 Leagues, 'tis all broken Land by the sea, & then you shall see a Longe sand to the westward, you shall see an Iland full of trees, & at this Iland is the port of Harauilida:[16] and you shall see to the westward of this port a Cape that runnes of into the sea, called Cape Blanck, this port is called Carobalada, it hath vpon, or over it, a very highe

[14] Caracas. Cape Codera lies to the westward from Araya some 110 nautical miles and in almost the same latitude. Of this whole region Ellffryth, we are certain, had particular knowledge, some of which he was willing to disclose. From Cape Codera he follows the Venezuelan coast in detail and the skill with which he selected his landmarks is shown by the fact that most of them are the sites of important lighthouses today. Of the rutters at hand, his is the only one which describes the Spanish main east of Cape Chichibacoa. Ellffryth describes bays and inlets, most of them secure, a few leagues apart, as far as Cape Romano; then he crosses the Gulf of Maracaibo, skirts the shore of Paraguana Peninsula to Cape de la Vela and takes up the usual course of the Spanish galleons. It is possible to follow Ellffryth's points and identify nearly every inlet; some names have been changed, but more often they have been distorted by his phonetic interpretation of local Spanish place names.

[15] Cape Codera is a high foreland, its cliffs white with guano. Centinela Island, lying 14 miles to the northward, by which the Cape is easily identified, is still described as having "the appearance of a white sail." *W. I. Pilot,* 1941, I, 67.

[16] Carenero harbor, so called because of its excellence for careening and repairing ships. The river is the Higuerote. To the west the shores of the harbor rise to a conspicuous tableland. On the north side of the Cape and to the westward are Corsarios Bay, the port of Chuspa (site of Panello), Chuspa River and Chuspa Bay, still an excellent anchorage. Caraballeda is the old port of Caracas, now a roadstead in the vicinity of the modern harbor of La Guaira, with which Ellffryth's port of destination, Harauilida, may be identified, although the use of this place name in such close connection with "Carobalada" is confusing. The coast line has been altered, the island and sand spit have disappeared, perhaps through constant dredging at La Guaira. The overhanging mountain is Mt. Pico de Naiguatá (altitude, 9,072 feet).

mountayne, when you are past this Towne that showes as it were in the sea, it is all a bould Coast.[17]

Goeinge from Haraualida to the Barburata, steere awaye west till you come with the Rematta, all the Land there is very high, and at the foote of the high Land, is the port of the Barburata,[18] before you goe in, you shall see two Ilands, Low, and close to the sea full of Mangroues, you maye very well goe within them in the Channell, which is the port. And if you will goe more to Leeward you shall see (halfe a league to Leeward) agoeinge out, where you maye goe out; and this called the Gulph of Tonesta.[19] And if you will goe from the Barburata: to Cora steere awaye west northwest, vntill you be with the poynt of Turata: which is not very high, there are 4 low Ilands full of mangroues which lies North & South from the point, within this point to the Southward, is the gulphe of Tonesta. Ther are within many Ilands on the west side, ther is a point verye bould which makes the port of Tucaca. you shall see a sandye Baye of white sand, you maye goe in that Baye, betweene Piedae: and Surgia: there is very good cleane ground the Ilands makes the port within the point, two Leagues to Leeward of these Ilands, or point in the Coast, is the riuer of Tocuya: but come not neere, for it doth breake a league of in the sea: ffrom thence steere awaye west, for Gnachoa: which is a very bould poynt, about it in the Land is a high mountayne, but as you run in it shewes like two Ilands, which are of the very Land, and when you see the entringe you maye goe in with your Lead, in 3 fatham, and more, within is a bould Baye, this lyes North & south from

[17] Cape Blanco. "The coast in the vicinity has a grey and rugged appearance, and from a distance of 4 miles off shore looks like a town standing under the high land." *W. I. Pilot*, 1941, I, 73.

[18] Port Borburata, "a good haven and a salt pond," according to *The English Pilot* of 1783, is a snug inlet, hidden and safe, 1½ miles east of Point Brava. Five cays, Largo, Santo Domingo, Islet Alcatraz, Islet Ratones and King Island lie just without the port and near Porto Cabello. At this time Borburata was the port of Venezuela and Porto Cabello a settlement of a few miserable fishermen's cottages. La Ramada doubtless refers to some coastal trading village of native huts.

[19] Gulf of Triste. The low point is Point Tucacas, in 10°52′, off of which lie Cayos de Pescadores, del Norte, del Medio and del Sur. The bold point is Brava; within, the port of Tucacas. The Tocuyo River, now navigable for 150 miles by canoe, empties into the ocean a league north of Point Chichiviriche. By position and description Point Manzanilla is Gnachoa, the mountain is Cerro de Cymarebo, 6 miles southwestward from the point and rising to 1,788 feet. Other smaller peaks are plainly visible on this shore and create the impression of islands.

Queriza,[20] goinge from hence to Gnachoa: steere awaye southwest, for the Coast lyes so; and you shall see the port of Cora:[21] wheras you enter, you shall see smale Ilands ioyninge with the Mayne on the southwest side, and these they call the fryers[22] from this point, to Cape Roman: the Coast lyes Northeast & southwest, and goeing from this port of Cora: to Carthagean steere awaye North vntill you Come vpp so high as Cape S[t] Roman: and when you haue doubled the Cape you shall haue on the Northerside, of you Rooba: and when you see Rooba, steere awaye west for the point of Cuquibaga.

Thus appears the land Eaſtward of cape St. Roman, along the coaſt of Coro and Frayres.
The English Pilot, 1733

Cape S[t] Roman[23] is a longe low point & the land makes like two coasts, one lyes Northeast & southwest, and the other East and West vpon the point you shall see a hill of redd sand, but all by the sea is Ilands, it is very deepe water before you are in with the shore East & West, a league within the Land, you shall see a high hill like a Sugar Loafe, called the hill of Pargnaua, and some call it the Mount of S[t] Ann: the Towne of Cora is two Leagues of this Cape.

And if you are bound for Carthagean, and will goe by Dominica, and Mataleno steere away west 86 Leagues & then steere awaye west southwest untill you see Queriza: & Aroba: and then steere west, a longe the Coast for Cape de La Vella.

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[20] Curaçao.

[21] Vela de Coro, in the southeastern corner of Vela de Coro Bay is now a small village; in the past it has been one of the most historic settlements of Venezuela. Founded in 1527 by Spaniards who carried on trade with Porto Rico and Santo Domingo, it was the first important European settlement of the Province. In the year of its founding, Charles V, in part payment of heavy loans from the Welsers, turned over the administration and exploitation of Venezuela to the Augsburg banking house and Coro became the capital.

[22] Frayles or Frayres. Both forms appear in 18th century pilots.

[23] Cape San Roman "high, bold and faced with steep red cliffs, at the base of which the sea breaks heavily" is the northermost point of the Peninsula of Paraguana (Lat. 12°12′ N). The depth of the sea, at its shallowest off this point is 9 fathoms. The sugar loaf is Pan de Sta. Ana (alt. 2,800 ft.).

Queriza[24] is an Iland Lyeing East & West, and if you bee to the Northward or to the southward of it, it shewes all broken like two Ilands and on the Easterne side of it, you shall see a round high hill, with a hillocke vpon the topp, & on the southeast side of this Hill, is a Harbour for frigatts called the port of S^{t} Ann: ther (they saye) is a verye bould Baye, on the Westerne side, it is sandye very broken Land, with many hommocks great & smale which shewes like organes, this Iland hath Latitude 12 degrees, & is 12 leagues Longe.

Aroba: is an Iland lyeing East & West, low Land with some hommocks white, & reed, broken to the sea, and on the southeast side is somewhate higher Land, full of hammocks, it hath one high hill like a sugar loafe, close to the sea, and ther is the port, which is a sandye Baye; this Iland stands in 12 degrees.

Cape Coquibacao: is a low point which riseth with high land ouer it, it hath vpon the point, some staynds of wood land, the Coast Lyes East & West, the Mountaynes of Coquibacao: are very high and they rise all ragged with two parts, the mountayne in the middle is highest, and is ragged on the middle, goeinge alonge you shall see the Cape, to the westward, & to the Eastward it falls awaye to the sea, and to the westward you shall goe with the port.[25]

Markes for Coquibacao to Cape de La Vella.

All this coast till you come to Cape de la vella: is low land by the sea, & deepe water, you maye goe fayre by the shore you shall see two Bayes,[26] the one (they saye) is a deepe Baye in the

[24] Curaçao and Aruba were headquarters for Spanish smugglers during the 16th century and until 1634, when these islands were taken by the Dutch. The habits of their conquerors changed little except in nationality. Curaçao became headquarters for Dutch corsairs and for Sephardic Jews who had escaped from Portugal to Holland. Ellffryth makes an error of from a quarter to a half degree in judging their latitude. The highest point of Curaçao is the Drie Gebroeders which lie north of the chief port on Santa Ana Bay. The chief bay of Aruba, St. Nicolas Bay, is mentioned by Ellffryth. He, however, admits little familiarity with these islands beyond hearsay.

[25] From Cape San Roman, across the Gulf of Maracaibo to Cape Chichibocoa, the first landfall of the Peninsula of Guajira, is a distance of 82 nautical miles. The mountains are Sierra de Chimare. From this cape Ellffryth picks up the usual route.

[26] Bay of Honda, between Point Soldado and Point Canon, has anchorage on the eastern side. A pilot of 1783 thus describes it, "The bay is large and even, the country is full of brooks and rivulets, the people ugly, thin and ill favored, going naked, are frightful to behold," *English Pilot,* 1783, p. 56, The other bay, El Portete, has today only 1½ fathom entrance sounding and can be used only by small vessels with local knowledge.

mouth of the Baye it is white sand, and round about the Baye it is low Land, full of Mangroues, it hath fresh water in the mouth of the Baye; with reed Spotts on the Easter side, and on the westnorthwest side 4 leagues is the port, it makes with a Baye, but not very deepe. therfor keepe of vnless you be in a smalle shipp, you cannot goe into this port, and to the westward is another port which they call the Heradara:[27] from this port to Cape de La Vella, is 4 leagues, all this coast is a bould Coast, you need not feare any thinge more then you see.

Cape de la vella: makes of it selfe, like a round high Iland ragged, and to the Eastward are two smale Bayes of sand, and to the Westward is a smale white Iland[28] ioyninge to the mayne, betweene this Iland & the shore you maye goe with a smale shipp, for you shall have two fatham water, over this Cape ther is a mountayne which shewes like a Sugar Loafe, & within the Land highe Mountaynes, very ragged which they call the Mountaines of Acesto: from this Cape to point Pedros:[29] it is a Low Land and round about a League of the port, you must keepe your Lead: Of the Laguna of S^{t} John: a little more then half a league, ther is a shoale that hath not aboue a fatham water, & when you are halfe a league from the Laguna of S^{t} John: Northwest & southeast from the Sugar loafe, you may anckor & you shall see the point of Pedros 5 leagues of, this is the Laguna of S^{t} John.[30]

Point de la pedros is a high poynt, and vpon the point it riseth with a round hill full of trees, ther is riuer de hatch:[31] within two Leagues. all the Laguna till you come to point Pedros is shoales a league of the shore, and when you are within the shoale, you shall see the Towne of riuer de hatch. it stands in the mangroues you must have a great care of the Easter side, of the towne for

[27] Herradura is shown on a Jefferys' map of 1780 as a trading port half way between Honda Bay and the False Cape. This is considerably farther from Cape la Vela than four leagues. Since neither Jefferys nor Ellffryth are wholly exact it is impossible to locate this port except as on the north coast of the Guajira peninsula.

[28] Farallon Island, ¼ mile west of Cape la Vela. The sugar loaf is Pilon de Azucar (265 feet) and to the southeastward are the Cerros del Carpintero. Sheltered anchorage with sandy bottom may be had to the south of the cape in 7 fathams. The rugged mountains inland are Teta Guajira, the highest peak over 2,000 feet.

[29] Ellffryth's description of the shore from Cape la Vela to Piedras Point was either mistaken or the coast has altered considerably. Today there is a great shoal of from 4 to 2 fathoms which extends south 120 miles from Cape la Vela.

[30] The Laguna of St. John appears on 18th century maps, not on modern ones.

[31] It is impossible to sail into the Hacha River today. A vessel leaving the anchorage must sail directly north to clear the littoral shallows, especially the bar, Five-fathom Elbow, that lies just northwest of the port.

shoales, therfor keepe of to the Southward & then you maye runn in 3 or 4 fatham water.

The course from Cape de la Vella to Cape Laguia.

Goeinge from river de hatch to Cape Laguia: steere awaye North two leagues, & then steere awaye West & by south, & then you shall see the Bayes, of Cape Laguia:[32] the Bayes of the Cape are foure, & ther is 4 Mountaynes which ioynes with the snowy mountaynes of S[t]a mart & betweene mountayne and Mountayne ther is a sandy Baye & a riuer,[33] in the mouth of the riuer are woodes with Canes; Cape de loguia is a Cape that Lyes North & south, it riseth like an Iland not very low, & without the Cape to the Northward, are two small Ilands by them selves which are blacke like two shipps at an anckor,[34] this Cape is in the Middle of the snowy mountaynes,[35] in the midst is the highest land of S[t]a mart, & vpon the topp of the high land of S[t]amart, is cliffes which shew like snow, & if you will goe into S[t]amart it is 3 leagues from the Cape & it hath 3 small Ilands, in the sea from the Cape you maye see the mountaynes of Bindey:[36] which is round, it is ouer the port of S[t]amart, & att the end of the snowy mountaines, & if you will goe in, if it be in the night keepe by the Cape all night and when it is daye you shall see the Towne,[37] this Coast Lyeth within a: 11: degrees of Latitude.[38]

[32] Cape de la Aguja seems to have six bays today. The *W. I. Pilot* gives 5 anchorages, Guachaquito, Cinto, Nahuange, Chengue and Concha. The coastal mountains are Vigia de Concha. They do not really "join" the Sierras Nevadas of Santa Marta. The latter are much higher (max. 19,000 feet) and much farther inland than Ellffryth seems to have realized; their small parallax might easily be mistaken for geographical continuity by an observer on a coasting ship.

[33] Bay of Santa Marta and Manzanares River.

[34] Cape de la Aguja is the northern extremity of an islet, separated from the mainland by a channel three cables wide. Northwest from the Cape three protruding rocks lie close together.

[35] Morro Grande on which is one of the principal lights of the coast and Morro Chico.

[36] Ellffryth's "mountaynes of Bindey," from the bearing he gives them, may be two-peaked Mount San Lorenzo.

[37] To reach the anchorage off Santa Marta an inbound vessel must swing around the bar that runs SSW from Morrito Point.

[38] Latitude of Santa Marta, 11°15′30″.

The course from S[t]a mart to Carthagean.

Cominge from S[t]a mart, steere awaye North, till you bringe your selfe East & west, from Cape Loguia:[39] then steere awaye west till you bringe your selfe North & South from riuer de grand,[40] & from thence steere west and by south & you shall see Morohermoso:[41] & then steere West alonge the Coast and if it be night, steere west and by North, till it be daye & then steere awaye West south west and you shall see Bushodilagato: & when you are as high as Bushodilagato, steere west till you are as high as the point of Hanao.[42] & then keepe a goode League of into the sea, because of a shoale that Lyes of the point, & then steere in to gett the souther point & keepe the Coast close abourd, which is a sandy Baye & if it be in the night keepe the lead all night, & keepe within the point till daye, & keepe alonge in 4 or 5 fatham, & when you haue lost that sundinge, you are with the port of Carthagean: Northeast & southwest, & then you maye be bould to beare in with the port.

Markes of the Land from S[t]a mart to Carthagean.

ffrom S[t] a mart to riuer de grand, is all low Land and they call it the Snigo.[43] & on the other side of riuer de grand, it is likewise Low Land & they call it the Sabanilla, & upon the topp it makes with a Mountayne & then you shall see a plaine mountayne[44] but ragged round about in all parts & that they call Morohermoso. & on the Northest side of this moro: it makes with some whites, with a wood of trees, that are high vpon it, & goeing to the westward, you shall see a Mountayne like a galley the west southwest side is highest, & the Northeast side the lowest, & in the point makes with two hommockes, & it is called the high Land

[39] A course SSW from Santa Marta would clear Cape Augusta and the intervening Cienaga Grande de Santa Marta. It is not clear why Ellffryth considered it necessary to beat back to Cape de la Aguja before turning westward.

[40] Magdalena River.

[41] The Morro of Hermosa Point is a conspicuous landmark rising to an elevation of 520 feet.

[42] From Cape Augusta to Canoas Point the littoral shoals sweep far out into the sea except at Point Hermosa, Point Galera and Point Piedras. Bushodilagato is Cerros del Bujio del Gato; Hanao is Point Canoas. The sandy bay is probably Playa Grande.

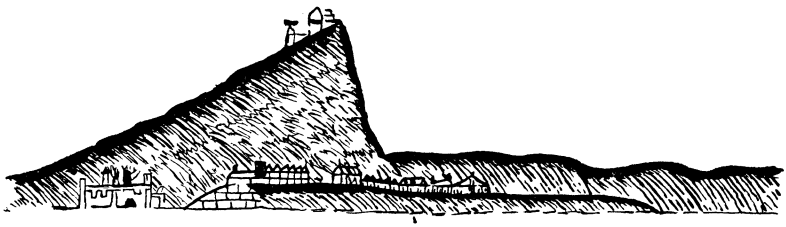
[43] Cienaga Grande de Santa Marta.

[44] Sabanilla Bay with Morro Nisperal, 467 feet, or Morro Cupino, 565 feet, the mountains on either side of Puerto Colombia.

of Sambre:[45] here is a very good port, that many shipps may ride, and if you goe in, it makes all playne land, & from this point of Mangrales, goeinge alonge the Coast, you shall see three Mountaynes[46] one close to another, that to the sea, makes ragged with some white Spotts, another is round which goes to the sea, which shewes like S[t] John Dealferacho: this is called Vnfrydelgato,[47] this makes an end of that Coast within Samby & Vnfrydelgato: are small Ilands, and they make shoale 3 Leagues of into the sea, & they make the water foule or thicke.

From Vnfrydelgato to Carthagean.

This Coast lyes Northnortheast, & Southsouthwest goeing a longe the coast, you shall see a point in the sea plaine but full of



Colina de la Popa
The English Pilot, 1793

trees, that is called the point of the Canoe: they give it well this name, for you shall see within this point another point,[48] some halfe a League to the sea, which shewes like a suncken boate, from this point you maye see the point or port of Carthagean. you shall see a hill that makes like a galley, high carued, the highest is to the southwest, & to the Northeast, it makes a longe point like a galley,[49] & if you will goe into Carthagean: in the night you maye goe

[45] A little inland to the south and west of Morro Hermosa is a conspicuous high mountain, Cerro del Piojon, 1,784 feet. The Bay of Galera de la Zamba or Samba lies below it within the Point of Galera. Today this bay will accommodate only small vessels with local knowledge.

[46] Cerros del Bujio de Gato.

[47] Piedras Point, Cascajal and Arenas Islands. Vnfrydelgato must have been a local place name, phonetically interpreted by Ellffryth, referring to the region of Gato Bay and Bujio del Gato mountains, between Piedras and Canoas Points. We hope the Earl of Warwick appreciated the reference to St. John Dealferacho.

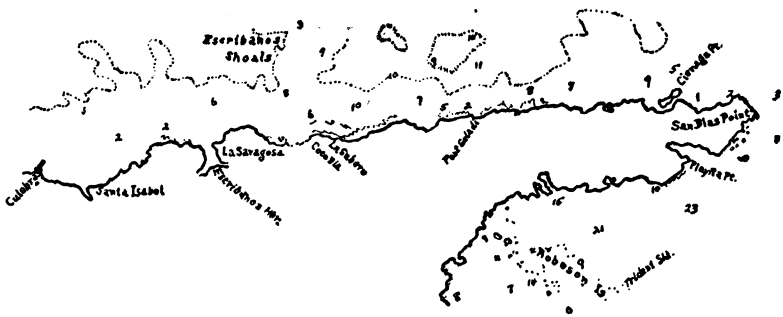
[48] Manzanilla Point, a conspicuous cliff of gray-white clay, near the Cerros Maritos.

[49] Colina de la Popa (511 ft.).

by your lead till you come to the Towne[50] ffrom the point of Yeacos: is a Leadge alongst the Coast, & this harbour hath a very good entringe & deepe water, you maye keep in 6 or 7 fatham, steeringe southwest, & if you chaunce to come in 5 fatham, alter not your course, for you shall have that depth with the shore, & you maye keepe a little of, & when you are in the mouth of the port, you shall come in deeper water, & when you Loose your soundinge on a suddaine steere in southeast, and Anckor at the Iland of Coreza: on the starbourd side which is an Iland at the mouth of the river, you must give the point a bearth, and if you will goe vpp take heed of the Terall,[51] & goe vpp in the morninge takeinge heed of a shoale which is in the midst of the channell, and come to an anckor right against the Fort.

The course from Carthagean to Nombre de dios.

When you come out of Carthagean: and would goe to Nombre de dios. steere awaye Northwest vntill you come as high as Medena:[52] and from thence steere awaye West till you bringe your selfe North & south from the head of Carebo; or the point



[50] The harbor at Cartagena is completely landlocked. Ellffryth enters the main harbor by Boca Grande, today closed by a ledge of rocks. A shoal blocks the entrance to the inner harbor, and leaves a channel only 2½ cables wide.

[51] Land breeze.

[52] Salmedina Bank, a ¾ fathom shoal of sand and coral, 4½ nautical miles west of Boca Grande. Ellffryth's directions vary from those given in Hakluyt's first rutter which prescribes, (Hakluyt, *Principal Navigations,* X, 290) during the time of the North winds, sailing "West till North and South with Cabeza de Catira and San Blas, and in the time of sea winds West and by North till you are with Nombre de Dios."

of the Sambilos.[53] and if it be night and much breezes lye of and on, till it be daye, and in the morninge, steere awaye West southwest, and you must knowe the point of Sambilos, or the riuer of Francisco, & then if you will you maye lye a hull or trye with your maine saile that you maye not ouer shoote Nombre de dios. and when you are with the point of the Sambilos. steere awaye west & by north, this course you can not misse but you must see all the Coast alonge till you come to nombre de dios. and you shall see a head of you 2 or 3 Ilands, these Ilands are called the Ilands of Lastiment,[54] and they are 2 Leagues west of Nombre de dios.

Markes of the Land from Carthagean to nombre de dios.

Knowe the Ilands of the head of Catura: which are Ilands low, and full of trees, and Lyeth East & west, the one of them is greater & more rounder then the other,[55] and more fuller of trees, it standith in the point of Sam blas: which is a low point, & on the very point makes a little hillocke with a little broken in the middle hard by this point of the Samblas, within the Land you shall see a high Mountayne, that makes in the middle like a saddle, these are the mountaynes of S[ta] Cruce: which some doe call the mountaynes of Commogo:[56] the Coast Lyes Northeast & southwest, to the Cape of Tiberoune:[57] which is at the mouth of the side of the Chea: by the point of the Samblas, from thence to Nombre de dious, the course lyes West and from Chea point to nombre de dios, is low land but ouer the riuer of Francisco, is a high mountayne & ther. you shall see the mouth of the riuer, and ther is a smale blacke Iland of rockes[58] which lyes shoald of, about halfe a league & then you shall see the Gnera: and at the point you shall see the Land greene & three hills of the same Land which shewes smooth, two Leagues the one from the other, that to the

[53] Point San Blas lies in Lat. 9°34′ N, Long. 78°53′ W. It is low and bordered by reefs on which lie many palm-crowned cays, variously named on 16th century maps Cuevas, Cativas, Cabezas and Islas de Pinas but now known as the Archipelago de Mulatas. Maps of the 18th century show the Francisco River in the position of the present Escribanos Harbor, the Scrivan of the Buccaneers.

[54] Ellffryth's Bastimento Islands are the Grande and Juan Joaquin Islands; here maize was found by Columbus.

[55] Probably Holandes Cay, the principal off-lying cay, 11 miles eastward from San Blas Point.

[56] Cerros Saino, 1,786 feet with a dark peak. Commogo is Comogre; the isthmus was sometimes called the territory of Comogre, an Indian chief in the 16th century.

[57] Cape Tiberoune lies in Lat. 8°41′ N, Long. 77°22′ W.

[58] Cerro de la Grand Loma, 1,240 feet. The small black island is Culebra, 3½ miles westward from Escribanos Harbor.

westward is greater then anye of the other two; and they are called the hills of Mignisa. That is at the mouth of the port of nombre de dios: and goeinge in, take heed of the Reciffs ther is a rocke which lyes of the Reciffs that the sea doth breake vpon, & you maye run betweene the rocke & the reciffs; and anckor vnder the reciffes, or run in more with the shore in 4 fathom; because of the Breezes: all is cleare ground.[59]

Knowinge nombre de dios, of in the sea you shall see a very high mountayne & in the middle shewes like a galley high carved and ragged to the seaward, & to the Eastward goeth the point ouer Portabella: this lyes East & west, Portabella[60] is a high Land full of hommockes & at the mouth of the port, ther is 4 small Ilands, & all the Coast you shall see none other, but onely three and if you will goe in, you must leaue the Easterne side, & steere in on the other side and within is very good ground.

Knowinge the ould mines, which is a very high land,—somethinge ragged which reacheth to the point. & coasting the coast alonge you shall see a point come out East & by North, which is a low point, ragged to the sea, with some greene Spotts, this land they call the poynt of Sagie:[61] and if you will Anckor you maye anckor at the riuers mouth, where is a very good riuer of fresh water. this Coast lyes in 9 degrees of Latitude.

ffrom Carthagean to nombre de dios, in the time of the Breezes.

Cominge out of Carthagean, steere awaye Northwest, till you meet with the breezes, & then steere awaye West, till you are with the ould mines & when you are North & south of them, then steere south in with the shoare and take great heed of the Land, because of the current it doth run to the Eastward like an arrow, & keepe not farr from the shoare, if you will fetch nombre de dios, if it take you with calmes, you may anckor all alonge the Coast, for it is good to knowe the Coast, & to keepe to windward, that you be not putt into the Seuall of Samblas.

From nombre de dious to Carthagean.

Comminge from nombre de dios to Carthagean: in the time of Bendeballes,[62] which is from Aprill, to the last of August, steere

59 From Pescador Point, at the easternmost side of Nombre de Dios Bay three low hills are visible, El Peñon, 145 ft., on the east side and Los Carboneros, 250 and 260 feet, on the west side; La Gloria, 369 feet high, stands at the head of the bay overlooking the village.

60 Porto Bello is sheltered by high hills and mountains on all sides; it is a fine harbor, but not one for Ellffryth to enter.

61 Chagres and Chagres River.

62 Vendavales, a strong wind which blows from the south by west.

awaye Northeast, till you come 3 leagues of into the sea, & then steere East north East, till you bringe your selfe North & south, with the Catesay: and then steere awaye East till you bringe your selfe north & south, with the Ile of Forta,[63] and from thence steere awaye East southeast, with the shoare, & you must knowe the Ilands of Barnardo: or the Ilands of Baruae: and keepe not farr of the shoare, because the current[64] doth set Northeast of, and you can not gett the shore, but I doe leaue this, to the consideration of the good Pilot, for ther are currents that comes out of the gulph, that runs so Swift, as an arrow, from Sauesdecatiba: the currents sets southeast, to the inward, & therfor I give thee this advice.

The Turtugo is a little round Iland, low by the sea, full of trees, it is from the Ile of Forta. 7: Leagues.

The Ile of Forta is a bigger Iland then the Turtugo: and the Northeast side is the Lowest doe not come very neere the shoare, for it is shoale, of the Iland, & it is from the Ilands of St. Bernard: 7. leagues, it stands 9 degrees & 40 minnits, & it lyes Northeast, & southwest from the Ilands of St. Bernard.

The Ilands of S^{t} Bernard are six: they are all low by the sea, & ther is no sandy Bayes in them, but they are all full of trees, doe not come very neere vnto them by reason they are shoalde of, & from these Ilands to the Ilands of Baruae: are 7 leagues, they stand in the Lat: of 10 degrees 45 minuts & lye from the Ilands, of Baruae, northeast & southwest.

The Ilands of Baruae:[65] are low Ilands, close to the shoare, full of trees they haue white sandy bayes, and so haue none of the other, they are many Ilands great & small, & on the Northeast side lyes a small round Iland, you maye goe betweene that, & the other, and you maye ride for the Breezes this Iland they call the Forna: and from thence to Carthageane steere awaye northeast, betweene Salmedino, & the mayne, and goeinge this course to Carthagean, as afore I haue sayd, Salmedino is low, that the sea doth breake all ouer it and it hath many points it is halfe a league

[63] Forta Island, 6 miles west-north-westward of Point Piedras, Lat. 9°24′ N, Long. 76°11′ W.

[64] The San Bernardo Islands are a group of low rocks and wooded cays just north of the entrance of Morrosquillo Gulf. The current in the entrance of this gulf is affected by the coastal counter current, it sets ENE and attains a speed of ¾ of a knot.

[65] It is 50 miles between Turtugo and the San Bernardo Islands, and Ellffryth makes more allowance for currents in sighting various possible landmarks along the coast than he usually needs to do. Baru lies just south of Terra Bomba. Ellffryth includes in the Baru group Arena Rosario, Grande and Tesoro, a group of islets surmounting shoals. Forna is Tesoro. The channel between this little archipelago and the mainland has depths of more than 40 fathoms.

longe, and at the foote of the breakinge or first breaches ther is 4 fathome water, it lyes East & west, from the port of Carthagean. & it is 4 Leagues of into the sea, and if it be in the night, keepe good watch because of them.

The course from Carthagean, to Cape S^{t} Anthony.

Departinge from Carthagean: to goe to Cape S^{t} Anthony, steere awaye north west into the Latitude of 14 degrees which is the height of the Senana and if you see nothinge you maye be bould to steere north & by west, into the Latitude of 16 degrees, and then heaue your Lead, & if you haue soundinge of the Seranela: tacke about, and keepe your lead till you are to windeward of the shoales, then steere awaye your course till you see the Camanes, or the Ile of Pines, or the mountaynes of Gnanignanico: or the Cape of Curentis:

The Rancadore[66] is a shoale that Lyes East and west which the sea doth breake ouer, it hath a little sandy Iland and a spoute that throwes vpp the water like a whale, keepe of, for on the west northwest side ther Lyes a point of Shoales, and stand in the Latitude of 13 degrees. ½.

The Serana[67] is an Iland which lyes East & west, it riseth with two hommocks, the one greater then the other, it is round about besett with shoales, but the Iland hath good soundinge it stands in 14^{o}-20^{m}:

The Seranela[68] is low Cayos of sand, and lyes Northwest and southeast, it hath 7 or 8 Cayos & the Leeward most hath a rocke which shewes like a boate, it is very good soundinge on the souther-side, & to Leeward of the Iland it makes Shoale, on the Norther-side it is deepe water, you haue no soundinge it stands in 15½ and if you come in the Latitude of 16 & see not the shore, then steere North & by west, and you shall fall with the Iles of Pinus.

Camanes grand[69] is an Iland full of trees & round about it is

[66] Roncador Cay lies in 13°35′, just 77 miles west of Providence Island. The general westerly set of the current varies from NW to about SW, necessitating great caution when passing.

[67] Serrana Bank is in 14°20′. Precautions recommended by Ellffryth and the other ruttiers of his day tally with modern pilots: "The eye is the best guide when navigating over this bank. The greatest depths are found over white sand; all discoloration should be avoided." *W. I. Pilot*, I, 189.

[68] Serranilla Bank lies in Lat. 15°52′ N. There is still good anchorage at Beacon Bay to the south during the regular trade winds. On the "west side it hath certain little copple, [West Breaker] which from sea seemeth to bee a shippe under sayle." Hakluyt, X, 292.

[69] The three Caymans are Grand Cayman, the largest and westermost, Little Cayman, and Cayman Brac, so called because its high rocky ground is covered with thick brush.

full of sholes & if you will you maye anckor, you shall see the other Camanes that Lyes East, & west one of another, they are low Ilands full of trees with sholes, you maye goe in betweene Camanes grand & the other, & you need not feare, keepe betweene them in 8 fathom, till you are cleare of them, this Iland stands in 19.^{D} if you will steere for Cape Corentis steere awaye Northwest, and you can not misse the Cape.

The Iles of Pinus lyes East and west, & is a plaine Iland, & in the middle of it, it riseth like 3 Ilands the middlemost is the highest, it riseth thus when you are south from it, but if you be to the southwest of it, it riseth with 3 hommocks, it stands in the Latitude of 21. degrees.[70]

Cape Corentis is a low Land, & all alonge the shore is full of trees ther are some Palmetoes which shewes like hommocks, it hath sandy bayes ragged to the sea, ouer the very Cape riseth with 4 or 5 poynts, south from it, it makes with a great valley, this cape hath Latitude 21^{D}-50^{m}.[71]

Cape S^{t} Anthony is a low land full of Sandy bayes, it makes with a great rowe of trees, neere to the Cape, & a sandy poynt lyeinge Longe out, & two woods in the very Cape, that it makes by themselves, this Cape stands in 22^{D}.

The course from Cape S^{t} Anthony to the Hauana.

Departinge from Cape S^{t} Anthony to the Hauana, steere awaye North 7 or 8 Leagues to gett without the organs, & if you haue a leadinge wind, steere awaye Northeast, alonge the Coast, for the Coast lyes Northeast and southwest, keepe that course till you are as high vpp as the Sugar loafe,[72] and when you are north of it, steere awaye East alonge the Coast, because of the current, will putt you of, and then you cannot gett into the Shore & so be forced to disinbogue,[73] if you enter too much into the Channel.

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[70] Approaching the Isle of Pines from the south three conspicuous peaks, the middlemost La Cañada, 1,017 feet, are first sighted. From westward, La Cañada shows three distinct summits, the center one dome shaped.

[71] Cape Corrientes, a landmark on the old galleons' track from Cartagena to Havana. Seen from the southwest the palmetto covered hummocks stand up sharply; toward the inland are forests of tall hardwood trees. Cape San Antonio has a similar appearance, high trees which become visible before land is seen and often have the appearance of ships under sail. The latitude is 21°45′.

[72] Sierras de los Organos which with the Sierras del Rosario and Sierras Acostas form a nearly continuous range extending between Mariel, near Habana and Guadiana Bay, 35 miles NE of Cape San Antonio. The highest summit is Pan de Guajaibon, 2,532 feet, the "sugar loafe."

[73] "Disimbogue is to pass some narrow strait or current into the main Ocean out of some great Gulfe or Bay." John Smith's *Sea Grammar* (London, 1627).

In the time of the Breezes, steere from Cape S[t] Anthony North or North northeast as neere as the breezes will giue you Leaue, till you come into the Latitude of 25 degrees, then cast about, and lye as neere as the Breeze will Lett you, & when you come as high as the Hauana ouer the Hauana it riseth with high round hommocks keepe close by the shore, and you shall see a round white tower, then you maye goe in, keepinge close to the moro, that the tower stands vpon.[74]

Departinge from Cape S[t] Anthony to take the sounding of the Turtugos, steere awaye in the time of the Breezes Northeast or as neere as the winde will lett you, till you haue soundinge of the Turtugos,[75] or till you think you are with them, and then heaue your Lead, & if you haue 50 fatham white sand mingled with stones, then you are West from them.

If you will goe from the Hauana to the meeancis,[76] you shall see high lands full of hammocks that shewes great Lands, one ouer the other, and you shall see a great high Mountayne, that is called the Mountayne of Saruco: and when that Mountayne is southeast, then you are North & south from the Hauana: And if you will goe into the Hauana: steere awaye south, but if you will goe to the Metancis: keepe by the shore, and you shall see a round mountayne, with two hommocks one on the one side & the other on the other, it shewes like to a cauldron, & then you shall see a hill, like to a sugarloafe, all the rest is Low Land till you come to the Metancis: and these are the markes:

When you are of it north & south, & if you will goe into the Metancis: bringe the sugarloafe southwest of you, & steere in, keepinge close abourd the point of the Yeacos:[77] which is a low point, on the other side of the point giue it a bearth there is a little shoale that lyes in the middle of the harbour, and you maye anckor right against a riuer of fresh water,[78] & a league within the Land, ther is a Staunch of one that dwells

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[74] Castillo del Morro.

[75] Northeasterly winds force Ellfryth to take a 350-mile tack north to the Dry Tortugas (24°38′ N), off which to the west soundings are found in 25 to 40 fathoms.

[76] Port Matanzas. Pan de Matanzas, altitude 1,277 feet, rises to the westward and is an excellent guide for the harbor. To the eastward 7 miles the summits of Tetas de Camarioca (852 ft.) are conspicuous. Sierras de Jaruco, a high ridge of irregular hills lies between Matanzas and Habana.

[77] Point Icacos.

[78] Three rivers flow into Matanzas harbor, the Yumuri, San Juan and Canimar. At this ranch (staunch), as along the Santa Domingan coast, Ellffryth had established quiet trade relations.

in the hauana, ther you maye fetch freshe Cassaui and plantines.

Departinge from the Hauana: and would goe to the head of the Martirs, which is in the mouth of the Channell of Bohama: steere awaye Northeast, and you must knowe the head of the Martirs, which is with 3 or 4 small Ilands, of sand, some haue Some trees, some makes heades of trees, that in the middle makes bigger then anye of the other, ther is close to these Ilands a Small little Cape of sand, that is white, and the Coast lyes Northeast & southwest, then you are entringe into the channell and presently you shall haue the Coast lye North & south, then steere awaye North northeast, till you come into the Latitude of 28 degrees. 30 minutes. there is the Cape of Caniberall: which is a Cape that lyes a league of into the sea, a league & a halfe, & in many parts the sea breaks vpon it, this Cape is in the Coast of Florida.[79]

Departinge from the Hauana: stand close upon a tacke, for to turne vpp for the Metancis, and when you are Northeast, & southwest from the sugar loafe of the Metancis, then steere awaye Northeast with the mouth of the gulfe, or with the Cape of the Martirs: which stands in the Latitude of 25 degrees, and when you come in that height, if it bee in the night, stand to the southwest till it bee daye with a small sayle, and when it is daye, keepe awaye your course, & if that you see no Land on the starbourd side, & see weeds of rockes, then you shalbe carried presently into the Channell and if you finde ther in 25 degrees of Latitude, then you maye be bould, for you are in the Channell, then stand vpon one bourd, and also vpon the other, in the Channell, to turne out, but stand the Longer bourd to the southeast, then to the Northward, because the current setts very Swift upon the Coast of Florida: and takeinge the altitude euery daye it is the best, and when you finde yourselfe in 29 degrees, then you are disinbogued, & you shall see very many weeds and the Easterly sea is downe, that is a Signe that you are out of the Channell, then you maye shape your course at your pleasure.—

The English Pilot, 1783.

79 The Martyrs, dreaded in every rutter and pilot before the days of steam, are the Florida Keys between the Pine Islands, of which Key West is the extremity, and the mainland. Ellffryth's "3 or 4 little islands" may be the Vaca Keys. Cape Canaveral lies in 28°30′.

Now followes the courses from Dominica to S^{t} Domingo, & the Baye of Mexico, New Spayne.

Comeinge betweene Dominica, & Totos Sanctos for to goe to Sta Domingo: steere away Northwest & by west, to goe to S^{t}a Cruze:[80] which is a playne Iland, but hath some hommocks which shewes like to the virgins: it lyes east & west, and one the Easternside it doth make two hommocks bigger than anye of the rest. and with this course you shall see the Iland of Portarico: and a small Iland called Beguim:[81] the Iland of Portarico:[82] lyes East & west, very high and as you goe Coasting along to the westward to Cape Rousea, before you round to the Cape you shall see a hommocke, which shewes like an Iland, but it is of the same Land, close to this, is Gudianillo: and if you are North & south of from this Iland into the sea, you shall see a little high hill of the same Land, and when you are north & south from the Saddle, you are north and south from Gudianillo: and if you will goe from Gudianillo to Cape Rousea: keepe a good bearth of the shore, a league or more, for there lyes a leadge of rocks of, from Cape Rousea: that is called the reciffs of Cape Rousea; it hath some red Spotts, you shall see no more Land to the westward of this Cape.

And if you will goe with Mona: Steere awaye westnorthwest Mona: is a little round Iland, ragged to the sea, from thence to the Sauona: keep of, if it be in the night, steere awaye west, and by south, but if it be in the daye, steere west, the Sauona is an Iland playne & full of trees, and on the western side you maye ride very well[83] from the Sauona, to Catilena, steere Northwest.

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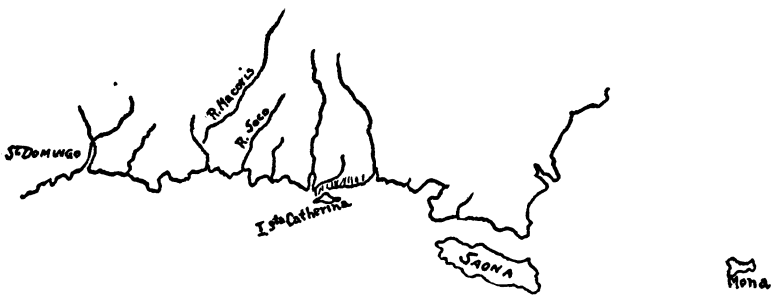
[80] Entering the Caribbean north of Dominica, Ellffryth sets an exact course for Santa Cruz, the contours of which he describes with some care because a NW or NW by ½ N would lead to Virgin Gorda. Its high peak, once known as "The Mount", is a single and not a double "hummock".

[81] Vieques Island.

[82] Neither Ellffryth, the authors of the Hakluyt "Ruttiers", nor other "pilots" stopped at Porto Rico. It was an island to sail by till Cape Rojo was sighted. Nevertheless, Ellffryth gives directions, none too accurate, for identifying but not entering a harbor which is apparently Guayanilla. The saddle-shaped mountain in the Cordillera Central is Calderón, 3,583 ft., but it lies NNW and not N of the harbor; Toro Hill shows dark against the hills beyond, when a ship is two or three miles off.

[83] From Cape Rojo to Saona across Mona Passage is about 80 miles, a long day's sail at five to seven knots. There is an anchorage at the west end of Saona Island, but no one who did not have business in the neighborhood early the next morning would ever use it.



Catilena. is a little small Iland, and from Catelina to Cape di Sethe[84] steere awaye west, Cape de seth, is a low Cape full of trees it shewes like an Iland, 5 leagues to Leeward of Catelina, is the riuer of the Sock and 3 leagues in the riuer are diuers stauches & hattos,[85] you maye goe in with a boate or shallop, for you haue not aboue 4 foote water & many times you shall haue fisher boates, and boates of trade.

Ten Leagues to Leeward of the Socke, is the riuer of Macarise: and 5 leagues within the riuer is an Engenia,[86] that makes good store of Sugar, and you maye goe into this riuer with a Pinnace that drawes 6 foote water, of the mouth of the harbour, or rather in the mouth is a small Iland of sand, & some trees: if you will goe into this riuer keepe the point of the mayne close abourd, & goe in betweene the Iland & the mayne: to the westward, and if you would goe to the Engenia keepe the riuer right vpp, & when you come some 3 leagues vp, in the riuer you shall see the riuer part, the one goes vnto Megna, and the other to macariso or the Engenia: leaue the riuer on the starbourd side, & goe vp in the other, & when you are a League vp, from the partinge of the riuer, ther is the Engenia on the starbourd sides & there are in the Engenia,

[84] Only along this 50-mile stretch of coast from Catalina Island past Cape Caucedo to Santa Domingo does Ellffryth describe in detail any of his trading ventures.

[85] Spanish words, like placel, medanos, estancias (ranches) and hatos (cattle-farms), were a normal part of Ellffryth's vocabulary. A shallow bar closes the mouth of the Soco River, one of the largest streams in the region.

[86] Perhaps from this engenia (ingenio, sugar-mill) up the Macorís, at the mouth of which Ellffryth felt secure enough to leave his ship and go 16 miles upstream, had come some of the Negroes he trafficked in (see Charles M. Andrews, *The Colonial Period of American History*, I, 47, 136 n.). Modern charts show less than two fathoms in the harbor of San Pedro de Macorís; the channel leads between Isleta and a small promontory of the river's eastern bank.

some 30 Negroes, men & women, you maye goe vp with your Pinnace to the Engenia: it is not aboue a bowes shoote from the riuers side, and ther is no more riuers from this to the S[t]a Domingo: But to the Eastward of Cape de Seath is a baye that makes betweene the point of Madaleno: and Cape seath but there is a leadge of rockes that lies all ouer within the baye & within the Leadge of rockes is called Andrea.[87] A Pinnace that drawes six foote water maye goe in, to the westward of the Leadge of rockes, there your plyers do many times ride.

From Cape de seath to S[t] Domingo: is 5 leagues, & the course lyes northwest, and southeast, & if you will goe from S[t]a Domingo for the riuer, keepe close abourd the Shore for it is a bould Shore, or ells the waters of the riuer will putt you of: for the water setts of with the point, & when you come with the point, give the poynt a little bearth, for it is shoald of a cables Length; you shall see vpon the point, a white tower, or small Fort: and when you are about the point you maye anckor against the castle of the Towne. which is on the other side, and if that you will goe in you must haue a Pilot, of the towne, for it is a bard Harbour, there is vpon the best of the barr, 20 foote water & when that you are in, your Shipps side lyes to the Shore & you Load and vnload vpon a plancke, the harbour lyes in North & south, it is one of the best harboures of the Indies there are ouer S[t] Domingo, the old mines, which is a high land brooken in the middle, and it riseth with two hommocks or peekes, and when you are South from S[t]a Domingo, then you are southwest from that Land and if that you haue them Lands Northeast of you, then you are past Sainta Domingo.[88]

Cominge out of S[t]a Domingo, and would goe for new Spaine: Steere awaye south, 6 Leagues, till you are of the poynt of Nacoa:[89] which is a Lowe pointe and smale, that lyes from S[t]a Domingo northeast, and Southwest, and when you

[87] The small town of Andrés in Andrés Bay, today a sugar-mill only, lies behind a reef enclosing a small inner bay, to which the only access is a narrow channel along the eastern shore.

[88] This entire description of Santo Domingo is exact. Rio Ozama colors the water offshore for a considerable distance; the shoal off Point Torrecilla, on which was Fort of St. Jerome, extends SW a cable's length; a three fathom bar lies across the harbor's mouth; and the Sierras de las Minas rise NW of the city. *The English Pilot,* 1783, p. 39, speaks of ships laying a plank to the shore to take in loading.

[89] Ocoa Bay lies past Nisao, now Point Palenque, and Point Salinas 40 miles west of Santo Domingo, an easy day's sail. Ellffryth apparently anchored off Ocoa River on the east shore of the bay, where a narrow ledge of sand affords safe anchorage if a line is run to the nearest palm tree.

are of this poynt, steere awaye west alonge the coast till you see a longe low poynt of land, full of hammocks, and when you are twhart of Port Hermoso, keepe of the pointe, & steere into the other Land, which is the Cone: keepe along close vnder the shoare, till you come with the Palme trees, and there you maye anckor close to the shore, ther is deepe water, and good Anchoringe, & an excelent riuer of freshe water; And comeinge out of the Cone: and would goe for the Beata.[90] Steere awaye southwest, and you shall see an Island northeast, it riseth like a high carved galley, and ahead you shall see the high land of Altabella.

Altabella. is a little high Iland that is with two breakers in it, when you are as high a head as Altabella, and would goe for Cape Tiberoun steere awaye west by north, alonge the shore, take heed of Janaque that is close to the point of Iaccome Janaque is a low round Island, full of Shoales round about, and sand, and when you are there you shall see the Mountaynes of Donomaria: which are very high mountaynes that are brooken, and runnes to Cape Tiberoune.[91]

Cape Tiberoune is a high round blacke Cape, ragged, it makes like the head of a Buffilo: you shall haue in the soundinge little whites from the Cape to S^{t} Iago. vpon Cuba, steere awaye west northwest, and you shall fetch the Port of Palmas: within the Port of Palmas is two great ports, ther are very great high hills, which are called the mountaynes of Guantonomo. keepe alonge the Coast west for to goe to S^{t} Iago: departinge from Port Palmas, keepe alonge the Coast close to the high Land, for there is S^{t} Iago: de cuba, about a league of you shall see a Tower, keepe of from it and you shall see well the Porte. you maye steere right in, ouer the westerne side is the tower by it selfe, and if you haue the winde of the shore, keepe your Anckor ready till you come into the Porte if need be, the Coast Lyes alonge west, and over it are highe mountaynes, goeinge alonge the Coast there are other mountaynes, called the mountaynes of Torguino, they rise with a Saddle,

[90] Beata Island, and SW of it the remarkable 500 ft. rock which is Alta Vela.

[91] It was at least a week's sail W by N from Ocoa to Cape Tiburon at the SW tip of Haiti, but Ellffryth took it without a break. At the end of the run one sights the Mountains of La Hotte, and avoids the shoals off Isle Vache, near Point Abacou.

the middle goes in shootinge with the Land, till you come to the Cape the Cape makes a lowe plane to the sea.[92]

Departinge from Cape Tiberoune and would goe for Cape de Cruce; steere awaye Northwest, you maye staye at Natrassa;[93] which is on your Larbord side, which is a smale Island, Low, and ragged to the sea, with this course northwest you shall goe with Cape de Cruce, befor you come to the Cape, you shall see the mountaynes of Targuero, which are high the Cape showes Low, the sea at the pointe shewes greene, & if you will goe in, you may, for it is good rideinge in 8 fatham, beinge a cleare sandy ground.[94]

Goeinge from Cape de Cruce: steere awaye northwest, and if it be fayre weather, steere northwest and by west, & you shall see on the Larbord side, the Camanes. This course you must knowe the Isles of Pinus that lyes East & west Low, it makes 3 hommocks in the middle and sheweth like 3 Islands that in the midst is highest, and when you haue them northwest, you haue them all three in one, & when you haue them northeast, you haue them open, and shewes three hommocks.[95]

Thus appears cape St. Anthony, when it bears N. about 2 leagues from you, being full of trees and scrubs.
The English Pilot, 1783.

And from the Isles of Pinus, to Cape Curentis, steere awaye west by north, it riseth blacke & low, ragged to the sea, it hath many palmettos vpon the point, and if it be cleare, you shall see vpp in the Land some mountaynes very high, they are the mountaynes of Gnanignoa:[96] from this to S^{t} Anthony, steere awaye westnorwest, Cape Anthony hath to the

[92] The description of this famous Cuban coast is brief but clear, WNW from Cape Tiburon across the Windward Passage to Porto Palma, now Guantanamo Bay; westward to the 180 foot entrance of Santiago Harbor; and past Pico Turquino 6,560 feet in the Sierra Maestra to Cape Cruz. Where had Ellffryth seen a buffalo?

[93] On a direct route to Cape Cruz there lies, 30 miles from Cape Tiburon, Navassa Island, where Lulu Bay provides difficult shelter.

[94] There is anchorage at Cape Cruz today in 4 fathoms sand, but the entrance is tricky.

[95] Past the Caymans to the Isle of Pines, with its peaks lying in a NW-SE axis.

[96] Here Ellffryth's two main voyages cross: the palmettos upon Cape Corrientes, with the Serrania de Guaniguanico rising inland, and upon Cape Anthony are now, of course, as familiar to the reader as to four centuries of sailors, who always drew them precisely spaced upon views and profiles.

Eastward, two white sandy bayes, it hath vpon the very Cape two woods which shewes very plane, to the northeastward 7 or 8 Leagues lye all shoale from the Cape departinge from Cape S[t] Anthony for new spaine if it be in the summer, steere awaye west by south, till you come into 30 fatham, you must goe alongst by the markes into the baye, and keepe this course to 20 fatham, and then steere awaye west and if you finde deeper water with this course, then steere awaye west by south, and come no neerer than 28 fatham, and when you haue Lost sounding, you shalbe south from the triangle, and when you are past the triangle,[97] which are small sandy Islands you shall loose your sounding, and when you haue lost your soundinge steere awaye southwest, & with this course you shall see the mountaynes of S[t] Martin which are high mountaynes, they lye northwest and southeast, and 14 leagues Longe, and that to the Northward is the highest then you shall see a rocke, apart, and it parts to the sea; and south of this mountayne within the land you shall see a high mountayne,[98] and it is called the loafe of Nicapa, it makes like S[t] John De looe: without these head Lands, steere awaye Northwest untill you are as farr a head as the poynt of S[t] Anthony. There is when you are in with the pointe you shall see the Island of Saraficis. which lookes like a Shipp vnder sayle, and ther you maye see S[t] John de Looe, from hence you may see the Shipps, and the fforte, shewing white all the Coast of Anthony makes high, as high as Medelene, it makes all sandy, from thence to S[t] John de Looe: you shall see no high Land but the mountayne of Sarneres which is another Porte, it is a high blacke mountayne, and is brooken in the middle.[99]

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[97] The usual course in summer from Cape Anthony to the coast of Mexico lay over Campeche Bank which skirts the northern shore of Yucatan to a distance of 130 miles and the western to 110 miles. As long as a ship remains on the 20 fathom line it is safe; when the soundings deepen toward the north, the Reef of Alacranes or The Scorpions is close. The Arrecife de Triangulos (20° 58′) is 8 miles in from the edge of the bank.

[98] The coast between San Juan Point and Roca Partida is formed by the base of the Sierra de San Martin. The volcano, Tuxtla, 4,920 feet, is situated about 15 miles south of Roca Partida and is visible a distance of 75 miles.

[99] Anton Lizardo Point, where the coast turns westward towards Vera Cruz. Sacrificios Island is a sandy cay covered with coconut palms, just to the southeast of Vera Cruz harbor. St. John de Looe is San Juan de Ulua, an island in Vera Cruz harbor, the site of a castle and fortress of that name. The Medellin River lies 7 miles WNW from the village of Anton Lizardo. The channel is barred. It is strange that Ellffryth fails to mention the towering peak of Orizaba (18,700 feet high), 63 miles inland but easily distinguished from a long distance.

Mexico: Goeinge from Cape S[t] Anthony in the time of the northes steere awaye west northwest till you are in the Latitude of 24 degrees, & then steere west, & then steere awaye southwest, & you must knowe the playnes of Mouia: and the white tower, & to know the planes of Mouia: it is all plane & Low, you maye see it all in 60 fatham, & for 5 Leagues you shall haue but 40 fatham, your soundinge brooken shells, knowe that over the fore, you shall see many high hills, that are within the Land, which lyes southwest, these they saye are the Mountaynes of Papalo: which goe to the snowy mountayne that Lookes like Digoes. which they call papalots, you must knowe the towne of Rusae: then you shall see more hills that are not very high but very ragged, they are the hills of villa Rico, then you shall see a high hill like a Bell, called Corayco. Bernal is a low small point, those hills haue many dales and so haue none of the other of this Coast.[100]

And for your better knowledge the hills of villa Rico to the southward hath no high hills, nor the hills of S[t] Martin, to the northward hath no high hill, but to the southward this is the difference of Villa Rico[101] and S[t] John de Looe: steere awaye south, and you shall come into 12 fatham and by this you shall knowe that this is the Land. without any further knowledge, Over the riuer of Lauera is Low land and on the souther side, is a great sandy baye, and you shall see it higher aboue the trees then all the rest, and if it be cleere, you shall see high hills which goe from Villarico to feniser: or the snowy mountaynes over S[t] John de Looe: you shall see a high blacke hill in it, which (they saye) is Monto de sanctos: more to the northwest a league of, is a high round hill, that they call the Vnerae: then you shall see a snowy hill, and it lyes West & by south, then are you East from Saint John de Looes

[100] These sailing directions seem intended to take advantage of the trade winds. The "plaines of Mouia" are doubtless the "Llanos de Almeria" of the *West-India Atlas,* 1780, which lie from the coast inland north of the Palmas River, north of Point Piedras del Sur. Vera Cruz on some maps is called Villa rico d'Almeria. The peaks of Monte Dos Hermanos, 1,046 feet high, lead to the entrance of the river. Cerro Gorda lies northwestward and about 6 miles inland; these are in line with the Sierra Maya in the interior. Bernal Point is at about 19° 15′ N. Lat.

[101] Vera Cruz had four locations in its first seventy-five years; its fourth location, in 1599, which is the present one and the one of Ellffryth's days is the original site; here Cortes founded his city of Villa Rica de la Vera Cruz, 22 April 1519, in 19° 11′ 53″ N. Lat. The second location was of short duration, at Zempoala, a Totonac village a little to the north; the third was north near the Island of S. Juan de Ulua.

port;[102] then you must knowe the Debolos, which is a round Island, little, and low, full of Palmes, and if you will you maye anckor in 9 fatham when you haue oaze.

Departinge from the Island of Lobus[103] for to goe to villarico steere awaye southeast, because of the reciffs of Tustpa. which runs of into the sea two Leagues, & if you will you maye goe betweene them, & the mayne but you must keepe close to the reciffs feare no thinge for ther is 8 fatham water, you shall knowe the riuer of Tustpa, for ther is ouer it some hills that are not very high, they lye northeast & southwest, they are about 8 Leagues Longe, in the middle it makes with two vallyes, & on the north side, ther is a nother hill you maye see them some 5 or 6 Leagues of in to the sea, you shall haue vpon your Lead, oaze & in the shore of Tustpa you maye anckor if you please, with a northerly wind, without knowledge of the riuer of S^{t} Peter. & Paule. and if it be cleare, you shall see the mountayne of Nesmas, to the southwest it is all full of medanos. & great sands, but to the southeast it is all oaze in 60 fatham, and from 40 fatham in with the shore, you shall haue shells.[104]

The course from Portarico to the Hauana thorough the old channell.[105]

Departinge from Portarico, steere awaye west by north, for the Island of Hispaniola. & goeing this course you must knowe the mountaynes of Samana. which is within the Land, it is not very high, but it is double and over another, & by the sea side is high, & theere is the gulphe of Sabana, doe not come very neere the shore the current setts stronge northwest & southeast, from Cape de

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[102] Ellffryth repeats himself in describing the vicinity of Vera Cruz. No early map includes all of his obsolete place names. One of the Hakluyt "ruttiers" calls the black hill Monte de Carneros, which is located on an 18th century map to the southwest of Vera Cruz, and south and somewhat east of Orizaba. Cofre de Perote, 13,415 feet, 25 miles northward of Orizaba, may be his Vnerae.

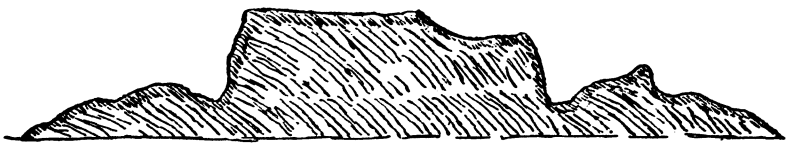
[103] Lobos Island, or the "Isle of Seales," is situated 9 miles SE of Cape Rojo on a coral reef and "consists of sand heaped up a few feet and covered with trees." *W. I. Pilot,* 1941, I, 317. The reef extends ¼ of a mile to the south and west, ½ of a mile to the east and 1 mile to the north. There are bars south to beyond Tuxpan.

[104] Tuxpan. There are depths of 5 or 6 feet over the bar at the entrance of Tuxpan River; within the bar the depths of the river, which is 4 cables wide, increase considerably, at Tuxpan to 24 feet. The river of St. Peter and Paul, now San Pedro River, flows into the Gulf some 30 miles to the southward. Cerro Gordo, 9 miles to the southward, can be plainly seen.

[105] Ellffryth abruptly begins the voyage to Havana through the old Bahama channel from a point he has not described before, off the NW corner of Porto Rico.

Engano to Cape Caberoune which is a Cape that runnes in the sea, not very high the land within is higher with some white Spotts in the middle of the Cape, at the pointe you shall see a sandy baye steere alonge the Coast till you come with Cape ffrancis. which is a high Cape round and ragged keepe to the shore that lyes East & west, you shall see within the Land mountaynes that are double one over another, they are very high, higher then the other in the Samana. you shall see a great plane steere alonge the Coast for Port de plates and if you will goe in for the Port, steere in for the shore, for it is a bould shore, and you shall see over the Port a high hill, which riseth like the crowne of a hatt, and a little hill of one side, ioynninge to the mountayne, & on both sides is low land at the foote is Port de plate. & you shall see the foorte & the friery hard by the fort, give the fort a bearth & steere in & ride against the howses, you shall ride in 4 or 5 fatham.[106]

Departinge from Port de Plate and would goe for Monta Christ,[107] steere awaye west by North alonge the shore & you shall see a hill like an Iland by itselfe: Standinge on the sea like to a mountayne of salt, steere right with this mountayne for it is Monta Christ, & ther is an Iland to the westward neere the shore, which is a league long, you maye ride behinde this Island in 5 or 6 fatham within this Island is the mayne Land, which is a point called Mansanale steere alonge the shore neere this baye you shall see the howses which is the Port.



Thus appears *Monte Christo*, bearing SSW. about 4 leagues from you. The English Pilot, 1783.

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[106] From low Cape Engano on Hispaniola, scarcely visible itself at 5 miles distance, the mountains about Samana Bay can be seen. They reach 1,800 feet, 4 miles inland from Cape Cabron. Samana Bay is full of shoals and Ellffryth holds past it, and past the bold headland of Cape Viejo Frances, with mountains of 2,500 feet behind it, to Port Plata. Port Plata is unmistakably marked by the lofty mountain, flat-topped, and cleft, of Isabela de Torres, 2,673 feet. The modern pilot likewise gives careful directions for avoiding shoals at the west side of the harbor entrance, and keeping to the town side of the harbor, on the eastern shore.

[107] S. E. Morison, in *Admiral of the Ocean Sea*, I, 395, describes El Morro de Monte Cristi as like a "great yellow tent with a ridgepole." Off Cabra Island, 3 cables WSW, is good anchorage. The village of Monte Cristi, to which Ellffryth probably refers, is a mile inland on Monte Cristo Bay. Manzanillo Point today is some 10 miles to the south, below Yuna Point.

Departinge from Monta Christ, steere awaye Northwest and keepe that course, till you come with the vrse [?] the Lanagna which is a ragged Land, & round about it are shoales & when you are north & south from the Turtugos,[108] for to goe with Cape S[t] Nicholas, steere awaye west by north, you haue from the Turtugos to Cape S[t] Nicholas 7 leagues, to goe from Cape 8. nicholas, to the point of Maico vpon Cuba; steere awaye west, & by north & you must knowe the Land of Baraco:[109] which is a Porte that is from the point of Maica 8 Leagues & it makes ouer the port a high mountayne like a smiths Anuile, others saye it is like a Crowne, & is called the crowne, steere alonge the coast till you come with the point which is Low, & runnes of into the sea, & if you will goe into Baraco bring the crowne southwest & steere into the harbour And from Baraco steere longe the shore, the coast lyes northwest, & southeast, till you come to the mountaynes of Lumana: which are very high mountaynes one double over another in the mouth of Banque the Land is all low, & ragged to the sea, and makes like a pointe that lyes North and south and within the same point makes a mouth like a gulph,[110] ther is Caymana, & Cayromana then steere awaye west northwest you must knowe the Cayromana, & if that you be bound for that Cayo, & can not fetch it before night keep short of it all night & in the morninge keepe awaye your course, you shall know it for it is a great Cayo full of trees, & this they call Cayromana But I am of a nother minde for I doe thinke they call Cayromana two low white Cayos of sand, which Lyes west northwest from this great Cayo: & then you shall see a head these cayos.[111] And if it be with the Breezes stand to the Northward till you haue doubled this Cayos: and when you see Abellos and are as high as it, if it be daye steere west, northwest, & if it be night steere northwest & by west, till you come to the Plaser. and when it daye steere your course west-

[108] For a man who must have known the possibilities of Tortuga as an illegal rendezvous, modestly exploited even in his day, Ellffryth is suspiciously reserved. The course he describes, NW from Monte Cristi till you are opposite the high lands of Cape Haitien, leads well north of the island.

[109] When you run along the coast from Cape Maysi and are off Punta Rama, both Puerto Baracoa and beyond it the unusual mass of the anvil or Yunque de Baracoa lie due SW.

[110] The Sierras del Cristal, 4,000 ft., higher than any mountains to the eastward, rise 13 miles inland from the Bay of Nipe, a magnificent harbor, but not the sort Ellffryth preferred. He seems to refer to this whole area. The "mouth like a gulph" may be the narrow gorge leading into Banes Bay.

[111] The old Bahama channel begins 150 miles NW of the Bay of Nipe, at Cayo Romano. Modern charts, as well as 17th and 18th century ones, call the great cay Cayo Romano, and the smaller ones to the NE Cayo Cruz and Cayo Megano Grande.

northwest, all the day till you come with the Cayos of the Iland of Cuba: and if it be daye steere with the cayos, but if be night hall: and goe betweene the Cauas and Sarasca: and on the side of the plaser, you shall see a white Caryo of sand, and then you haue gone the greater part of the Channell.[112] & to know when you are out of the Channell you shall see at the side of the Cayos the maine Land, you shall see a white Cayo of sand aboue the water like a shallop, you maye see it a good way of, & it is called the shoale of S[t] Nicholas:[113] it is north and south from the crosse of the father, which are 4 small Cayos of sands, in the mayne Land you shall see mountaynes which makes 3 hommocks made in this sorte, that to the northward is the highest, & the other two are Lower, and are called the mountaynes of Marico,[114] from the shoale of S[t] Nicholas, steere awaye southwest, for the Sugar Loafe of the Metancis.

now ffolloweth the course ffrom Cape de le uela to henerieta and the Iland of provedince.[115]

ffrom Cape leuela steere a way west and by north in to the latitude of 12 degrees and 40 minnuts then steere awaye west ffor the Iland henereata is an Iland lying north north east and South Southwest and hath shoales alongst the eastward side ffrom the north end to the midle of the Iland itt is a hole ledg of Rocks and att the end of this ledg their lyeth toe Sandy Ilands within thes Ilands their is a good harbour wher many ships may ride If you will goe in their keep the ledg and the toe Ilands one the starbord Side and loofe in to the bay you may ride bee twene the shoales and the mayne Iland their is 7.8. or 10 ffathom watter[116] this channell goeing in is hallfe a mille broade ffrom this

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112 The line of cays runs NW to Cayo Romano, W by N to Boca Carabelas, NW by W to Cayo Megano and Bajos Nicolao, and W by N to Cape Cruz del Padre. Ellffryth's course leads to Cape Icacos, sometimes called by sailors "Pt. Jacko." His directions for avoiding Cayo Megano at night lead to and even upon the Cay Sal Bank (the Placer, or Placel) north of the Bahama Channel, with Cay Sal its westernmost point.

113 Arrowsmith shows a Cayo Blanco between Cayo Cruz del Padre and Cayo Mono, which is rocky. Modern charts show nothing at this spot but a small detached 2 foot patch which usually breaks. The name "Nicholas" is found further east in the Nicholas Channel, south of Cay Sal Bank, and in Bajos Nicolao near Cayo Megano. Ellffryth would seem to be talking of Icacos.

114 The three hills of the Tetas de Camarioca.

115 From here on the manuscript is in Ellffryth's own hand. Cape Leuela can only be Cape de la Vela on the Colombian coast (see n. 28); Henrietta is St. Andrews Island, in Lat. 12° 30′ to 12° 36′, Long. 81° 42′.

116 The ledge lies 1¾ miles to the east of the Island; the harbor, 4 or 5 fathoms deep today, lies ½ mile off the mainland, with Haine Cay and Rose Cay to the east.

channell to the South end of the Iland the ledg lyeth allalongst the shore so that a man Cannot goe in with the shoare with a boate in noe place except it bee in ffayre wether upon the west Side of this Iland their is a Cove where a man may Correene And trim a ship If ocation searve itt is very smouth in the Coue and a man may bond downe a ship by the shoare there is in the Coue 20 ffoote watter and without the mouth of the Coue their is a goode Roade.[117]

The markes of the land ffor this Iland

this Iland is not very hie but their lyes a Redge in the midlle of the Iland ffrom the north end mide way to the South end hier

117 Southwest cove.

then the rest[118] If you will goe in to the easterd harbour you may steere bolldly with the Souther most end of the hie land tell Such tyme as you see the toe Sandy Ilands and the shoales keeping the Ilands and the shoales one your starboard Side you may bolldly run in and anchor bee twene the shoales and the mayne Iland. If so bee you will goe ffor the Cove which is one the west side you must steere ffor the northern end of the Iland tell Such tyme as you bring all the shoals South and bee east of you and then you may bee boold to loofe in with the shoales itt is all deep water you may run within toe cables lenth of the shoare the markes to knowe the Coue are thes their are three bayes the theird is the deepest wher you must loofe in to ride and their is the Coue[119] the Souther end of this Iland hath Som broken ground ffrom the South end of the Iland South east bee twene three and foure leagues their lyeth 2 rocks hie aboue watter which showeth licke toe Sayles[120] this Iland lyes in 12 degrees & 45 minuts

ffrom henreata to goe ffor the mayne[121]

you must steere away north west and by north ffor Cape muskeetoe bee ffore you Com in with the land you shall have change of watter and but ten ffadham 12 leagues of you shall run along in that depth vntell you see the land you need not ffeere anything tell you Com in to 7 ffadham. If itt bee in the night And you Com to that depth you must ethere Com to an Anchor or stand about to the Southward tell day ffor presently afftor you Com in to 7 ffadham steering the same Course fformerly named you shall see A fflat shoale dry aboue watter you may goe of etheir Side of itt giving the shoale a berth this shoale lyeth 3 leagues of the mayne beetwene this shoale and the mayne is 9 ffathom watter and oasie ground all the way as you Com in beefore is Sandy ground you may borowe as neere to the mayne as you

118 The ridge is about 350 ft. high.

119 Southwest cove is at the head of the third and largest of the three bights from the northern end of the island.

120 These two rocks would seem to have grown into the modern Courtown Cays, 12° 24′ N, 81° 28′ W, called E. S. E. Cays in the 18th century.

121 Ellffryth's directions in the following paragraph, from St. Andrews Island to Mosquito Cay on the great Mosquito Bank, and up the Mosquito Channel to Cape Gratias à Dios, cannot be followed on a modern chart. The formation of the reefs and cays along this coast have certainly changed in 300 years; coral in this area grows at the rate of 2½ inches a year. A NW by N course from St. Andrews leads east of Ned Thomas Cay, (82° 46′ W; 14° 10′ N) a ridge of sand which is the southernmost of Mosquito Cays, and lies some 20 miles offshore south of Mosquito Cay itself. Jefferys' excellent *West India Atlas*, 1780, shows Waniessa, or Devils Key, between Ned Thomas Cay and the mainland (c. 83° 5′ W; 14° 11′ N), but Mosquito Cay, with anchorage in 3 fathoms still possible to the SW, lies NE by E of it.

will by your lead ffor itt is all boolld, this Coast lyeth north north east and South South west itt is all Lowe land and noe danger beetwene that shoale and Cape grati deus: ffrom this shoale If you will goe ffor the mucketoes Steere away east and by north the Course lyeth So. you must bee shure not to Com to the northward of that Course but keep to the Southward beecause their is a ledg of shoales which recheth vpp all most to the musketoes and when you com with in toe legues of the musketoes you may stand in bolldly with the westermost Iland wher you may anchor in what depth you plese.

The Iland of provedance is a very hie Iland

and Risseth with 7 or 8 hommocks, steere with the Southermost parts of thes hommocks tell you com in with the land beecause that all the easter part of this Iland is ffull of shoales And when you Com about the Souther end you may looffe in with the shoare by your led I cease to writ more of this beecause If your shipp is Com they cannot want a pylot.[122]

now ffolloweth the Course ffrom provedence to the musketoes.[123]

ffrom provedance to the musketoes you must Steere away northwest 18 leagues and then shall you com in to Sounding. If itt bee in the night and ffynd but 12 or 13 fadham watter then stand about to the Southward and Stand to and againe while day then steere your Course as beeffore but keep good lookking out beecause their is 3 shoales which lyes a little to leeward of your course and Somtyme the Courrant may defend you If you bee carffull you may goe of either Side thes shoales, thes shoales ly South South east & north north northwest ffrom the musketos and are distant ffrom the musketos 6 leagues you shall haue noe les then 12 ffadham watter tell you Com within a league of the musketos, you must bee shure to keep all the Ilands of the musketos north west of you tell you Com to the westermost Iland wher

[122] Old Providence was Ellffryth's own discovery. He does not tell how to reach it, nor its latitude, but what he does say is accurate. High Peak and Spanish Saddle in this ridge of mountains both top 1,100 ft., and a continuous coral ledge extends from 10 miles north of the island, 2 miles off its eastern shore, and 3 miles south. The harbor is between the ledge and the island, and is entered from the south. Of Santa Catalina Island, northwest of Providence, where the settlers built their fort, and of the harbor enclosed by it, Ellffryth makes no mention.

[123] This description is likewise vague. According to Jefferys' *West India Atlas* a NW course from Old Providence led to Eastern Reef, about 20 miles E by N from Mosquito Cay.

you may anchor beecause that all the Sea with in 4 leagues to the eastward of the muskotos is ffull of shoales.

now ffolloweth the Course ffrom the musketoes to Cape gratiu deus.[124]

If you will goe ffrom the musketos to Cape gratidos Steere awaye South west tell you Com in to 12 ffadham watter and then steere awaye north keepe your lede and borrowe uppone the shoaling of the musketos in this Course you shall see an Iland one your larborde Side which is ffull of bushes and a ledg lying alongst tell you See another white sandy Iland keep this Course tell you bring that Sandy Iland South-west of you and then Steere away north north west ffor Cape gratideos their is all a Cleere Sea and noe danger you shall haue noe les then 14 ffadham watter tell you com in Sight of the land And then you may borrowe in by your led to what depth you please but take heed of the Cape beecause their is a sand which lyeth out north east halfe a league,[125] you may Ride of Etheir Side of itt in Cleere ozee ground If you will steere away ffrom the Cape ffor Iland of Cuba steere away north and by west tell you Com in to 15 degrees and 45 minuts their lyeth 3 or 4 Ilands with many shoales keepe them one your Starbord Side[126] and If you bee neere them in the night keepe your led and Com noe neerer to the north end then 20 ffadham watter ffor you shall haue 16 ffadham Close vnto the shoales and If you ffinde that Sounding bare up west in to 20 ffadham water and then steere away your Course ffor Cuba affter you are past thes shoales you have all Cleere sea.

If you bee att Cape gratidees which lyeth in 15 degrees of lattitud

And woulld goe ffor the bay of handoreres steere away north west and bee north 7 leagues and their you shall meet with a Cape which is likke Cape gratiodeos and wee call itt the ffalce Cape you shall know itt by this, the Sounding Round

---

124 Once again late 18th century charts show Stoney Island lying off modern Gorda Point, southwest of Mosquito Cay, and north of it a shoal which was sometimes dry. Cape Gracias à Dios lay NNW. Ellffryth seems to choose a channel which leads today through the westernmost reefs of Mosquito Bank, instead of the open Mosquito channel nearer the mainland.

125 There is no such island on a detailed modern chart.

126 The Hobbies, 16° 2′ N 83° 7′ W, are the northwesternmost of the reefs of Mosquito Bank. From them the course to Cape San Antonio is N by W.

about itt is hard ground[127] and Cape gratiodeos is softe ground betweene this baye and Cape gratideos is a deep bay ffull of shoales ther ffore you must take heed that you com not within your course, ffrom this ffallce cape steere awaye north west for Cape Camorromme which is aboolld Coast you shall knowe the Cape by the change of watter Com not neere itt by hallfe a league ffor itt is shoale And this Cape lyeth in 16 degrees of Latitud and If it bee you will goe ffrom Cape Cameronme to Cape handouer steere awaye west 6 leagues and then steere away west south west ffor the Cape, you shall knowe Cape handover by this all the land ffrom Cape musketoe to Cape handover is loe land And Just over the cape beegines hie land wher you shall seee one your Starboard Side and Iland called goenashma, uppone the north west Side of this Iland is a little round Iland with in musket shot of the other you may ride hallfe a myle ffrom this Iland And right against this Iland is a river of ffresh watter wher you may watter but you must haue a gaurd beecause their are Some Slaues which plant uppone that Iland and doe bee long unto truck Sillea the towne of trucksilo lyeth hallfe a league within Cape handover one the South Side.[128]

you must take notice that the
Courrant Settes very

Strongly ffrom Cape gratideos to the north west so alongst as the shoare lyeth so that you cannot by any means ply itt up backe againe alongst the shoare[129] but you must stand Close uppone awind to the northward tell you Com in to 17 degrees of latitude and their you shall ffinde the Corrant setts up to the Eastward. I am to give you notice that att Cape Cameromim you may watter your ship Side for their is a riuer that runneth out So swifftly that itt maketh the Sea

[127] Modern charts show a spit of hard sand extending off False Cape.

[128] Ten years before William Claiborne discovered Ruatan Island and planted a short-lived colony upon it (see Newton, *The Colonizing Activities of the English Puritans,* p. 267), Ellffryth had described the course to it from Cape Gracias à Dios, past False Cape, Cape Camaron, Pico Poyas, and Cape Honduras. Bonacca or Guanajo Island lies 24 miles north of Cape Honduras, and 7 miles from it is Borburata Island, which is a part of Ruatan. Only twice in his whole account does Ellffryth suggest his trips had been dangerous, once from the Caribs of Dominica, and once from the slaves of Truxillo.

[129] Columbus spent 28 days bucking the head winds and currents in the 170 miles from Romano River to Cape Gracias à Dios, (S. E. Morison, *Admiral of the Ocean Sea,* II, 336-8).

ffresh a mille of but this riuers mouth is so shoale that you can not goe in with any vessell.

Thus ffar I have fformerly proseeded and woulld have gon ffurther if I might haue had wher with all and allso liberty: but Seeing itt is your pleasurs to the Contrary I am Contented to rest their are dyvous shoales both to the north ward of us and allso to the west and South west which are not yet perffectly discouered I have had Sight of them both wayes but had not meanes to make a perffect discouery of them and allso of the mayne ffrom Cape musketoe allongst the Coast to Norforago[130] all with in my Judgment itt ware Expedient shoulld bee parffected And if itt please your Lordshipps to Send any man whom you shall thinke more ffitter than my selfe to make thes discoueryes I will bee redy to give him the best advise I can for the perfformance ther of And I rest

Your humble Sarvant

Daniell Ellffryth

[130] Ellffryth means the whole Mosquito Coast southward from Point Gorda past the Pearl Cays, Little and Great Corn Islands to, probably, Monkey Point, where early maps show the Bay of Nicaragua cutting deep inland.

JOURNAL

OF THE

EXPEDITION

TO

La Guira and *Porto Cavallos*
in the *West-Indies*, &c.

[Price One Shilling.]

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EXPEDITION

TO

LA GUIRA

AND

PORTO CAVALLOS

IN THE

WEST-INDIES,

Under the Command of Commodore KNOWLES.

In a LETTER from an Officer on board the *Burford* to his Friend at *London*.

LONDON:

Printed for J. ROBINSON, at the *Golden Lyon* in *Ludgate-ſtreet*. 1744.

JOURNAL

OF THE

EXPEDITION

TO

La Guira and *Porto Cavallos* in the *West-Indies*, &c.

DEAR SIR,

I SHALL endeavour, agreeable to my Promiſe, to give you ſome Account of our Expedition; had it been a ſucceſsful one this

might have bore reading, though badly described; but you must fortify yourself with Patience to have a sad Series of Misfortunes and Disappointments most sadly told.

THE 11th of *February* sail'd from *St. Kitts*; the 16th anchor'd at *Tortugas*, where Mr. *Knowles* called a Council of War, agreeable to his Orders, which was to consist of the Sea Captains, the Commanding Officer of the Land Forces and Captain *Somers*. He then opened to us his Orders and Instructions, which was to use the utmost of his Endeavours to take the Fortifications of *La Guira* and *Porto Cavallos*; and if we succeeded therein, to garrison those Places with the Land Forces and Marines; to

to let the Inhabitants of the Country know, that the *Engliſh* did not come there to take from them their Rights, Religion, or Liberties, but that they would from us enjoy them with greater Certainty, and more Happineſs, than when under the Tyranny and Cruelty of the *Guiapeſco* Company, which we were now come to rid them of. We were by this Order to make Prize of every thing on ſhore or a-float that belonged to the ſaid Company, and afterwards to make an Attempt upon *Porto Rico*, if it ſhould be thought practicable. But Mr. *Knowles* introduced another Order of their Lordſhips, which in ſome meaſure contradicted the former: We were by this Order to look upon *Porto Cavallos* as the

principal and main Deſign of the Expedition; yet were left at liberty to take what Veſſels we might ſee in *La Guira* Road, and inſult the Fortifications as we paſſed. This put us to ſome Difficulty in determining, whether we ſhould attack firſt *La Guira*, or *Cavallos*: But we came to an unanimous Opinion, that it was better for the Service, ſhould we find any Veſſels at *La Guira*, to attack their Fortifications, as we muſt naturally believe, that at our moſt diſtant Appearance off the Place, they would not fail to haul them cloſe under the Command of their Cannon, ſo near that our Ships could not venture within them. That therefore it was quite neceſſary to ſilence moſt, if not all their Forti-

fications, and which, by the Intelligence laid down before us, we conceived there would not be much Difficulty in accompliſhing: Beſides, it was conſidered, that ſhould *Cavallos* be firſt attack'd, and the Squadron ſhould there meet with any Diſtreſs in Maſts and Rigging, it would be with Difficulty, and probably take up much Time, if at all, they could beat up to *La Guira*, which Garriſon would by Land have quick Intelligence of our coming, and be better fortified and prepared for us than it's probable they now would, as we ſhould come upon them by Surprize, which we had great Reaſon to believe would be the Caſe, from the Secrecy of our Expedition: Whereas on the contrary, ſhould

we meet with the like Diſtreſs at *La Guira*, little or no Time could have been loſt, as leſs than twenty-four Hours would carry us thence to *Cavallos* (which is quicker than Couriers can get there by Land) —— and Maſts much damaged might be made to ſerve ſo little a Way afore the Wind; and then, could we but make ſail enough to bring our Ships to paſs againſt their Fortifications, the Succeſs would depend more upon Anchors and Cables than Maſts and Rigging: And that could we but meet with Succeſs at *La Guira*, it would give ſo much Spirits and Encouragement to our Men, and on the contrary, ſo much intimidate the Enemy, that it would probably be a great Means of afterwards facilitating

litating the Conqueſt of *Cavallos*.

AGREEABLE to theſe Reaſonings, the Attack of *La Guira* was reſolv'd upon, and the following Diſpoſition of the Fleet was made for that Purpoſe: *Burford*, *Laſhington* Commander; *Eltham*, *Smith*; *Norwich*, *Gregory*; *Suffolk*, *Knowles*; *Advice*, *Elliot Smith*; *Aſſiſtance*, *Calais*; *Lively*, *Watkins*; to anchor a-ſtern of each other, but to be as near each other as poſſible, in order that we might make, as it were, one ſtrong and regular Fortification of the Whole; the *Scarborough*, *Liſle*; and Bomb-ketch, *Burville*; to lay under Cover of the Fleet, the Off-ſide, to throw their Shells: The Small Craft to

be

be without all. Plans were laid before us, in order to our having an Inſight of the Place, and for the better forming the Diſpoſition.

THE 19th, early in the Morning, we were off the Coaſt of *Carracas*, three or four Leagues to windward of *La Guira*. The Night before, the *Otter* Sloop was diſpatch'd with Orders to be by Day-light off that Place, to reconnoitre what Veſſels were lying there, and to make ſuch Signals as were appointed of their Numbers; which was done accordingly.---The Commodore call'd a Council of War; it was repreſented, that ſeven or eight Sails had cut out and gone to Leeward, but three remained there.

ELATED

ELATED with the Hopes of Succeſs, we concluded thoſe Ships were going down to *Cavallos*, a Place we look'd upon would ſoon be our own, and where we ſhould find them: It was therefore agreed to put in Execution our former Reſolutions at *Tortugas*. Therefore the Signal being made to form in the proper Line of Battle, we made ſail: But taking in all our Sails except our Fore and Mizen Top-ſails (which was to prevent our being confuſed in coming too with much Sail, as well as to be ready for Action as ſoon as poſſible) kept us till Noon before the headmoſt got a-breaſt of the Place. We were all to give our Broad-ſides as we paſs'd, as we were not to load that Side again, the o-

ther being ready the Moment we brought up. But what with thoſe Broad-ſides, and the headmoſt bringing too and being in Action ſo much ſooner than the ſternmoſt, (as we were all obliged to give each other room) created ſuch a Smoke, that it was with Difficulty moſt of us could ſee how to form the Line; and then it was not quite according to the Diſpoſition that was propoſed, ſome of the Ships getting on board each other. But they ſoon extricated themſelves out of that Difficulty; and each Ship was to paſs ſo, as all our Cannon fired clear of each other. I cannot ſay we were near enough, for none of the Squadron were within the Execution of Small Arms; by which Means

Means we loſt the Uſe of the Troops (except a few that were called to the Guns in the room of the Seamen loſt) neither did our Grape, I believe, do much Execution; one Round undoubtedly muſt, whenever they happen'd to hit: Don't be ſurprized when I ſay they happen'd to hit, and conclude from thence, that we fired any how and at random. The Place is quite an open Road, and the Wind being to the Northward of the Eaſt, occaſion'd a Swell that gave the Ships too much Motion. This, I believe, would have puzzled the moſt able and experienced Engineer, to have been any way certain of his Mark. What Advantage then muſt the Enemy have over us? they had no Mo-

tion; whereas ours was ſtill the more favourable to them; for as we roul'd from them, they placed their Shot the more ſure and deſtructive; which proved too true, in moſt of the Ships having ſeveral Shot between Wind and Water, and below it. About half an hour paſt One all were in Action; and I believe our Enemies muſt do us the Juſtice to ſay, that there could not be a more conſtant repeated Fire than they received from the Ships, which laſted about two Hours; nor had it ſlackened then only wanting Powder, for it it was impoſſible to fill Cartridges as faſt as they wanted them, tho' the Filling-rooms were crouded; however, I think there was none of us fired ſlow to the laſt. About half

half an hour paſt Four o'clock we had the Misfortune to ſee the *Burford* and *Eltham* cut out of the Line in Diſtreſs, who carried with them the *Norwich*, who was no further diſtreſſed than their coming on board of him. The *Eltham* anchor'd without, the *Burford* and *Norwich* were driving; but with Orders from the Commodore, who had been on board each of them (as he was indeed every where, where his Preſence was neceſſary) to anchor in ſome of the Bays to Leeward. Theſe Orders were particularly given to Captain *Gregory*, who was to take care of the *Burford*, who made much Water, Captain *Luſhington* being then incapable of any Duty, being in great Danger from his Thigh being ſhot off.

THERE

THERE was now only the *Suffolk*, *Advice*, *Assistance* and *Lively*, remained at the Attack; upon which the Enemy redoubled their Fire, who seem'd to have slacken'd a good deal before those Ships cut and stood out of the Line. About Eight the Commodore, with the rest, cut and stood off. The *Suffolk*, *Advice*, *Scarborough* and Bomb-ketch, anchor'd without Gun-shot; the *Assistance* and *Lively* drove to Sea. There seem'd to be several successful Bombs thrown into the Town, especially one that blew up a Magazine, and kept burning for some Hours afterwards. There was an Attempt made to cut out the *Spanish* Ships that lay in-shore, or to set them on fire; which (had

(had not ſome of our People behav-ed moſt egregiouſly ill) might have been eaſily done; for we were in quiet Poſſeſſion of one of the Ships, and our Boats had her in Tow, when ſome of our People on board of her, mad or drunk, fired a Piſtol, which alarm'd the Fort they were neareſt, who fired a Shot at them; upon which the Boats precipitately left her (without putting her on fire, though they had Combuſtibles for that Purpoſe) to drive a-ſhore; and in the Morning the *Spaniards* got her off again.

THIS Miſmanagement was laid to Mr. *Farren's* Charge, the Commodore's Lieutenant, for which he was to be brought to a Court-Martial: He was ſince kill'd at the Action

Action of *Cavallos*, ſo is gone to anſwer at a higher Tribunal. Moſt of our Ships ſuſtain'd a great deal of Damage in Hulls and Maſts, eſpecially the latter, and the Booms of all were ſhot to pieces; ſo that there was not a ſpare Top-maſt, Yard, or Sparr, in the Fleet.

We were obliged to fiſh the wounded ones as well as we could. Several Guns were render'd uſeleſs. There was near an hundred Men kill'd; two hundred ninety odd wounded, many of which died afterwards; and we loſt moſt of our Boats, being either ſhot a-drift or to pieces.

The *Lively* join'd theſe at *La Guira* the 22d, and reported they

had ſeen the *Norwich*, *Burford*, and *Aſſiſtance*, about ſix Leagues to Leeward, the two latter not having any Sail out. She was immediately diſpatch'd to go in queſt of thoſe miſſing Ships, with Orders if they were met with, that they ſhould rendezvous at *Barbatt*, or any where to Windward of *Cavallos* (as there's Anchoring-ground all along the Coaſt) till the Commodore ſhould join them.

WHILE they lay at *La Guira*, the Bomb-ketch was conſtantly employ'd in throwing her Shells into the Town.

La Guira is ſituated advantageouſly on the Side of a Hill, regularly fortified in a Half-moon

from one part of the Hill to the other; there is no furprizing it by Land, the Paffages along the Hill on each Side being narrow; nor did we find it was too eafily to be furprized by Sea: It was computed there were ninety-fix Guns play'd on the Fleet.

THE 23d, the Commodore, with thofe of the Squadron that were with him, fail'd from *La Guira*, in hopes of joining the miffing Ships at *Barbaratt*, and going again upon Service. But how great was the Difappointment and Uneafinefs, when he found only the *Lively* there, who had feen nothing of them. Upon which he called a Council of War the 25th, where it was thought proper not

to attempt any further Attack upon the Enemy till we ſhould join together our whole Force, and then determine what might be beſt for his Majeſty's Service. The *Lively* was therefore ſent to look into the Bays along the Coaſt and into *Curaſoa*, while the Commodore and the Squadron took the Rout of *Aves* and *Bonaire*, in hopes of joining thoſe ſeparated Ships.

THE 3d of *March* the *Lively* join'd the Commodore off *Bonaire*, and brought him Letters from Captain *Gregory*, who had carried the miſſing Ships into *Curaſoa*. The Commodore was ſurprized to find by thoſe Letters, that he was preparing to heave the *Norwich* down, and had order'd the wounded Maſts

of the other Ships to be got out; which the Commodore, coming in the next Day, prevented.

THE Commodore had likewiſe a Letter from Captain *Gage* of the *Otter*, that on the 21ſt in the Morning he ſaw the *Norwich* chaſing; that he likewiſe chaſed, and coming up, Captain *Gregory* told him to purſue the Chace, as he ſail'd beſt, and he would follow; that the *Otter* coming near enough to engage the Chace, who proved a *Spaniard*, began to fire, which the *Otter* return'd: The *Norwich* fired two or three Guns, which Captain *Gage* ſuppoſed was by way of Signal to call him off; and the *Norwich* ſtood off herſelf to Sea. The *Otter* had made ſuch a ſuc-

ceſsful

ceſsful Fire on the *Spaniard*, that they quitted moſt of their Guns, and muſt inevitably in a ſhort time have been her Prize, had not they unluckily drove within reach of the Enemy's Cannon at *Cavallos*, when the *Otter* was obliged to quit her, and the *Spaniard* got into that Harbour.

We found the brave and worthy Captain *Luſhington* had been buried at *Curaſoa*, who died of his amputed Thigh: He died, as he lived, an Honour to his Country and Society, and conſequently a Loſs to both.

Captain *Burville* died ſoon afterwards, and two Land Officers, of Fevers: Captain *Edward Smith* ſucceeded to the *Burford*, *Watkins*

to

to the *Eltham*, *Gage* to the *Lively*, *Stuart* to the *Otter*, *Prattin* to the Prize, and *Tyrrell* to the Bomb-ketch.

GIVE me Leave, Sir, to digreſs now a little, and obſerve how imprudent, as well as unhappy, was the Conduct of the Ships being carried into *Curaſoa*; we ſhortned our Proviſions, loſt many Men by Sickneſs, and ſome by Deſertion; got but little more done to the Ships than what might have been done in any of the Bays of the Coaſt, except a ſmall Supply of Powder, which was quite neceſſary; there was indeed ſome Plank and ſome Rope bought; but as the Victualler whom it was on board of ſoon parted Company, we loſt the Benefit

nefit of thoſe Stores. But the chief Misfortune was the giving the Enemy ſo much Time to prepare themſelves; beſides, they knew from *Curaſoa* (as they have a conſtant Correſpondence with that Place) our Force and Deſign, and were likewiſe ſupplied with Ammunition from thence even by the Governor, who though he carried it fair to the Commodore, is a very Scoundrel at the bottom.

WHEREAS could we have gone with the whole Squadron from *La Guira* to *Cavallos*, and only put into ſome Bay or other (as there are ſeveral between thoſe Places) to ſecure our Maſts a little, we might have been almoſt as ſoon at *Cavallos*, as they had Intelligence of

of our being on the Coaſt, or at leaſt before they could make any new Preparations; and we are inform'd ſince our going to *Curaſoa*, the Governor of *Caraccas* came himſelf to *Cavallos*, and doubtleſs brought Numbers with him. But to return to my Relation.

ALL the Ships being join'd at *Curaſoa* the 5th of *March*, the 6th the Commodore ſent the *Scarborough*, *Lively*, *Otter*, and *Pembroke's-Prize*, to cruize off *Cavallos*, to prevent, if poſſible, any Supplies being ſent to that Place, eſpecially Ammunition, which we were inform'd they were ſhort of. The 12th the *Pembroke's-Prize* came back, not being able to keep company with the reſt; upon which,

which, her Maſts were ſhortned, in order to make her ſail better.

The *Dutch* Merchants ſeem'd to have the Expedition at Heart, and offered the Commodore to raiſe him four or five hundred ſtout Men, as they called them, with Sloops to carry them, if we would take them into the Service. And they were abſolutely to be under his Command and Direction, to be diſtributed among the Ships, or to be ſent upon any Detachment a-ſhore, as he might find Occaſion. This, you may believe, Mr. *Knowles* readily conſented to; and it was agreed they ſhould be victuall'd and paid as the *Engliſh* were, and to have equal Share of Prize, ſhould we ſucceed.

FOUR Sloops were accordingly by thoſe Merchants got ready, and *Engliſh* Colours given them; but we did not find the Men come in ſo faſt as propoſed, for when we ſail'd there was not one hundred in all, and moſt of thoſe *Mulattoes* and *Negroes*: So you may conclude we did not look upon this as any great Reinforcement. We had an Hoſpital erected while we lay at *Curaſoa*, where, to be ſure, the freſh Proviſions were of Service; but we loſt many Men, few having recovered, and were obliged to carry Numbers of Sick and Wounded to Sea; and notwithſtanding our long Paſſage, few of them recovered, ſo as to be ſerviceable

viceable upon Action; and we buried ſeveral in that Paſſage.

Our Ships having water'd, and patch'd up, as well as we could, our Maſts and Yards (without getting new ones, or putting the Governor to any more Expences than was at that Time abſolutely neceſſary, and to be as expeditious as poſſible to go upon the intended Enterprize) were ordered to go out as ſoon as conveniently they could, and cruize off the Harbour's Mouth till the reſt ſhould join them; which we began to do the 17th, and the 21ſt all were out and joined.

It would be endleſs and tedious to tell you what Method we took,

and how much we were harraſs'd and diſappointed, in endeavouring to turn up between *Curaſoa* and the Main, which kept us till the 4th of *April* without Succeſs; for there was no getting the better of the Lee Current, tho' quite moderate Weather; and to add to our Miſfortunes, we loſt Company with the *Advice*, and Victualler ſhe had in Tow: So that at laſt it was determined to ſtretch to the Northward, to ſee if a Paſſage could be gain'd that Way. It was indeed thought of before, and would have been put ſooner in Execution, but the Commodore was cautious of venturing with the wounded Maſts and Ships where there might be any large Sea, knowing that if any of them ſhould carry away their

their Maſts, they muſt proceed to *Jamaica*, and entirely overſet the Expedition. But, however, now it was our laſt Reſource, there was no other Way left; for the *Dutch* Pilots, who were long acquainted with the Coaſts, told him, that when the Lee Currents ſet in there, they generally laſted ſix or ſeven Weeks, and with great Strength.

In ſtretching to the Northward we gain'd our Paſſage, and ſooner than we expected, for we ſtretch'd as far as *Hiſpaniola*, and on the 14th were on the Coaſt of *Caracas*, and to Windward of *Cavallos*.

The 15th the *Scarborough* and *Lively* join'd us. We took out of

the

the Bays, as we went along, the *Dutch* Traders, and carried them with us; not from any great Service we could expect from them, being very ſmall Veſſels, and chiefly mann'd with *Negroes*; but to make a formidable Show; for which Reaſon they had *Engliſh* Pendants left them. We anchor'd that Evening under the Eaſtmoſt Key of *Barbaratt*. The Bomb-ketch was carried down under a Key about a Mile and a half from the Caſtle of *Cavallos*, which ſhe began to bombard; the *Norwich* anchor'd near, to defend her from any Suprize from the Main.

NEAR *Barbaratt* is an Iſthmus, that ſtretches obliquely to the Northward, then Weſtward, where it

it forms a Point call'd *Ponto Bravo*; thence ſtretching Southward, terminates in a Point on which the Caſtle is built; on the other Side, to the Weſtward, within Piſtol-ſhot, is the Main, which forms the Entrance of *Cavallos* Harbour. This Iſthmus forms a large Lagoon, within which is part of their Harbour; another Lagoon, running farther to the Southward, makes the other, cloſe up into which their Veſſels were haul'd; except one that lay near the Harbour's Mouth in order to be ſunk. Up-on *Point Bravo* is a Faſcine Battery of fifteen Guns; and a little within, towards the Caſtle, is another of eight Guns, which is to rake Ships as they approach the Caſtle or Harbour: Though they at firſt did

did not ſeem to have Guns at thoſe Faſcine Batteries, that pointed towards the Bomb or *Norwich*, yet they got ſome that Way, and began to annoy them.

THE 16th in the Morning there was a Council of War, in which there was as good a concerted Scheme laid out and reſolv'd on, as could poſſibly be contrived or thought of for the Good of the Expedition at that Juncture; and we muſt give the Credit of this Scheme to Mr. *Knowles*, and believe Every-body will do him that Juſtice to ſay, he ever took indefatigable Pains to put in Execution any Scheme (let it be his own or others) that tended to the Good and Honour of the Service: It was

to

to land a Body of Seamen to ſur-
prize and attack the Faſcine Bat-
teries. They were at the ſame
time to be ſuſtained by all the
Land Forces, in caſe of any great
Repulſe. The Seamen were to file
off to the Right and Left, to let
the Troops advance with proper
Fire, or make a proper Retreat,
ſhould the Enemy be too power-
ful. And to ſecure a Retreat, the
Aſſiſtance was laid cloſe to the
Iſthmus leading to *Barbaratt*, which
Part ſhe entirely commanded with
her Cannon, and was beyond the
reach of the Enemy's.

THERE they were to land in
the Evening, but not march till
late at Night: There were ſome
Dutchmen to lead, who were ſup-

poſed to have known the Way, from their having been at work at the very Place when they were Priſoners with the *Spaniards*.

THE Body of Men, in all, conſiſted of Eleven hundred; the Whole under the Command of Major *Lucas*; a Number, it was believed, which was ſufficient for that Undertaking: And the Conſequence that was expected from it was very great; for it was conſider'd, could thoſe Batteries be taken, and their Guns turn'd upon the Caſtle, as they were near enough to batter and breach, and the Squadron afterwards to have made a general Attack upon the Caſtle, muſt in all human Probability have given us Succeſs. To facilitate this

this Attack and divert the Enemy, the *Norwich* and *Lively* were ordered to fall down near thoſe Faſcine Batteries, and to keep a conſtant Fire upon them.

IT was not believed by that Means there could be much Execution done to the Enemy; but it was enough if they could harraſs and fatigue them, and to put them into ſome little Confuſion, that they might be glad of ſome little Reſpite at Night; which would make our Attack by Land more eaſy and ſure.

THE *Norwich* being dilatory in her Motions, which occaſion'd ſeveral Orders and Meſſages from the Commodore to her Captain;

and Captain *Gregory* anſwering the Commodore, that he would conſult his Officers, about doing what the Commodore ordered peremptorily to be done, he was immediately, for ſuch Diſobedience of Command, ſuſpended, and *Stuart* ſent to command in his room.

In the Interim, the *Eltham* was likewiſe order'd to fall down to thoſe Faſcine Batteries; and thoſe three Ships keeping a pretty good Fire while Day laſted, ſeem'd to have had the deſired Effect, as in a great meaſure appear'd afterwards, of fatiguing and jading the Enemy at thoſe Batteries. The Ships had the good Luck, tho' ſome Guns from the Caſtles reach'd them, of receiving, but

but little Damage in Masts and Rigging, and had but three Men kill'd, and a few more wounded.

In the Evening the Seamen and Soldiers were landed, with their proper Arms; *Prattin* was to head and command the Seamen, having likewise a Lieutenant and other petty Officers under him, that came with the Detachments from each Ship; but the whole Body, as I observ'd before, was under the Direction of Major *Lucas*.---Some time after Dark they began their March, and in great Order and Silence came up to the Enemy's Advanced Guard, where there was but three; which, as happy as could be wish'd for, were found fast asleep. This made it pretty plain,

plain, that the Employment the Ships gave them in the Day-time had fatigu'd them; and, I think, made it very evident too, they expected no Attack that Night by Land; for otherwiſe, the Advanced Guard, who in all Countries generally are choſen Men, would not have given themſelves up to ſuch entire Supineneſs and Neglect, and ſo dangerous to themſelves.——We may from this conclude too, that thoſe in the Faſcine Batteries, tho' they might not have given themſelves the ſame Indulgence, were at leaſt as ignorant of any Attack; for if they had not increaſed the Number of their Advanced Guard, and given them an Officer at their Head, they would certainly have kept Patrols going conſtantly be-

tween them to prevent any Surprize. So far the Prospect on our Side was charming.

But, oh! how shall I describe the rest; those that had seized the Advanced Guard, one of the *Spaniards* struggling, a Sea Officer, it's said, imprudently kill'd him, by firing a Pistol, which might as well have been done with a Sword or Bayonet, and have given no Alarm; upon which, some of our Men began to fire at they knew not what, for no Enemy had fired at them, or indeed appear'd at all: One Volley was followed by another, and two or three more succeeded, and all among themselves, by which they wounded each other; and presently, such a shocking

ing and uncommon Pannick ſeized the whole Body of Men, Soldiers and Seamen, that the foremoſt Ranks fell upon thoſe behind them, they upon the next, till they drove each other down, and were in one general Confuſion. To ſuch a Height did ſome carry their Pannick, that they threw themſelves into the Water; by which ſome were drowned, and more would have been ſo, had not Boats taken them up. Not an Enemy all this while appeared againſt them, nor was there any Fire from them, till their Confuſion and Fire amongſt themſelves alarm'd the Faſcine Batteries, who fired two or three Cannons, but we cannot learn that they did any Miſchief.

THEY

THEY at laſt got, with tramp-ling over each other, near the *Aſſiſtance*, where they were taken on board: There were ſome Men loſt; it's ſuppoſed moſt of them were drowned; ſeveral returned wounded, and two that were left diſabled, were taken by the Enemy the next Morning; many left their Arms behind them, which was Booty for the Enemy, unexpected and unſought for.

THE next Morning, the 17th, the *Norwich*, *Eltham*, and *Lively*, got up to the Key, where the Bomb lay; ſhe was kept conſtantly employ'd in throwing her Shells, but apparently with no great Succeſs. There was likewiſe a ſmall

Mortar placed on the Key, and ſome ſmall Royals on the Neck of Land, to play upon the Faſcine Batteries; but as they did little or no Service, were not long continued. The Faſcine Battery never after fired upon the Bomb, and thoſe Ships that lay near her: Either they were ſhort of Ammunition, or they ſoon expected a general Attack; we believe the latter, for we obſerv'd them, with great Numbers of Men, intrenching and ſecuring themſelves for that Purpoſe.

THE 21ſt a Council of War was held, to conclude what was beſt to be done; it was conſider'd, our Proviſions began to be ſhort, though we had been at ſhort Allowance

lowance moſt part of the Time; the Shells almoſt all expended, ſo that we could expect little more Service that Way; our Men falling down daily, and the Enemy ſtill fortifying and improving their Works. Therefore there was no Time to be loſt, a general Attack with the Shipping was thought to be the moſt and beſt that could be done for the Service, and indeed ſeem'd to be the only one that we could have Hopes of Succeſs in, ſince our Landing proved fruitleſs.

THEREFORE the following Diſpoſition was ordered: The *Aſſiſtance*, *Burford*, *Suffolk*, and *Norwich*, to lay in a Line againſt the Caſtle, and two Water-ports that were juſt below it; the *Eltham*,

Scarborough, and *Lively*, to lay againſt the Faſcine Batteries; and all to be as cloſe the Shore as poſſible, in order that the Small Arms might do Execution.

THE few Shells that were left were to be kept in reſerve till the Morning of the Attack, and then to be play'd upon the Caſtle as quick as poſſible. The Ships were ordered to compleat their Ground-Teer (which was to be done at *Barbaratt* River, for then neither *Spaniards* or *Indians* moleſted us) that they might not be deſtitute ſhould any Accident drive them to Sea.

ALL the Ships Company, Soldiers and Seamen, were to have a good

good Reſt the Night before the Attack; Proviſions and Liquor being got ready for them in the Morning; that they might go upon the Attack, and be enabled to continue it with Vigour and Cheerfulneſs: And the Day of Battle was to be the 23d, *Saint George's-Day*. The Commodore having looked into the Complements of the Ships, and divided the Men according to Proportion to each, and diſtributed what *Dutchmen* could be got from the Sloops (for there were not many) to the Ships that moſt wanted, and every thing being ready for Action; the Officers and People in general in charming Spirits, and going with as much Joy to the Attack as if they were going to a Feaſt.

THE

THE 23d we weigh'd, but there not being Wind enough to command the Ships, anchor'd again, the Breeze not coming in again till the next Day.

THE 24th, in the Afternoon, weigh'd; but ſtaying ſome Time to form the Line, and having but a little Way to drive, obliged the Ships to come to not ſo near as they wiſh'd and expected: However, the fartheſt off did Execution with the Grape, and ſome of the neareſt did with their Small Arms. At Two all were in Action; in about two Hours time the Faſcine Batteries were tolerably well ſilenced, for out of fifteen Guns there was in one, and eight

eight in the other, there was only one fired now and then. The large Ships kept an inceſſant Fire upon the Caſtle, who could not be ſo well ſilenced, for they returnd it warmly upon the Ships; but it was obſerv'd they had not ſo good Gunners as at *La Guira*, for they fired chiefly at their Rigging, and over them; they otherwiſe muſt have ſuſtain'd much more Damage, being nearer. But I believe there may be a better Reaſon given, why their Shot was not more ſucceſsful here (which evidently ſhews the Advantage of Ships being near) for there was ſuch a conſtant Shower of Round, Grape, and Stones, flying about them, that probably they did not care to expoſe themſelves much

much by taking long Aim. And to confirm this, ſeveral were ſeen even to load upon their Backs; and many were obſerv'd to throw themſelves flat often.

BESIDES, they were pretty well diverted by a Shower they were little accuſtom'd to; for the Commodore had ſome ſmall Mortars on his Poop, which were play'd off charmingly during the whole Action; for moſt of their Shells were ſeen to break above or about them. At Six the *Eltham* was order'd to weigh and ſtand in a-ſtern of the reſt of the Ships againſt the Caſtle. Between Eight and Nine the Signal was made to cut or ſlip; and the Ships ſtood off, and anchor'd without Gun-ſhot.

Some of the Ships ſtill ſuſtain'd more Damage in their Maſts, Yards, and Rigging. The *Aſſiſtance*, the next Morning, was obliged to be tow'd off, not being able to make ſail; and the *Burford* to be warp'd farther: The latter had drove within reach of the Enemy's Cannon; they fired briskly upon her, and ſome went into her; but, with the Aſſiſtance of all the Boats, ſhe warp'd out of their reach.

THE Squadron in this Attack had about forty-five Men kill'd, and about as many more wounded; but only one Officer kill'd, which was the Commodore's Lieutenant, Mr. *Farren*. There were ſome Boats loſt.

We could next Morning plainly perceive we had done the Caſtle a great deal of Damage: The Wall the whole Length of it towards the Sea was perforated like a Cullender, there was hardly a Foot Space but ſome Shot had taken place in; ſome of the upper part of the Wall quite tore up, and ſome Embraſures entirely drove away; which muſt have kill'd them many Men, if not diſmounted ſeveral Guns. We could obſerve but thirty-one Guns upon the Caſtle, but releaſed Priſoners afterwards inform'd us there were forty-one; but it's a Queſtion whether they could bring all theſe to bear upon the Ships: There were twenty-three in the Faſcine Batteries, and eight

eight or ten in the Water-ports. There was a Faſcine Battery or two the other ſide of the Caſtle; but I believe none of the Ships were ſo near as to bring them open. The *Advice* join'd us the Day after Engagement, but left the Victualler behind, who was gone to *Jamaica*.

THE 27th the Squadron rendezvous'd at *Barbarät* again; a Council of War was held, when our preſent Condition was conſider'd, and whether it was poſſible we could proceed to any further Service. Our Ammunition being examin'd into, moſt of the Ships were found to be ſhort, and ſome had none; ſo that we could not,

with all we had left, make near ſo offenſive an Attack as the laſt was; and if the Enemy could withſtand our firſt and ſtrongeſt Efforts, they very probably could our laſt and ſmalleſt: That ſhould we not then be ſucceſsful, after having fired all our Ammunition away, his Majeſty's Ships would be left quite defenceleſs, in regard to any thing they might meet on their Paſſage; which would be highly diſhonourable for the Service, and greatly hazard the Loſs of thoſe Ships; that could the ſtation'd Ships get up unmoleſted to their Iſlands, they there could get no Supply, but muſt be quite uſeleſs.

ANOTHER Obſtacle to the At-
tack, could we have afforded Ammu-
nition, was the Want of Anchors,
moſt of the Ships having but one
a-piece left. Should Shot cut any
of their Cables, and thoſe only
ſingle ones be loſt, Ships ſo near
the Shore might in all probability
be loſt themſelves, before they
could make ſail with ſuch wound-
ed Maſts, and which at any At-
tack muſt be ſtill liable to be more
wounded. It was conſider'd like-
wiſe, that we had from our firſt
ſetting out loſt Numbers of Men
by the Enemy and Sickneſs; that
many of thoſe on board were, by
Wounds and Sickneſs, render'd un-
ſerviceable, ſo that none of the
Ships

Ships could above half man their Guns, agreeable to the Proportion of their proper Complements; and that we were ſhort of Proviſions and Water: Which Circumſtances made it too plain, that we were not in a proper Condition to make any farther Attempt upon the Enemy. And it was with Regret Every-body found they were forced, in Honour and Prudence, to come to that Reſolution.

THE *Barbadoes* and *Antigua* Ships were order'd to make the beſt of their way to their Stations; the Bomb-ketch to proceed to *England*; the Commodore, with the other ſeventy-gun Ship, to follow to *Antigua*, from whence, ſhould

ſhould they meet with no contradictory Orders, they were to return home; the *Aſſiſtance* to go down to *Jamaica*; the *Norwich* to cruize off *Cavallos* a Fortnight or three Weeks, in order to meet the Victuallers, that were to come down there to the Squadron, and then return to *Antigua*, from whence ſhe was to be ſent home; and the *Dutch* Sloops and Men were to be diſcharged about their Buſineſs.

THE Bomb threw her remaining Shells towards the Enemy's Shipping in the Harbour without Succeſs; after which, the Commodore ſent a Flag of Truce to the Governor

Governor, in order for the Exchange of Priſoners.

FOR two or three Days ſeveral Compliments paſs'd between them. Mr. *Knowles* return'd twelve Priſoners, and the Governor ſeven; which was all that were made on either Side. The Governor wrote to him, as well as ſent him word, that he was wellcome, with his own Boat, to get as much Water as was neceſſary for him and his Officers; but was given to underſtand, that if he attempted any thing farther, in regard to watering the Fleet, he muſt expect Reſiſtance.

THE

THE Squadron having divided, as proportionably as could be, among each other their Proviſions and Ammunition, the wounded Maſts and Yards being fiſh'd, and Rigging ſecured as well as could be expected with what little was to do it with; the 1ſt of *May* ſome of the Ships got under way, in order to proceed, and the 3d all the Squadron were in Motion, and each made the beſt of their way, purſuant to their Orders.

THUS, Sir, ended an Expedition, as unhappy for thoſe that were engaged in it, as it was unfortunate to our Country, in not having Places taken that would

I have

haven opened ſo advantageous a Trade. We, of courſe, expect Cenſure, that Concomitant to Ill Succeſs. It's a true Obſervation, that Succeſs covers a raſh Action; whereas, on the contrary, a Miſcarriage frequently expoſes the moſt prudent Conduct to Cenſure. I chiefly pity Mr. *Knowles*, as I have often Mr. *Vernon*, and other Commanding Officers, who, though unſucceſsful, have had the Service of their Country very much at heart. For it's the Misfortune of Great Men, that their Actions are liable to the Cenſures of the meaneſt and moſt worthleſs, whoſe raſh Judgments are generally form'd according to Succeſs, and not from juſt and real Motives.

MAY You, Dear Sir, be ever ſucceſsful, and enjoy every Bleſſing of Beings; and do me the Juſtice to believe, that I am, with great Truth and Eſteem,

Your moſt Faithful

and Obedient Servant.

ART. I.—*Meteorological Observations during a Residence in Colombia, between the Years* 1820 *and* 1830.* By Colonel RICHARD WRIGHT, Governor of the Province of Loxa, and Confidential Agent of the Republic of the Equator, &c. &c.

IF the materials of science could be gathered only by the scientific, the following collection of observations would be a useless labor; but it frequently happens that, in distant countries, the opportunity of observing natural phenomena falls to the lot of those very ill fitted in most respects to profit by it. The genius of Humboldt, like an incantation of science, descends upon the New World but once in a series of ages. The most that can be done by an ordinary observer, is to offer his mite,—a single stone towards the pyramid of knowledge,—in the hope that he may casually prove useful; and with such humble pretensions can scarcely be deemed importunate. Should even this apology barely extenuate the sterility of a ten years' residence in a country so admirably varied and rich in natural phenomena as Colombia, something farther may be urged in excuse of the *military* traveller, obliged frequently to *hurry* through the most interesting parts, and to vegetate whole years in others of minor importance; without books, without instruments, without resources; fettered too often by the chain of his own daily wants and sufferings; and

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fallen on a time when every species of local and traditional information, every glimmering of philosophic research had been buried and obliterated amid the storms and struggles of the revolution.

The geographical features of Colombia have been portrayed by Humboldt with an accuracy which renders further description superfluous. It is, however, impossible to traverse this extensive territory, without being struck by the physical phenomena of a country where *height* produces the effect of *latitude*, and where the changes of climate, with all the consequent revolutions of animal and vegetable life, are brought about by localities to which we find little analogy in Europe. The equatorial seasons, as is well known, are merely the wet and dry; and though the Spaniards, influenced by European recollections, have given the former the name of winter *invierno*, it is during this period that nature revives from the vegetative torpor which the scorching tropical heats produce in the lowlands in almost an equal degree with the frosts of northern climates. In the vast plains which extend to the south and east of the great chain of the Andes, the rainy season observes an invariable order. The Orinoco begins to rise in April, and attains its maximum of increase in July and August, when the immense savannas which extend to the base of the Andes are converted into the appearance of an inland ocean. It decreases from this period, and the summer is reckoned from October to April. In the mountains, on the contrary, the rains commence about the former month, and predominate, with intervals of fair weather, till May or June. The winter of the low lands, to the west and north of the Cordillera, both on the Pacific and Atlantic coasts, is governed by that of the mountains, but with several curious localities. Thus, the rainy season of Guayaquil is nearly as regular as that of the plains, being reckoned from the middle of December to the middle of May; while the thick forests, which further to the north cover the provinces of Esmeraldas, Barbacoas, and Choco, produce, by their constant evaporation, an almost perpetual deluge. Wherever, on the contrary, the Cordillera recedes to some distance from the coast, as is the case with parts of the Venezuelan chain, the intermediate country is parched often by a drought of several years. Maracaybo, and a considerable part of the province of Coro, are instances where sandy plains, scantily shaded by *Mimosas* and

thick plants, afford shelter and subsistance only to flocks of goats and asses. The coast of Rio Hacha is equally dry and sterile, till it approaches the foot of the isolated ridge of Santa Marta; while the Goagira territory, situated betwixt Rio Hacha and Maracaybo, is regularly inundated every year, and consequently, though destitute of streams, maintains considerable herds of cattle and horses; a circumstance to be ascribed to the vicinity of the Ocaña branch of the Andes, which extends, with its clouds and thick forests, almost to the confines of this province. The whole Peruvian coast from Payta to Lima, is an additional instance of the same fact, where the recession of the Andes from the coast is marked by sandy deserts, which the industry of the Incas had rendered productive by artificial irrigation. In the valleys and on the table lands of the mountains themselves, the culminating summits produce great variations in the distribution of moisture. The city of Caraccas, situated at the foot of the Silla, has the benefit of a regular though mild rainy season, while within a league there are spots which suffer several years of drought. Popayan, placed at the head of a sultry valley of the Cauca, and surrounded by lofty *paramos*, has nine months of continued rains and tempests, attributable to the clouds which are driven in opposite directions from the mountains till they encounter the hot ascending air of the valley. In the ancient kingdom of Quito, now called the Republic of the Equator, the mass of Chimborazo interrupts the passage of the clouds from south to north; so that, while the western slopes are deluged with rain, the elevated plains of Riobamba to the east recall to the imagination of the traveller the deserts of Arabia Petræa. Following the same mountain chain towards the city of Quito, we observe the storms arrested between Cotopaxi and Pichinca, over the valley of Chillo; while two leagues farther to the north, the climate of the village of Pomasqui is so dry as to have given it the name of Piurita (little Piura.)

The manner in which rain is formed and precipitated at various elevations, seems to illustrate and confirm the theory of Leslie. In the region of *paramos*, i. e. from 12,000 feet upwards, the encountering aërial currents, unless in the case of some strong agitation of the mass of surrounding atmosphere, are of low and nearly equal temperature. The rains in consequence assume the form of thick drizzling mists, known by the name of *paramitos*.

On the elevated plains we find the showers more or less sudden and violent, according to localities which give rise to a mixture of currents more or less variably heated. Quito, for example, is situated on what may be called a *ledge* of the lofty mountain of Pichincha, and overlooks the valley of Chillo of Guaillapamba, furrowing the adjacent table land, on which the thermometer often rises to 80° in the shade. The encounter of portions of the atmosphere, thus variously heated, produces showers as sudden and heavy as those which generally distinguish tropical climates. On the slopes of the Cordillera the rains are generally violent for the same reason. Looking to the hygrometrical state of the atmosphere, as it results from observations made on the table lands of the equator and the coast of the Pacific, we find it to vary from 0° in the damp forests of Esmeraldas to 97°·1 on the elevated plain of Cayambe; the experiments in both places being made during June and July, the summer months both of the coast and mountains. The average medium for the low lands is 23°·85; for the Cordillera 44°·36 of the hygrometer constructed upon Leslie's principle; but we are in want of sufficient *data* for those elevations which approach to the limit of perpetual snow. To judge, however, from a small number of observations made on the mountain of Cayambe at 12,705 and 14,217 feet of elevation, and at the hut of Antisana at 14,520 feet, where the hygrometer was found to give 16°·5, 13°·9, and 30.°3, it would not seem that the dryness of the atmosphere increases in ratio of the elevation; at least, in the neighborhood of snowy mountains, where a continual moisture is exhaled, and heavy mists sweep over the soil towards evenings even of the fairest days.

To estimate the general distribution of temperatures through the vast territory of Colombia, we may conveniently consider it as divided into five zones. 1st. That of the level, or nearly so, of the ocean. 2nd. That of the small elevations, from 500 to 1,500 feet. 3rd. That of the slopes of the Cordillera, from 2,000 to 7,000 feet. 4th. That of the elevated plains, or table lands, from 8,000 to 10,000 feet; and 5th, That of the *paramos*, from 11,000 feet to the limit of perpetual snow.

1. The degree of heat at or near the level of the ocean is modified by a variety of local circumstances, which may be ranged under the following heads: proximity of the sea; of great rivers and lakes; of lofty ridges of mountains; of extensive forests; of

contiguous elevations which impede the circulation of air, and produce reflected heat. The various combinations of these circumstances may be considered as affording a rule of the increase or diminution of temperature. Thus, La Guayra, situated on a sandy beach backed by a perpendicular wall of rocks, has no counterpoise to the excess of heat but the sea breeze, and the remote influence of the ridge of the Silla, which no where reaches the limit of perpetual snow. Humboldt considers it in consequence as the hottest place on the shores of the New World, (Personal Narrative, vol. iii, p. 386,) the mean annual temperature being 82°·6; yet the observations I made during some months' residence in Maracaybo give an annual mean of 84°·63. Nor is this surprising, when we consider the localities of both places. In Maracaybo the sun's rays are reflected from a barren sandy soil, scantily sprinkled with *Mimosas* and prickly plants. The mountain chains are too remote to have any influence on the atmosphere, so that several years frequently pass without any regular fall of rain. The vicinity of the lake, no doubt, acts slightly as a refrigerant; but the city is built on the border of its outlet to the sea, where it is both narrowest and shallowest, and is consequently heated nearly to the temperature of the incumbent atmosphere. Add to this, the small sandy elevations to the north, which intercept the partial effect of the sea-breezes, so that they are scarcely felt, except in the months of December and January, when the thermometer sometimes sinks to 73°; yet the medium even of these two months is not less than 81°; while that of La Guayra from November to December at noon, is, according to Humboldt, 75°·8, and at night 70°·9. (Personal Narrative, vol. iii, p. 387.) Rio Hacha is situated on a sandy beach; the sea-breeze blows with such violence that boats can scarcely land between ten in the morning and four in the afternoon. These winds, however, sweeping over the hot plains of Coro and Maracaybo, have but a partial effect in lowering the temperature, the annual mean of which is 1°·98 less than that of Maracaybo. I never saw the thermometer lower than 75°, nor above 89°. In Santa Marta the average of the coolest months is 82°·25. The thermometer, however, never rose during my residence there above 87°. The soil is sandy, and the city is surrounded by bare rocky heights to the north and south, which counterpoise the cooling influence of the *Sierra nevada*, (snowy mountains,)

from which it is but a few leagues distant. The temperature of Barranquilla, a village situated on the river Magdalena, about eighteen miles from its mouth, is nearly the same with that of Santa Marta; for if, on the one hand, the air is refreshed by the evaporation from a damp soil covered with luxuriant forests and the vicinity of a large river, on the other, it is beyond the reach of the sea-breeze, and the influence of the mountains which operate in Santa Marta. The annual mean is 82°·20. That of Cumana is, according to Humboldt, 81°. The breezes which sweep from the gulf of Paria over the wooded Brigantine chain, probably contribute to lower the temperature.

We have thus, on a calculation of six points on the Atlantic coast of Colombia, a mean annual temperature of 82°·56.* The shores of the Pacific, as far as the latitude of Payta, are subjected to other influences, being almost entirely covered by damp, luxurient forests; while the ocean itself is cooled, as Humboldt observes, by the winds which blow continually from the south. This, however, is more perceptibly the case from latitude 8° to to 13°, where the air is cooled to an average of 71°·8 (Humboldt *De Distributione Geog. Pl.* p. 92.) Betwixt 9° N. lat. and 3° S. lat. if we may trust to observations made at the five points of Panamà, Esmeraldas, El Morro, the island of Punà, and Guayaquil, the annual mean is 80°·11, being 2°·45 less than the mean of the Atlantic coast. A notable difference also arises from the superior elevation of the Pacific chain of the Andes, and its more immediate vicinity to the coast, while the Venezuelan branch, with the exception of the Santa Marta ridge, is both lower and more inland. A curious exception to the general temperature of the Pacific coast, may be found on passing Punta Galera and Cabo San Francisco (lat. 50′ N.) to the south. The sky is here almost perpetually clouded, and a drizzling rain falls through the greater part of the year. During a week I passed there I never saw the sun; and the average temperature was only 74°·14. This was the more striking, as along the coast, immediately to the north of Punta Galera, the weather was constantly dry and the sky clear. The miry state of the road across the point of the Cape of

* I have not included Cartagena, because the number of observations is perhaps too limited to draw a conclusion as to the yearly temperature. If we take them into the calculation, the annual mean would be 82°·86, which is probably too high.

San Francisco indicates the line of separation betwixt two distinct climates. It will be seen by the map, that from P. Galera the coast, after running nearly due west, turns abruptly to the south.

2. On penetrating into the interior of the country, and examining the temperature of small elevations, we may take, as forming an aggregate specimen of the whole country: 1. The damp wooded valleys of the Orinoco and Magdalena; 2. The forests which border on the Pacific; and 3. The immense plains of Venezuela, alternately flooded and parched with excessive heat. Humboldt assigns to the valley of the Orinoco a mean temperature of 78°·2. The small number of observations I have made on that of the Magdalena, would give a mean of nearly 83°, which I should scarcely think too high, considering the localities of the river, which, flowing from south to north, affords no channel to the sea-breezes. Its mass of water is also much less considerable than that of the Orinoco; while its numerous sinuosities, and the low ridges which border it in the upper part of its course, contribute to render the air stagnant and suffocating. The temperature of Honda, at 1,200 feet of elevation, is as high as that of any part of the coast except Maracaybo. The unbroken forests which extend from the roots of the Quitenian Andes to the shores of the Pacific have a much lower temperature, caused by the proximity of the snow-capped Cordillera, and the humidity which prevails throughout the year. Accurate observations give an annual mean of 76°·78, or 1°·42 lower than the valley of the Orinoco, and 6°·22 lower than that of the Magdalena. The mean temperature of the plains of Venezuela is reckoned by Humboldt at 88·4, (*De Distributione Geog. Plant.* p. 92.;) yet several reasons may induce the belief that this calculation is excessive. This illustrious traveller performed his journey during the summer season, when the atmosphere is heated by the reverberations from a parched and naked soil. Persons who have resided near the Apure, state the climate in rainy weather to be cool, and refreshed by a constant breeze. It is only on the coast of the Pacific that the rainy season is the period of the greatest heat, when the air is still, and undisturbed by those electric explosions so common on the mountains and in the interior. The observations I made at Varinas and San Carlos, towards the beginning of the winter season, give a mean of 81°; and averaging

the dry season at 88°·4, we have a yearly mean of 84°·7, which is probably the extreme, or something beyond it. There is no doubt it is in the plains of the interior we find the greatest heat during the dry season. In the level country, called the valley of Upar, betwixt the mountain ridges of Santa Marta and Ocana, I found the thermometer in the shade several times above 100°, and once as high as 108°. The average of nineteen observations made at different points of this district is 89°·9; but we must allow a considerable decrease during the months when the soil is covered with thick vegetation, and drenched by continual rains. As a general mean of the interior, at small elevations, we may take 80°·67, or nearly that of Cumanà.

3. The temperate mountain region lies nearly betwixt the elevations of 3,000 and 7,000 feet. Below this may be considered as a hot climate, such, for instance, as Valencia and the valleys of Aragua in Venezuela, the height of which is from 1,500 to 2,000 feet, and its mean temperature 78°, or 0°·24 above that of Guayaquil on the Pacific; but the soil, stripped by cultivation of its ancient forests, imbibes freely the solar rays, which are besides reflected from the rocky elevations which every where surround the cultivated districts. The temperature of Caraccas (elevation 2904 feet) was fixed by Humboldt in his Essay *De Distributione Geographica Plantarum*, p. 98, at 69°·6; but in his Personal Narrative, b. iv, c. xii, p. 460, he considers 17°·2 of Reaumur = 70°.40 of Fahrenheit, nearly as the true yearly mean. My own observations during a residence of some months give 71°·40. The preference would be certainly due to Humboldt's calculation, but for some collateral circumstances deserving attention. I heard it generally remarked in the city, that the seasons had grown *hotter* since the earthquake of 1812. It would be difficult to explain how the temporary evolution of volcanic gases, supposing such to have taken place, could operate any permanent change on the surrounding atmosphere; yet other causes may have produced an effect falsely ascribed to the phenomenon most impressed on the imagination of the inhabitants. On looking over Humboldt's collection of observations for December and January, 1799, we find the thermometer seldom rise to 75°, and often sink to 59°; so that the mean of these months is about 68°. During the same months in 1821, the daily range was from 65° to 76°. I never observed it lower than 61°·5, and on one occa-

sion, at 5 a. m., it stood at 61°·0. The mean of these two months is 70°·21, or 2° 21 higher than the estimate of Humboldt. The clearness and beauty of the sky, during almost the whole period of my residence, is also a circumstance opposed to Humboldt's "*cœlum sæpe nubibus grave quæ post solis occasum terræ appropinquant.*" *De Distributione Geog. Plant.* p. 98. I remember but once to have seen a fog in the streets of the city. Future observations will show whether any change of climate has really taken place, or whether the differences observed be only such variations as may be frequently remarked in the same place betwixt one year and another. The mean of the whole temperate mountain region may be reckoned at 67°·80; that is, if we limit ourselves to the districts partially cultivated and inhabited. The declivities of the Andes, still covered with vast and humid forests, have probably their temperature proportionably lowered. Thus the village of Mindo, on the western declivity of Pinchinca, embosomed in humid forests, at 3,932 feet of elevation has a medium temperature of 65°·5, the same with that of Popayan.

4. The elevated plains of the Andes, betwixt 8,000 and 11,000 feet, on which were anciently united the most powerful and civilized indigenous nations beneath the dominion of the Zipas of Tunja and Bogotà and the Incas of Quito, and where the great mass of Indian population is still to be found, have a general medium temperature of 59°·37, modified however by local circumstances, and particularly by the proximity of the *Nevados*. Thus the village of Guaranda, placed at the base of Chimborazo, though nearly 500 feet less elevated, is at least one degree colder than the city of Quito, sheltered on all sides by the ramifications of Pichincha. The city again is above one degree warmer than its suburbs on the plains of Anaguito and Turupamba to the north and south. Riobamba is about two hundred feet below Quito; yet its situation on an open plain, bordered by the snowy mountains of Chimborazo, Tunguragua, and La Candelaria, renders the climate colder and more variable; while the town of Hambato, only 300 feet lower than Quito, but built in a nook of the river which runs near it, and shut in by dry, sandy elevations, has a climate about 2°·0 warmer; so that sugar-cane is cultivated in its immediate vicinity. The general uniformity of temperature, which spreads a certain monotony over tropical regions, is joined, at great elevations, to a daily variability which must

exercise a considerable influence both on vegetable and animal life. The thermometer, which often sinks at night to 44°, rises in the sun wherever there is a reflected heat, frequently to 120°, being equal to the heat of Jamaica; while in the shade, it seldom exceeds 65°; so that, on passing from shade to sunshine, one is immediately exposed to a difference of above 50°, and, in the course of twenty-four hours, to nearly 80°. The shade, in consequence, even on the hottest days, imparts a feeling of chilliness; while the solar rays seem to scorch like the vapor of a heated oven. The same difference is perceptible on the *paramos*. At the foot of the *Nevado* of Santa Marta I observed the thermometer at 5 a. m. sink to 22°; at 9 a. m. it rose to 73° in the sun. On the height of Pichan, betwixt Quito and Esmeraldas, elevation 12,986 feet, the thermometer stood at 53° in the shade, and 83° in the sun. On Antisana, the difference was 22° *at the same time*, but 34° betwixt 6 a. m. and 3 p. m. When the atmosphere is calm it is much more considerable.

5. Although at great elevations, i. e. from 12,000 to 16,000 feet, it is difficult to form a series of meteorological observations, such is the yearly equality of the temperature, that a single day may be safely taken as a sample of the whole year; nay, more, a collection of observations made at similar heights, though in different places, will give a similar result to a series taken on the same spot. Thus in the following table there is little difference betwixt the result of eight observations made on seven different mountains, and the six made on that of Antisana:

1.	Paramo of Santa Marta	15,000 ft.	22°	5½ A. M.
2.	Paramo of Cayambe	12,705	37°.6	" "
3.	Paramo of El Altar	12,986	42°.8	" "
4.	Mine of Condorasto	14,496	45°.0	12 "
5.	Volcano of Pichincha	15,705	46°.0	1 P. M.
6.	Mountain of Atacaso	14,820	41°.0	" "
7.	Nevado of Cayambe	14,217	43°.0	1½ "
8.	Paramo of Antisana	14,520	38°.58	6 " observations.
	General mean		39°	

Although it scarcely falls within the limits of a mere meteorological journal to expatiate on the wide field of inference which opens to our view, when we reflect on the influence of temperature, not merely on animal but on social life, yet the operation of local circumstances has been so striking, and will probably play so important a part in the future destinies of the South American continent, that it is difficult to forbear some remarks on so interesting a subject.

Climate is one of the first agents which operates upon the propagation of the human race over the face of the globe, presenting itself sometimes as a benignant conductor, at other times raising a hostile barrier which science and industry slowly overcome. The Spaniards who people that part of South America now under consideration, as soon as they had formed on the coast the establishments necessary to preserve their connection with the mother country, seem to have traversed hastily the fertile but insalubrious lowlands to meet on the Cordillera a temperature adapted to their habits and constitutions. The dominion of the Incas had, upon similar principles, extended itself along the immense ridge; and the descendants of the conquerors and conquered are, to this day, found united on the same elevations, from whence the population has descended gradually into the plains; and would have done so much more slowly, but for the importation of the African race, who find on the sandy coast and sultry savanna a climate congenial to their constitution. It may be a matter of curiosity to inquire, why that portion of the *bronzed race* which constituted the empire of the Incas and of the Lipas has constantly exhibited a constitutional type so different from the tribes of the same race now thinly scattered through the plains and valleys. The dominion of the Incas could scarcely be said to have established itself in the lowlands. With the exception of the dry narrow track of the Peruvian coast, their empire was exclusively of the mountains; and Indians who speak the *Quichua*, or general language of the Incas, still manifest the same preference for cold and elevated situations; sleeping in the open air rather than under a roof, and exhibiting an insurmountable repugnance to descend into the hot country, where they fall victims more rapidly than even the Europeans. The latter, although commercial interests have led them to form establishments on the coasts, and more partially on the great rivers, may be said to live in a state of perpetual hostility with the climate. Their complexions become sallow, their frames feeble; and although, where heat is uncombined with great moisture, as in Cumanà, Coro and Maracaybo, they are subject to few diseases of a violent character, the strength is gradually undermined, and the species may be rather said to vegetate than to increase. The individuals of African race, who complain of cold when the yearly mean is 75°, alone develope all the physical strength and energy of their character in the hot

lowlands of the coast and interior. The mixed race, or people of color, unite to bodily hardihood intrepidity, ambition, and a deadly feeling of those prejudices which, in spite of laws, continue to separate them from the *white* descendants of the Spaniards, who thus encounter, both in the high and lowland, two races in whom the seeds of hostility have been sown by injustice, and fostered by mistaken feelings of interest and vanity.* It is on the mountain slopes of from 3,000 to 7,000 feet that we encounter climates most analagous to our ideas both of health and pleasure. Raised above the noxious miasmata of the coast, we dwell in perpetual summer amid the richest vegetable productions of nature, amid a continued succession of fruits and flowers. This picture, however, must not be considered as universally exact. In those unbroken forests where population has made little progress, the sky is often clouded, and the soil deluged with continual rains. The western declivities of the Andes, which front the Pacific, are particularly exposed to this inconvenience.

It might be expected that with regard to human life and vigor, the elevated plains of the Andes would correspond to the northern countries of Europe. This, however, as far as regards the inhabitants of the European race, does not seem exactly to take place. It is true they escape the billious and intermittent fevers so prevalent in the lowlands; but they are generally subject to typhus, dropsy, goitre, and such complaints as indicate constitutional debility. Nor do we find among them either the muscular strength or longevity of the Indians or Africans; and still less of the nations of northern Europe. Are the diurnal changes of temperature to which they are exposed, less favorable to health than the alternation of European seasons which expose the frame to changes equally great but less rapid? Or must we rather look for the cause in their domestic habits, which exhibit a strange mixture of effeminacy and discomfort?

When we examine the social or political effects of climate and localities, we are struck with their powerful effects on the past struggles and present state of the country. The cities of the coast must be considered as the inlets both of European products and European ideas. Liberal opinions have extended themselves

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* It is the people of color, or mixture of Africans with Whites and Indians, who on the plains form the most hardy and warlike part of the population of Colombia.

towards the interior in proportion to local obstacles, i. e. to the greater or less facility of communication. It is this circumstance which marks the difference betwixt Venezuela and the south and the centre of Colombia, indicating a distinct and more rapid career of civilization and prosperity. The branch of the Andes which traverses Venezuela is much inferior in elevation to the ridges of Quito and New Grenada. The whole of the inhabited part of it belongs to the hot country or temperate mountain zone. The following are the heights of the principal towns through its whole extent:

Caraccas . . .	2903 ft.	Mean temp. 71°
Valencia . . .	1495	——— 78
Barquisimeto . .	485	——— 78
Tocuyo . . .	2058	——— 75
Truxillo . . .	2684	——— 75
Merida . . .	5280	——— 66
Cucuta . . about	400	——— 83

The differences of climate and productions betwixt the different parts of the country are consequently trifling, and form no bar to general communication betwixt the coast and interior. There is therefore an amalgamation of ideas, an homogeneity, if we may use the term, in the mass of feelings and opinions on political subjects. The population is not only more enlightened, but, what is of more importance, more equally so. A different state of things presents itself, when we examine the centre and south. The main ridge of the Andes ascends rapidly from the frontier of Venezuela, and, by its direction from north to south, places the population at a continually increasing distance from the sea-ports of the Atlantic; while its superior elevation producing a different climate and temperature, gives birth to new habits and a distinct nationality. To descend to the coast from these altitudes, is a matter both of risk and difficulty. The line betwixt the *Llaneros* and *Serranos* is strongly drawn, and a separation of character evident. The country from Cucuta to Bogotà through Pamplona and Tunja has a mean elevation of from 8,000 to 10,000 feet, and a temperature of about 59° Fahr. It is true that Bogotà communicates with Europe by the valley of the Magdalena; but the length and inconvenience of this channel of intercourse render it accessible but to few. Hence the struggle of opinions in New Grenada, where the civilization of the superior class is out of proportion to that of the bulk of the people.

The Quitean Andes afford us another powerful illustration of this view of the subject. The following is the line of elevations between Quito and Chimborazo:

Quito	9,537 feet	59° Fahr.
Llactacunga . .	10,285	57°
Hambato . . .		61°
Riobamba . .	9,377	57°
Guaranda . . .	9,075	58°

The roads which descend to the coast of the Pacific are few, almost impassible, and lead to no seaport of importance except Guayaquil. Journeys thither are undertaken with fear and hesitation; and the character of the *Serranos* is marked with all the traits of isolation resulting from the geography of the country.

Next to the direct influence exercised by climate on the frame of man, we may consider it relatively to the facility it affords of nourishing him, and advancing his progress in civilization. The most important presents made by the Old to the New World are cattle and cerealia. The only domesticated quadruped known to the Indians was the llama, which furnished, like the sheep, with thick wool, unwillingly descends or is propagated in the sultry lowlands. The horned cattle of Europe, on the contrary, have multiplied almost equally on the plains as on the *paramos*. On the farm of Antisana, for instance, at an elevation of from 12,000 to 16,000 feet, there is no less than 4,000 head. The herds raised on the plains of Venezuela, as on the *Pampas* of Buenos Ayres, are, or were previous to the revolution, almost countless. Two immense magazines of animal food are thus placed at the two extremes of temperature, in situations uninterfered with by agricultural labor. The horse has been destined to figure in the political changes of the New World. The fear and respect with which he inspired the natives at the period of the Conquest is well known. Horses have since multiplied prodigiously in all parts of the country, but more especially in the plains of Venezuela. There, during the war of independence, Paez, and other guerilla chiefs, at the head of an irregular cavalry, and maintained by the cattle, defied the efforts of the Spanish infantry, and kept alive the embers of the revolution.

The best kinds of horses are those that are bred in the lowlands, and brought to the mountains at about four years old, where they acquire hardihood by the influence of a colder climate, and their

hoofs, accustomed only to soft pastures, are hardened on a stony soil.

The breed of sheep, like that of llamas, is limited to the loftier regions of the Cordillera; while goats multiply more readily on such parts of the low country as are both hot and barren, as in the province of Coro, where they form the chief wealth of the inhabitants.

But while nature facilitates the dispersion over the globe of certain species of animals, she seems to limit others by an impassible barrier. The dog undergoes the fate of his European master; his sagacity and strength decay in a hot climate, and the breed dwindles rapidly into an animal totally inferior in habits and organization. The foresters accordingly, and the Indians of the lowlands, who are accustomed to the chase of the wild hog, bring dogs for the purpose from the mountains, where, though the Spaniards are by no means curious in this particular, a strong species of greyhound, more or less degenerated, is to be met with, and is used in the highlands for stag-hunting.

The influence of temperature, and consequently of local elevation, on vegetable life, was first examined in Colombia by a native of Bogotà, the unfortunate and illustrious D. Josè Caldas, who fell a victim to the barbarity of Murillo in 1811, in consequence of which his numerous researches in natural history were almost entirely lost, with the exception of some papers published in the *Seminario de Bogotà* in 1808, and fragments still existing in MS. or casually preserved and printed in Europe, to one of which I shall presently have occasion to refer. Humboldt travelled through South America about the same time that Caldas was directing the attention of his countrymen to physical science, and his investigations have fortunately been subjected to a less rigorous destiny. His admirable treatise, "*De distributione Plantarum geographica*," has left for future observers little but to corroborate the accuracy of his views and multiply facts in illustration of his theories.

When we begin our observations from the level of the sea, we find certain families of plants which scarcely ever rise to above 300 or 400 feet: the "*Sandalo*," producing the balsam of Tolu, the *Lecythis*, the *Coccoloba*, the *Bombax*, the *Rhizophora Mangle*, the *Manchineel*. A second and more numerous class push on to about 2,000 feet of elevation; such are the *Plinia*,

the "*Copàl*," the "*Anime*," the "Dragon's blood," the mahogany tree, the "*Guayacàn*." Among plants, the *Cæsalpinia*, *Ipomæa quamoclet*, most of the *Bignonias*, *Portlandias*, the Vanilla, *Cassia alata* and *riparia*, the *Pontaderia*, which forms the ornament of tropical rivers. The palms ascend to the height of 5,000 feet; the arborescent ferns, from the level of the sea, amid the damp forest of Esmeraldas, to 7,000 feet. Of cultivated plants the Cacao and indigo are most limited as to elevation, neither of which is cultivated with success at above 2,000 feet. An attempt to raise indigo at Mindo (3,960 feet) completely failed. It would seem that a dry climate is most favorable to indigo, such as is found in the valleys of Aragua near Valencia; while heat and moisture, as Humboldt observes, are particularly required for cacao. Yet cacao cultivated on lands which are flooded part of the year, as is the case with the greater part raised in Guayaquil, is of inferior quality, scarcely producing in the market a dollar per cwt. That of Esmeraldas, on the contrary, where notwithstanding the moisture of the climate, the waters never settle on the soil, is of equal or superior quality to that of the valley of Tuy near Caraccas. In Canigue, at an elevation of about 1,000 feet, the trees are loaded with fruit in less than two years from the time of sowing the seed; while generally three years is the period at which they are reckoned to commence bearing.

Coffee is abundantly raised from the level of the sea to elevations of 5,000 or 6,000 feet, or even higher in favorable situations. There are plantations near the valley of Banos in Quito at above 7,000 feet.

Cotton requires, according to Humboldt, a mean temperature of not less than 64°—60°, which would bring it to the elevation of Loxa.

The sugar cane is cultivated in Colombia from the level of the sea to an elevation, which may appear extraordinary, of 7,865 feet in the valley of Banos at the foot of Tunguragua, of 8,500 in the valley of Chillo below Quito, and of nearly 9,000 feet near the town of Hambato. It must be observed, however, with respect to the latter, that the *vegas* or nooks formed by the windings of the river, where alone it is raised, are so sheltered as to produce almost an artificial temperature. A palm tree brought young from Guayaquil flourishes there, and "*Aguacates*," (the fruit of *Laurus persea*) ripen perfectly, with oranges, limes, and other

fruits which in general are not cultivated at above 6,000 feet. In proportion, however, to the elevation is the time required for ripening the sugar-cane, varying from nine months at the elevation of 1,000 feet, to three years at the elevation above cited.

Plantains and maize are the principal articles of food in the lowlands or hot country, "*tierra caliente,*" to use the expression of the natives. The larger variety of plantain, "*Plantano harton,*" cannot be cultivated at elevations above 3,000 feet, while the smaller variety "*Camburi,*" will ascend to 6,000 feet, maize is perhaps the plant which, of all others, embraces the greatest variety of temperature and elevation. It is cultivated with equal advantage from the level of the ocean to the flanks of the Andes, 0 to 11,000 feet; temperature 80°—59°. It is true, that in the lowlands it ripens in three months, whereas on the table lands of the Andes, it requires ten; but the grain is larger, and the ear fuller in the cold than in the hot country.

The central or temperate zone of the Andes is distinguished by the *Cinchonas*, the arborescent ferns which precede and accompany the palms nearly, and in the moist forests of the Pacific, entirely to the level of the sea.* At the back of the Pichincha they first appear about 8,500 feet. The *Alstræmerias* and *Calceolarias*, peculiar to the New World, belong to this zone, though the former ascend to 11,000 feet and the latter to 15,000.

The *Cerealia*, with almost all the varieties of European vegetables, belong to this region. Humboldt observes a peculiarity that wheat is grown near Vittoria at the elevation of 1,700 feet, and in Cuba near the level of the sea; (*Geo. Pl.*, p. 161) but it is probable that the reason why the cerealia are cultivated only at elevations where the *Musæ* disappear, may be the natural inclination of the inhabitants of the warm country to prefer the cultivation of a plant which yields an equal abundance of food with infinitely less labor, not only in the mere cultivation, but in the subsequent preparation. The three great wheat districts in Colombia are the mountain chain of Merida, the elevation of which rarely reaches 5,000 feet; with a general temperature of 72°; the plain of Pamplona, Tunja, and Bogotà, elevation 8,000 to 10,000 feet; temperature 58°; and the Quitenian Andes of the same height and temperature. Humboldt has accurately observed,

* Humboldt, who had not visited these forests, confines them to betwixt 800 and 260 hexap. *De Geo. Pl.*, p. 185.

(*Geo. Pl.*, p. 152) that a comparison betwixt annual mean temperatures of Europe and the elevated tropical regions would by no means give a correct state of the climate. Thus, though the mean temperature of the south of France and of Quito be the same, (about 59°) such fruits as peaches, apricots, pears, figs and grapes, which ripen in perfection in the former, although abundantly produced in the latter, never attain their proper size or flavor. The reason is, that the temperature is equal throughout the year. There is consequently no period, as in Europe, of summer heat sufficient to ripen fruit requiring at this season a mean temperature of 65° or 70°. As far, however, as the height of 7,000 feet all kinds of fruit are cultivated with success; and the markets of the colder country are thus constantly supplied from the neighboring valleys or "*calientes.*" Humboldt is mistaken in supposing the olive always barren (*semper sterilis manet*, p. 154.) On the Quitenian Andes near Hambato, it produces abundantly, though little attention is paid to its cultivation.

When we ascend above the extreme limit of cultivation, which may be placed at 11,500 feet, and pass the region of the *Barnadesia, Hyperica, Thibaudiæ, Gaultheriæ, Buddleiæ*, and other coriaceous leaved shrubs which, at this elevation, form thickets of perpetual bloom and verdure, we enter the region of *Paramos* (13,000 to 15,000 feet) properly so called, which present to the eye unvaried deserts clothed with long grass, constituting the pasture grounds of the Andes. Humboldt is inclined to fix below this region the limit of forest trees; (*Geo. Pl.*, p. 148) and in fact very few are generally met with near this elevation on those flanks of the Cordillera which join the inhabited table lands. But I have observed on crossing the side of Pichincha, towards the uninhabited forests of Esmeraldas, that the forests occur nearly through the whole space which, on the eastern slope, is a naked *paramo*. Is this owing to a difference of climate? Or has the practice of burning the *paramos*, universal in the Andes, together with the demand for fire-wood in the vicinity of large towns, contributed to give this region the bare aspect it has at present? Further observations on the mountain slopes towards Maynas and Macas are necessary to throw light on this point. It is certain from the present aspect of the inhabited plain of Quito, where we meet with a few scattered trees of *Arayan* (*Myrtus*) and artificial plantations of *Capuli*, (*Prunus salicifolia*) we should con-

clude that the region of forests had scarcely ascended to the height of 8,000 feet, yet some of the houses of Quito are still standing, built with timber cut on the spot.

A circumstance which cannot have escaped the notice of those who have ascended towards the limit of perpetual snow, is the variety and luxuriance of the Flora at the very point where the powers of vegetation are on the brink of total suspension. At above 15,000 feet the ground is covered with *Gentianas*, purple, azure and scarlet; the *Drabas*, the *Alchemillas;* the *Culatium rufescens* with its woolly hood; the rich *Ranunculas Gusmanni;* the *Lupinus nanus* with its cones of blue flowers enveloped in white down; the *Sida Pichinchensis* spotting the ground with purple; the *Chuquęraga insignis;* all limited within a zone of about 500 feet, from whence they seem scarcely to be separated by any effort at artificial cultivation. Several attempts I have made to raise the Gentians, *Sida*, and other plants of the summits of the Andes, at the height of Quito, have been invariably unsuccessful. The attempts indeed to domesticate plants in a situation less elevated, is attended with greater difficulties than the transport of plants from one climate to another. Besides the difference of atmospheric pressure, as Humboldt has observed, plants transferred from one elevation to another never meet, for a single day, with the mean temperature to which they have been accustomed; whereas, transferred from one latitude to another, the difference is rather in its duration than in its intensity. It is easier to accustom a plant of the lowlands to this elevation, than to bring down those of the *paramos*. Thus the orange and lemon trees, Aguacates (*Laurus persea*) *Ricinus communis*, *Datura arborea*, all natives of the hot lowlands, grow and flourish, more or less at an elevation of 8,000 feet above the level of the sea.

On the Method of Measuring Heights by Boiling Water.

It will be observed in the following Journal, that the indication of *heights* is, in most cases, joined with that of boiling water. The former is in fact a deduction from the latter; I had but a confused idea of this method, till, upon my arrival at Quito, I met with a pamphlet of the late D. Francisco José Caldas, (one of the most eminent victims sacrificed by the barbarity of Murillo on taking possession of Bogotà in 1816,) published in 1819 at Bourdeaux, in which he details the steps by which he arrived

at a knowledge of this principle, and the experiments by which he confirmed it. In the year 1801, during a scientific excursion in the neighborhood of Popayan, he happened to break his thermometer; and in attempting to mend it he was led to observe the variability of the extremity of the scale corresponding to the heat of boiling water. His reflections on this subject led him, after various experiments, to the following conclusions: "The heat of boiling water is in proportion to the atmospherical pressure: the atmospherical pressure is in proportion to the height above the level of the sea; the atmospherical pressure follows the same law as the risings of the barometer, or, properly speaking, the barometer shows nothing more than the atmospherical pressure. Boiling water therefore shows it in the same manner as the barometer. It can consequently show the elevation of places in the same manner, and as exactly as this instrument." *Ensayo de una memoria sobre un nuevo metodo de medir las montañas, etc.* p. 10. His first experiment in Popayan gave b. w. 75°.7 of Reaumur, the height of the barometer being 22 in. 11 l. To find then the variation corresponding to one inch of the barometer:

$$28^{in.} - 22^{in.}\ 11^{l.} = 5°.1 \text{ or } 61 \text{ lines.}$$

$$80° - 75°.7 = 4°.3. \quad \text{Then}$$

$$61^{l.} : 4°.3 :: 12^{l.} : \frac{4°.3 \times 12}{61} = 0°.8.$$

Then reversing the process

$$0°.8 : 12^{l.} :: 4°.3 : \frac{4°.3 \times 12}{0°.8} = 64.5 = 5^{i.}4\tfrac{1}{2}$$

Difference betwixt this result and that of the barometer $3\frac{1}{2}$ lines. Satisfied with this commencement, or dawning of a new theory, he began a series of experiments in the mountains near Popayan, taking this city as the centre of his labors, and fixing the elevation of the barometer at $22^{i.}$ $11^{l.}$ 2, and boiling water at 75°.65 of Reaumur.

At a spot named Las Juntas I made my first observation. The barometer stood at 21^{i} 9^{l}, or 14^{l} lower than at Popayan; the heat of boiling water was 74°.5 Reaumur. Then

Height of the barometer in Popayan	22^{i} 11.2	B. W. 75°.65
at Las Juntas	21 9	——— 74°.50
	1 2.2	1°.15

1 2.2=14l.2 : 1°.15 : : 12l $\frac{12\times1°.15}{14.2}$ = 0°.971 of Reaumur for 12l. of the barometer.

I ascended to Paisbamba, a small farm five leagues south of Popayan. Barometer 20i 9l.1. B. W. 73°.5.

Barometer in Popayan	22i	11l.2	B. W.	75°.65
in Paisbamba	20	9.1	B. W.	73 .50
Differences	2	2.1		2° 15

2 2.1=26l.1 : 2°.15 : : 12 $\frac{12\times2.15}{26.1}$=0°.988 of Reaumur, for 12 lines of the barometer.

I ascended a hill E. of Paisbamba called Sombreros. Barometer 19i. 6l.5. B. W. 72°.4.

Barometer in Popayan	22i	11l.20.	B. W.	75°.65
on Sombreros	19	9.05.	B. W.	72 .40
Differences	3	5.15.		3 .25

41l.15 : 3°.25 : : $\frac{12\times3°.25}{41.15}$=0.947 for 12 lines barometer.

I ascended the hill of Tambores: barometer 18i 11l.6. B. W. 71°.75.

Barometer in Popayan	22i	11l.2.	B. W.	75°.65
on Tambores	18	11.6.	B. W.	71 .75
Differences	3	11 .6.		3 .90

47l.6 : 3°.9 : : 12 $\frac{12\times3.9}{47.6}$=0.983 for 12l barometer.

Proof that above $\frac{9°}{10}$ of Reaumur is the true exponent of one inch of the barometer.

I then proceeded to take the observations of Las Juntas and Sombreros, and calculating the exponent anew.

Barometer in Las Juntas	21	9	B. W.	74.60
in Sombreros	19	6.05		72.40
Differences	2	2.95		2.2

26.95 : 2°.2 : : 12 $\frac{12\times2.2}{26.95}$=0°.979 Reaumur for 12 lines of the barometer.

Barometer in Paisbamba	20	9.1.	B. W.	73°.50
in Tambores	18	11.6.		71 .75
Differences	1	9.5		1°.75

$1.9.5 = 21^{l}.5 : 1°.75 :: 12 \quad \frac{12 \times 1°.7}{21.5} = 0°.976$ of Reaumur for 12 lines of barometer.

The mean of the six quotients is 0.974, which may be assumed as the exact exponent of 12 lines of the barometer.

Given then the heat of boiling water in any place to find the corresponding elevation of the barometer, and consequently its height above the sea.

As 0°.974 : 12 lines, so is the difference of the heat of B. W. To ascertain at Popayan the number of inches, lines, &c. of the barometer. Ex. in Tambores, B. W. 71°.15, to find the corresponding height of the barometer.

B. W. in Popayan	75°.65		
in Tambores	71 .75		
	3 .90		

$0.974 : 12 :: \frac{3.9 \times 12}{974} = 48^{l}.05 = 4.0.05.$

As Tambores is above Popayan, deduct this quantity from the height of the barometer in that city.

Barometer in Popayan	22	11.20	
Deduct	4	00.05	
Remain	18	11.15	ht. of bar. in Tambores.
Barometrical height observed	18	11.60	
Do. by calculation of B. W.	18	11.15	
Difference		45	

a result as exact as can be desired.

Upon this principle I calculated the elevation of the following eleven places:

Popayan,	Poblason,
Juntas,	Buenavista,
Paisbamba,	Hevradura,
Sombreros,	Pasto,
Tambores,	Quito.
Estrellas,	

Memoria, &c. p. 13. *et seq.*

Working upon the foregoing principle, Caldas adapted to his thermometer a barometrical scale. The product of 0°.974 of Reaumur by 19 is 18.506, or, in round numbers 18.5, i. e. 18°.5 of Reaumur corresponds to 19 inches of the barometer. Then measuring 18.5 from the summit, or 80° of Reaumur's scale, he transferred it to the opposite side of the thermometer, dividing it into 19 equal parts, or inches of the barometer, subdividing these by a nonius into 24 each = half a line of the barometer. In this manner the elevation of the thermometer by boiling water indicates the corresponding elevation of the barometer under the same atmospheric pressure. Caldas observes that Humboldt, to whom he had communicated these ideas, when they met in Popayan, objected the variability of the heat of boiling water under the same atmospherical pressure; to which he replies: "Long practice has taught me its invariability in this respect, using the requisite precautions in making the experiment: otherwise, how could there be equal thermometers? Is not the invariability of the heat of boiling water under the pressure of twenty-eight inches, the foundation of the superior term of all thermometrical scales? It is true that boiling water does not *immediately* acquire its extreme heat, but pushing the operation to its *maximum* its heat is always the same." p. 24.

Caldas did not consider an invariable exponent possible, on account of the variability of atmospheric pressure. The want, however, of a barometer induced me to make some experiments to this effect, by way of rendering this method of measuring elevations still more simple, and of more general use. Is the variability of atmospheric pressure such as to make any important difference in these calculations? Does not water boil constantly at 212° at the level of the sea? At Quito I found the same result as Caldas had several years before; and several times the same result in this and other parts of the Andes. The difference then, is scarcely perceptible in the thermometer, and consequently unimportant in the results of a calculation founded on the heat of boiling water. The thermometer besides, immersed in boiling water, is less liable to a variety of atmospheric influences to which the mercury of the barometer is necessarily subject. Hence the great differences in different barometrical measurements of the same elevations, and the differences observed betwixt different thermometers exposed to the air in the same place,

which I have observed on comparing three together to amount often to $1\frac{1}{2}°$, and never to less than $\frac{1}{2}°$.

I took the following method to obtain an exponent of the value in feet of each degree of the diminished temperature of boiling water.

The elevation of Quito is, according to Boussingault, 9524; and water boils at 196°.25; $212° - 196°.25 = 15°.5.9524 \div 15.75 = 604$ ft. 6. in. nearly. Neglecting the fraction as unimportant, I assumed 604 for the value of the degree, and began my observation on the conical hill of Javirac, which backs the city, and is calculated at 729 feet in height. Water boiled here by two thermometers at 195°. Then $196°.25 \div 195 = 1.25$, difference of boiling water between the hill and the city; and $1.25 \times 604 = 755$ feet; difference 26 feet. I next ascended the volcano of Pichincha, and found at the foot of the crater B. W. $186°.212° - 186° = 26° \times 604 = 15{,}730$ feet; and adding 246 feet, the difference between this point and the summit, reckoned at 15,976. There could be little error in the calculation. I next applied this formula to the heights of several places calculated by Humboldt, and where the heat of boiling water had been ascertained by Caldas.

Thus Bogotà, height according to Humboldt -	8694 ft.
B. W. according to Caldas 197°.6 - - -	8712
Difference - - -	18
Popayan, according to Humboldt - - -	5823
B. W. 202°.21 - - - - - -	5922
Difference - - -	99
Pasto, according to Humboldt - - -	8572
B. W. 197°.6 - - - - - -	8712
Difference - - -	140 ft.

The differences here are in four points 27 feet, 18, 99, 140. With respect to the hill of Javirac, commonly called *El Panecillo*, I suppose the measurement to have been made by the Academicians. But their calculations generally differ from those of Humboldt, as in the case of Quito; the former giving 9371 feet, the latter 9537; Pichincha 15,606 feet, Humboldt 15,976; Chimborazo 20,583, Humboldt 21,414. But even a difference of sites

is sufficient to account for the 27 feet on ground so unequal as that of Quito. The 18 feet in the height of Bogotà is so trifling a difference, that it rather proves the exactness of my calculation. In Popayan we have 99 feet; yet the different barometrical measurements of that city differ still more widely. Caldas observes, p. 31, "The Baron de Humboldt's barometer stood in Popayan at 23 3.4, mine at 22 11.2, and Bouguer's at 22 10.7." The most accurate measurements of the peak of Teneriffe, selecting 4 out of 14, leaves a difference of 71 French toises, or rejecting the barometric measurements of Borda, of 18 toises.—*Humboldt, Pers. Nar.* v. 1, p. 160, 170. Saussure is said to have found water boil at 187° on the summit of Mont Blanc, being, according to Humboldt, 15,660 ft. It is 90 ft. only below the point on Pichincha, where I found it to boil at 186°. The elevations nearly equal the difference cannot amount to a degree; and I consider the error less likely to be on my side, because I was aware of the probable cause of error, and had to deduce the height from the accuracy of the observation. Humboldt in the same manner suspects the accuracy of Lamouroux's observation on the peak of Teneriffe.—*P. Nar.* vol. i. p. 159.

[To be continued.]

Report of an Expedition to Explore a Route by the Rivers Waini, Barama, and Cuyuni, to the Goldfields of Caratal, and Thence by Upata to the Orinoco

W. H. Holmes; W. H. Campbell

Proceedings of the Royal Geographical Society of London, Vol. 2, No. 3 (1857 - 1858), 154-157.

Sixth Meeting, Monday, February 8th, 1858.

SIR RODERICK I. MURCHISON, PRESIDENT, in the Chair.

PRESENTATIONS.—*The Hon. W. Napier, Lieutenant A. H. Gilmore*, R.N., *and Mr. James Young were presented upon their election.*

ELECTIONS.—*Lieutenant J. A. Napier Hewett; the Rev. Anthony W. Thorold; Thomas Brown; Frederick D. Goldsmid; and George Seymour, Esqrs., were elected Fellows.*

The first Paper read was—

1. *Report of an Expedition to explore a Route by the rivers Waini, Barama, and Cuyuni, to the Goldfields of Caratal, and thence by Upata to the Orinoco.* By Sir W. H. HOLMES and Mr. W. H. CAMPBELL.

Communicated by the FOREIGN OFFICE.

SIR W. HOLMES and Mr. Campbell sailed from the river Demarara to the mouth of the Waini on August 27th, 1857, whence they made a boat excursion along the Mora Creek to the Barima River, in order to obtain the assistance of Indians for ascending the Waini. The Mora is a natural navigable canal, of 50 or 60 miles long, connecting the Barima and Waini: it might be turned to good account, for its banks are heavily timbered, but its channel is now choked with stumps and fallen trees. The schooner was taken up the Waini as far as the mouth of the Barama River, up which the party proceeded in canoes on September 6th, carrying provisions and articles of exchange. This river was rapid and remarkably tortuous, and the travellers could not reach the Dowaicama cataract and portage till the 12th. This river, the Waini, and the Barima, run through forests of immense timber; Sir R. Schomburgk never saw trees so

gigantic as those along the upper course of the Barima. On the 15th they came to an Indian path that led to the Cuyuni, at a distance of two or three days, through an undulating country, and followed it on foot, but owing to various delays they did not reach the Cuyuni till the 26th. They found this river to be about 500 yards wide, and containing a considerable body of water, though at a distance of 200 miles from the sea. They now started in a flotilla of "wood skins" which had been ordered to meet them. There were numerous rapids in the Cuyuni which caused great delay, but on October 1st they reached the mouth of the Curama River, which was blocked up by drift timber, otherwise it would have afforded the best line of route, as it passes only 30 miles from Caratal. It flows from the high savannah lands, and forms a natural outlet, that admits of being turned to account, for the produce of that immense and admirable grazing country. On September 30th the hills by the side of the Cuyuni became more mountainous, and more covered with blocks of quartz, and they gradually rose into the Ekreku range, about 2000 feet high. The scenery was striking, the atmosphere drier than elsewhere in Guayana, and the climate genial. On October 7th the Cuyuni was left, being still 300 yards wide, and the Yuruan was ascended: this tributary was about 200 yards wide. After 8 miles the mouth of the turbid Yuruari was reached: it was 150 yards in width, and was infested with a perfect plague of sand flies. The party ascended its stream: they reached the first savannah on October 9th, where the river ran, fringed with a narrow bush, through thousands of acres of pasture land totally unoccupied. Cattle farms began to appear as Tupuquen was approached; they had mostly belonged to the late Colonel Hamilton, who owned a vast tract of land in this neighbourhood.

The party were politely received by the Alcalde of the mud village of Tupuquen: it was formerly a missionary station, and is now chiefly tenanted by persons connected with the diggings of Caratal, from which place it is 6 miles distant. Caratal was reached by the party on October 14th.

The diggings consist of about 50 thatched lodges, for the most part without walls, and tenanted by from 120 to 200 diggers. There are no goldfield laws here, but each man can dig where he likes. The community appeared an honest one, but very sickly. In the process of gold-seeking, the bush has first to be removed, then the upper soil, then a hard subsoil which requires the pickaxe, and at 10 or 15 feet the "Graja" is reached. This is a layer of earth, clay, quartz, and iron stone, in which the gold is found. Below it is stiff clay. In most cases the miners fail in meeting with the

Graja: either they come upon solid rock or are flooded with water. The successes at the diggings appeared in no way commensurate to the hardships. Every man suffered from fever, and many from béche (inflammation of the lower bowel). Vermin of all kinds abounded. The usual diet was beef dried in the sun.

On October 18th the travellers started for Upata, which they reached on the 22nd, passing through Guacipata, and crossing a wide savannah with fine park-like clumps of trees, and dotted with hills, covered to their summits with verdure. The natives were as hospitable as their means admitted, but it was strange that in this pastoral country, milk and cheese were found to be rarely used, and butter was altogether unknown. Milk had the reputation of predisposing to fever. The ordinary food is dried meat and cassava bread. The whole country abounded with quartz (Sir W. Raleigh's "el madre del oro"). Las Tablas was reached on October 25th: it is the port of Upata, as regards the Orinoco; thence they boated to Barancas in 12 hours. This town was surrounded with lagoons that were then drying up: its inhabitants suffered much from fever, and from this time fever began to attack all the members of the expedition, though they had previously enjoyed perfect health. Dr. Blair, one of their number, died of it.

Thirty or forty Indians, of various tribes, had accompanied the party throughout their journeyings, and they are much praised for being honest, willing, and easily satisfied. The opinion of Sir W. Holmes and Mr. Campbell is, that the districts of the Waini, Barima, and their tributaries are worthy of a much closer investigation than either their time or experience enabled them to give.

Mr. Bratt started for Caratal very shortly after the above-mentioned travellers. In his tours of inspection he passed along three different routes to the diggings, and found in all of them the same repetitions of wet alluvial land, dry arenaceous savannah, stunted trees, coarse grass, large quantities of quartz lying about in all directions, and a remarkable absence of animal life. He estimates the number of men in constant work at 130, and the yield of gold at 100 oz. per week. He does not think that Caratal is, by nature, an unhealthy place.

Mr. James Shanks, surveyor, left George Town on October 3rd, and reports his belief that the climate of Caratal is fatal: he estimates the yield of gold at less than 80 oz. per week. If any trade should arise between Venezuela and Guayana, he believes the course it would take would be along the left bank of the Yuruari and alongside the Cuyuni; water navigation being, as a general rule, impracticable on these rivers. He considers that the colony of British

Guayana possesses natural advantages for pasturage and cultivation that are equal, if not greater than those of any ground in the far interior.—F. G.

The PRESIDENT: We return thanks to Sir William Holmes and Mr. Campbell for this very clear description of a country that they have traversed, and also to the Earl of Clarendon, our constant friend, for sending us this interesting communication from the Foreign Office. You will all recollect that the person to whom we are most indebted for a knowledge of the great territory adjacent to the country now explored is Sir Robert Schomburgk, a gold medallist of this Society, and formerly our Consul at St. Domingo. The subject is one that would have interested you infinitely more a few years ago; for the quantity of gold now found in the adjacent province of Venezuela would then have astounded most people, whilst it now passes for little. In fact, the description of the country accords with the accounts we have from all gold countries. The gold is found in the broken detritus of the country, at a few feet below the surface, as we know to be the case with a great number of the gold diggings of Australia and California. We are much obliged to these gentlemen for their interesting communication and their accurate account of the physical geography of the country. There was only one geological slip in the paper. The authors alluded to the country being of volcanic origin, and immediately afterwards spoke of a great deal of quartz. I beg leave to say that volcanoes and quartz rocks have no natural connexion.

MR. JOHN CRAWFURD, F.R.G.S.—I agree with you entirely in thinking the paper is very well written. Notwithstanding this, I have a few observations and a few strictures to make. The country is very like all countries situated in the eighth, ninth, and tenth degrees of latitude in possessing enormous forest trees. These gentlemen dwell upon the value of the timber, but it would have been as well to have told us what the quality of this timber is. They have not told us whether it is fit for shipbuilding, which is the only purpose for which it could be well exported. In the next place, they state that the country is well fitted for the growth of coffee. That is not the case. In a latitude of eight or nine degrees it requires an elevation of three or four thousand feet above the level of the sea to grow good coffee. This is the case, I believe, in Ceylon. No good coffee can be produced at the low elevation of a thousand feet.

DR. SHAW.—They report a mountain two thousand feet high.

MR. CRAWFURD.—That is the top of the hill; whereas to cultivate coffee we must go to the sides of the hill. I do not believe it to be an extremely fertile country. It is not volcanic, and you seldom find a country fertile that has not a considerable share of volcanic formation. Australia is a case in point. With respect to the gold, it is not at all to be regretted that the country does not belong to us, for its productive powers seem to be far inferior to both California and Australia. But, supposing the territory had been ours, it would have been impossible to introduce any kind of labour. What kind of labour could we get? I know there are gentlemen here partial to Australia as a penal settlement, who would say that Europeans might settle in this country. I am perfectly certain they never could. The Red Americans are totally unfit for labour. To employ negro labour, we must have slavery, and that we should never consent to; and, as for Chinese labour, it is very costly, and the people very offensive.

A Journey in the Interior of British Guiana

Everard F. im Thurn

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PROCEEDINGS

OF THE

ROYAL GEOGRAPHICAL SOCIETY

AND MONTHLY RECORD OF GEOGRAPHY.

A Journey in the Interior of British Guiana.

By EVERARD F. IM THURN.

(Read at the Evening Meeting, May 10th, 1880.)

Map, p. 528.

FOR three years I have been superintending and collecting for the museum in Georgetown, the larger of the two only towns of British Guiana, or, as it is more commonly called, Demerara. In the course of my work I had to make various long journeys in the uninhabited interior of that country. It is of one of these journeys, which lasted from January to July of 1878, that I propose to speak to-night.

British Guiana is an oblong strip of country, considerably longer than broad, one of the ends of which forms part of the sea-coast of the north-eastern shoulder of South America. Various large rivers, rising in the interior, and running down to the sea parallel to each other and to the longest direction of British Guiana, alone give access to much of the interior.

The country may be said to consist of four tracts, lying one beyond the other, parallel to the coast-line. Of these, only the outermost, the sugar land, which lies next to the sea-coast, is at present cultivated and inhabited to any considerable extent. Next to this is what may be called the timber tract, from which alone timber has as yet been remuneratively brought to market. This extends toward the interior as far as the lowest cataracts on the various rivers. It is at present impossible to cut timber profitably beyond the cataracts, owing to the difficulty of carrying it to market. So that an imaginary line roughly parallel to the sea-coast, and cutting each of the great rivers at their lowest cataracts, marks the furthest limit from the coast of this tract. This part of the country, which is inhabited only by a few negroes and Indians, once contained much valuable timber, which was readily brought to market along the highways formed by the rivers and creeks. But this has now

been felled and destroyed, and it is no longer easy to find any spot at which it is worth while to set up the large and expensive plant necessary for remunerative timber-cutting, so that unless means are taken to allow these forests to recover, and to maintain a succession of large and valuable trees, or unless highways are opened into new places, the timber trade of the colony must before long come to an end.

The two remaining tracts are entirely uninhabited except by a few widely-scattered Indians of four or five different tribes. The forest tract immediately succeeds the timber tract, and, lastly, furthest from the coast, lies the savannah tract.

The former of these is everywhere covered by dense forests, as yet untouched by the wood-cutter, and consisting largely of the two most valuable trees of the colony, greenheart (*Nectandra Rodiæi*), and mora (*Mora excelsa*). The land is generally low and flat, rarely rising in rocky and undulating slopes, and still more rarely forming a solitary mountain or range of mountains. The best idea of the nature of this part of the country may be obtained by climbing to the top of some one of these hills, and looking down on the great and wide sea of tree-tops ending only at the horizon, and unbroken, except where here and there a long narrow thread of white mist, lying over the trees, marks the winding course of some small stream.

The last of the tracts is formed by the savannahs of the interior. These must be distinguished from the so-called savannahs of the coast and forest regions. Nearly all the small creeks or tributary streams of the coast and forest tracts rise in treeless marshes, often inundated, and these are also spoken of as savannahs. Again, along the banks of the Berbice and Corentyn rivers, not far from the sea, there are considerable patches of open grass-land. But the chief savannah, that which forms the Savannah tract, is of all the land of British Guiana furthest from the sea. It borders on the Brazils, from which it is only separated by the Cotinga and Takutu rivers, and it forms part of the great grass-plain which occupies so much of the interior of South America. Our share of this huge meadow is about 14,000 square miles in extent.

Of the rivers which traverse British Guiana, passing through each of these four tracts, the Essequibo is the largest and most important. It was up this river that I made my way in 1878 on to the Savannah, over which I passed on into Brazilian territory.

A line of steamers, subsidised by the colonial government, runs from Georgetown along the coast to the mouth of the Essequibo, where they touch at the island of Wakenaam. Three times a week a smaller steamer runs from here up the river for a distance of about thirty-five miles, partly for the convenience of the few who travel in that direction, but chiefly for government purposes, the penal settlement of the colony being situated on the Mazeruni, a large tributary of the Essequibo. From Bartika Grove, at the junction of the Mazeruni with the Essequibo,

the steamer passes up the former river. As our course lay up the Essequibo, I left the steamer at Bartika Grove, where one of my companions met me with a crew of Indians of the Macusi tribe, who were to go with us as boat-hands.

Our party consisted of my friends, Messrs. Flint and Eddington, myself, and some dozen Indians.

For some distance from Bartika Grove we passed through scenery which, if somewhat monotonous, is yet extremely beautiful, and is characteristic of this timber tract. The river in this part varies from about one and a half to two miles in width. A few islands of various sizes are scattered through the reaches. The banks on both sides of the river, as well as the islands, are everywhere clothed, down to the edge of the water, with rounded masses of foliage, generally laurel-like in character, and really, though not apparently, rising to a great height. The whole scene is on so gigantic a scale that these forests seem hardly more than low bush. There was but little flower to add to the colour; but here and there, highest among the banked foliage, a mora tree, breaking into new leaf of various shades, white, pale liver-coloured, a deeper red, and occasionally even a deep bright crimson, stood out in vivid contrast with the varied greens of the surrounding trees. Lower on the bank of foliage, the large white and crimson flowers and huge dark pods of the wild chocolate tree (*Pachira aquatica*, Aubl.) attracted the eye to where small flights of day-bats, startled by our passing boat, flitted about among the roots which rose from the water in the shadow of the overhanging trees.

Some 15 miles above the Grove, the river suddenly contracts to a width of less than a quarter of a mile, forming a narrow reach called the "Monkey Jump," through which the current forces its way with great violence. Passing through this we came out in a very few minutes into a new reach of the river, wider than before.

With a careful pilot a small steamer might penetrate a little beyond the "Monkey Jump," to a point a few miles before the first falls on the river at Aretaka. A few years ago a path was cut through the forest from this highest point navigable for a steamer to the Kaieteur Fall on the Potaro River, which in height, volume, and in the beauty of the surrounding scenery, must rank among the very finest falls in the world. Probably, however, it will be long before this path, which was cut under government direction in the hope of attracting strangers, is made easy enough for the ordinary traveller. At present it has not been once used, and much of it is already obliterated by the rapid growth of tropical vegetation.

Opposite to the point from which this path starts stands Moraballi, a cluster of three houses, inhabited by a woodcutter and his family, and interesting to us as the last civilised houses which we were to see for six months.

Leaving Moraballi, we soon reached the furthest point to which the tide runs. This is some 60 miles from the sea, at the first rapids, called Aretaka, which separate the timber from the forest tract. These rapids interrupt the course of the river for upwards of 15 miles, and are very similar, differing probably only in their greater or less length, to most of those which obstruct the rivers of Guiana and render their navigation difficult; so that a description of these will serve to give a general idea of all.

In Aretaka Rapids it is impossible to form an idea of the real width of the river. As far as the eye can see is a vast extent of water from which rise many rocks and islands of all sizes. The rocks sometimes stand singly, sometimes in groups, sometimes are piled in large numbers one over the other; some of these support a few water-guava bushes or even a few stunted and gnarled trees. The larger islands are generally covered with trees, and often, from their extent, are hardly distinguishable from the banks of the river. The water rushes, gurgling and foaming, in all directions among the boulders. A few banks of yellow sand crop out among the rocks. It was normally the dry season, and an abnormal drought had prevailed for a year and a half, so that the bed of the river was even more exposed than usual.

On the larger islands and on the banks of these rapids live a good many Indians, chiefly Caribs, and a few half-breeds between negroes and Indians, called "Cobungrus." These latter retain the many good qualities of the Indian, and to these they add the few good qualities, such as physique and strength, of the West Indian negro. We took up our quarters for a few days at the house of one of these Cobungrus, a finely built man named Cephas, more than half Carib, who held by commission from the governor of the colony the oddly combined offices of rural constable and chief of the Indians of the Essequibo River. His curly hair gave indication of this black blood, but in all other respects he looked and lived a true Indian. As he limped down to meet us under the trees at the waterside, his naked red skin, relieved only by the usual dark-blue lap or loin cloth, and by a splendid necklace of highly polished teeth of bush-hogs or peccaries, he was certainly a picturesque figure. The cause of his limp was evident in a horrible-looking wound conspicuous on one shin. This had been produced twenty-seven months previously by the bite of a large snake, bushmaster. The wound kept him in his hammock for fifteen months, but since that he had been able to get about as freely as ever except for the odd hopping action in his walk.

Some little distance from the river, on top of a hill, the three or four huts which form the settlement stand in a clearing walled by tall forest trees. Among the charred trunks of felled trees which lie in all directions in this clearing, cassava and other plants cultivated by the Indians grow intermingled with wild seedlings and shoots from the stumps of

the trees which once stood there; and the whole is densely matted together by yam vines and by razor grass (*Scleria scindens*), and other wild creeping plants.

The houses consisted only of four posts supporting a roof of palm leaves. The women were at the moment engaged in making cassava bread. The rich red colour of their skin, made yet more red by paint, the red waistcloths which formed their only dress, the red-dyed cotton bands which were fastened round their legs below the knee and above the ankle, the vast quantities of red beads round their necks and waists, and the many red-stained cotton hammocks slung in the houses made up a striking picture—a harmony in red and brown.

As on every other occasion in which I have taken up my quarters in the houses of Indians of various tribes, the people were civil, hospitable, and pleasant.

One day passes very like another to the traveller as he ascends the river in his canoe. During the first two days we were slowly making our way up the Aretaka Rapids. The rocks, on account of the unusual dryness of the season, were very much exposed, and the water-channels between them, though numerous, were both narrow and shallow. The canoes often had to be dragged by main force over the rocky floor. Where the channels were deeper the water rushed down more violently, and it was difficult to haul the canoes against the current. But the Indians worked wonderfully. Some swam, and had hard work to keep their course in the rushing water. Others, up to their waists or even up to their necks in water, stood on half-submerged rocks hauling by means of ropes attached to the canoes. All laughed and shouted, but the roar of the river half drowned their noise. The only woman of the party worked at least as energetically as the men. Once she suddenly lost her footing, slipped, and was swept down the river, the current carrying her right under the canoe. The half-terrified, half-amused expression on her wholly hideous face, when it reappeared from under the water, was most ludicrous. She swam like a fish, and was soon running on the rocks, and pulling again as strongly as ever. All Indians, men and women alike, swim splendidly, but with a peculiar action. The legs are hardly spread, but are bent somewhat downward at an angle to the trunk, and are then suddenly again straightened, thus driving forward the body of the swimmer.

One curious feature in the rocks was especially noticeable, on account of the dryness of the season. The rocks, especially those lying lowest in the bed of the river, have a curiously glazed, black, and vitrified appearance, due to the presence of oxides of iron and manganese. On speaking about this to the Indians, they at once silenced me by the assertion that any allusion to this appearance would cause rain to fall.

The Indian who was the spokesman on this occasion was a Macusi boy named Moï. He was returning to his home on the Savannah

after having spent two years in the service of a coloured man in Georgetown, where he had learned to speak English and to wear clothes. It was strange how quickly he now fell back into his old Indian habits. Even on the first day he threw off his clothes and resumed the ordinary Indian lap, a narrow strip of cloth passed between the legs, and suspended in front and at the back on a string tied round the waist. As he moved about among the other Indians, it was very evident that the clothes which he had worn for two years had made his skin become much fairer in tint. Strangely enough, he alone of all the Indians looked naked, and it was some months before the lighter tint of his skin, with the consequent effect of nakedness, disappeared.

The banks of the Essequibo above Aretaka are almost uninhabited, even by Indians; throughout the several hundred miles of country through which we passed between Aretaka and the mouth of the Rupununi, we came across but three or four settlements. Our camps, therefore, were generally made in the forest. As, however, Indians are continually passing up and down the river, there are certain recognised camping places, from which the bush has been cleared. Sometimes, however, when as night approached we were not near one of those places, we had to clear ground for ourselves in the bush. The nights spent in the open air in the tropics are a pleasant memory. By the time the camp was ready the daylight had faded, and our fires alone threw round a circle of flickering light, contrasting strangely with the darkness of the surrounding forest. Where the firelight was strongest the Indians lay, smoking and talking, in their hammocks, close to each of which was a fire, which occasionally flared up and seemed to lick the naked skins of the Indians through the meshes of the hammock. Not content even with this, the Indians sometimes made the boys take lighted palm leaves and singe them as they lay in their hammocks, this strange proceeding being intended to destroy savage insects.

One by one the Indians fell asleep. Various kinds of frogs kept up an almost deafening concert of marvellously varied croaks, some musical, some most unmusical. One imitated the beat of paddles striking in regular time against the sides of a canoe after the Indian custom; and the likeness was the more deceitful because the sound alternately rose and fell gradually as though a canoe came up the river, passed the camp, and was then paddled up stream out of ear-reach. Often and often I have lain long in doubt whether the sound heard was caused by paddles or by frogs. And while the frogs croaked, every now and then a night-jar flitted swiftly and most silently by, and then suddenly shrieked out its loud cry of "*Work-work-work-to-hell.*" Or another and larger species began to moan out the four notes of its most hideous and depressing cry, sounding them in rapid succession, the first shrill and high-pitched, each of the succeeding ones lower, and the last almost an inaudible moan. It is only comparable to the cry of a despairing and dying

human being. At times was heard the noise—something between a snort and a bellow—of a cayman; and at other times mysterious sounds, resembling the crack of pistol shots, which I afterwards found were caused by caymen raising their tails into the air and bringing them down sharply on the surface of the water.

Toward morning the loudest and most appalling noise of all broke out. Beginning suddenly in a deep roar, it became louder and louder, till the whole forest rang with the din. It is hardly possible on first hearing this to believe that the terrific roar is produced only by the somewhat small red howling monkey (*Mycetes seniculus*), called baboon in the colony.

Before daylight the Indians were out of their hammocks, making preparation for the coming day's journey. A plunge into the river was the first thing. In the early morning the temperature near the river is comparatively low; though the thermometer stands perhaps at 70°, the air feels as chilly as on an autumn day in England, and the water, having retained much of the warmth imparted by the sun of the previous day, seems by contrast like that of a warm bath.

And now the sounds and sights of the day began. Some toucans, perched on the very highest boughs of a tall tree, were revelling in the morning sun, and greeting it with their usual yelping cries. Emphasis is given to each puppy-like yelp by an odd and comical antic; the head is jerked down, the tail lifted almost at right angles to the body. Flights of parrots, crying shrilly, began to pass over the river to their feeding grounds, flying so high that their colours were not to be discerned. From the forest the "pai-pai yo," or greenheart bird (*Lipangus cineraceus*), began incessantly to cry its own Indian name; this is probably the commonest bird in the forests of Guiana, and its shrill cry, heard nearly all day long, is the most characteristic sound of these forests.

Having no meat, we stopped early in the day to hunt. Half the booty, a young tapir, was given to the Indians, who, as usual, immediately boiled and ate it; for an Indian, when he gets meat, is never satisfied until it is all eaten, after which he contentedly does without animal food until he has sufficient energy to go and procure a fresh supply. The other half of the booty was put on a babracot to dry. A babracot is a small stage of green sticks, built some two feet above the fire, on which the meat is placed and smoked. Meat treated in this way, though it loses its distinctive flavour, keeps good for many days even in that climate. Before starting from the camp the next morning the Indians destroyed the babracot, saying that if a tapir, passing by that way, found the babracot, it would come by night on the next occasion on which an Indian slept at that camping place, and catching the said Indian, would forthwith babracot him, tit-for-tat.

The days spent in travelling along the smooth reaches of the river

were more monotonous, though even there the scenery is beautiful. As among the falls, innumerable islands, some of considerable extent, stud the river and hide its real width from the eye. The beauty of the scenery is in great measure due to the effect of the distant views as seen between the approaching headlands of each two of these islands. The traveller from his canoe in the centre of a lake-like expanse of still water, in the midst of a group of these islands, sees the water flowing toward and from him, through many channels, each of which is framed by the trees overhanging from two neighbouring islands. In the more open reaches of the river, in the dry season when the water is low, banks of bright yellow sand swell up from the water, and either form islands, often of very considerable extent, or fill the bays in the curves of the river banks. Twice in each year, when at the end of each wet season these sandbanks show above water, the river turtles, which are very numerous, lay their eggs in the sand; and gull-like razor-bills (*Rhynchops nigra*) make their uncovered nests on the sand, and wheel about over them incessantly uttering their harsh cry.

One evening we reached a hut on the Paripie Creek belonging to some half-bred Brazilian Indians. These people, called Nikari-karus, are hybrids between Brazilians and Indians of various tribes. Their proper home is on the frontier of British and Brazilian territory; and the few settled on the Essequibo are deserters from the frontier forts and cattle farms, where, at any rate till recently, the labour done was forced.

Another day, at Warraputa Cataracts, I for the first time saw the rock-pictures which form so strange an addition to some of the landscapes of this part of South America. A large number of somewhat conspicuous figures are engraved on the surfaces of a group of granite boulders in the very midst of the cataract. The figures represent men, monkeys, snakes, and other animals, and also certain simple combinations of a few straight or curved lines in a pattern, and occasionally more elaborate combinations. The individual figures are small, averaging from 12 to 18 inches in height, but a considerable number are generally shown in each group. There is another form of pictured rock which occurs in places in Guiana. The two principal forms may, for the sake of convenience, be distinguished as "deep" and "shallow" respectively, according as the figures are deeply cut into the rock—as are those at Warraputa—or are merely scratched on the surface. The former are from one-eighth to half an inch, or even more, in depth; the latter are of quite inconsiderable depth. The two kinds seem never to occur in the same place, or even near each other, and they also differ in the kind of subject which each represents and in various other points. No theory of the origin and nature of either kind of these rock-drawings has ever been seriously proposed. Those in Guiana seem to be part of a widely scattered series of similar drawings occurring both in North and South America.

Soon after we left Warraputa, misfortunes began to attack our party. First, our bread was exhausted, and it was with great difficulty that we obtained a very scanty supply from one of the few Indian settlements which we passed. Then sickness, especially fever, appeared among us. As a similar misfortune is very likely to attack all travellers in that land, where the days are always burningly hot, the nights, by comparison, bitterly cold, and the atmosphere is always saturated with moisture, it may not be out of place to say that these attacks, though frequent and very troublesome, are but rarely dangerous.

Two other diseases, diarrhœa and ophthalmia, both of which at a later time attacked members of our party, must be carefully guarded against. Ophthalmia is extraordinarily common among the Indians, nearly every other individual having weak eyes in consequence. The disease seems very readily to infect travellers. The germs are probably conveyed from the eyes of some Indian to those of the new comer by the countless tiny flies which continually settle on the eyeball, forming one of the most serious plagues of that country. But on the whole, whatever the coast may be, the interior is not unhealthy.

Owing to the illness of so many of our party, and to the now complete failure in our supply of provisions, it was with great pleasure that, on the 14th day after our start from Aretaka, we reached the site of an old Dutch settlement, at Arinda, where a family of half-bred Brazilians have now established themselves.

Some groups of fine coffee-trees, long left untended, alone mark the site of the old Dutch settlement entered in the map published by Hartzine in 1770 as "Post Arinda." It was the highest on this river, with the exception of a small plantation, probably a branch establishment, of which Schomburgk saw traces, forty years ago, at Ouropocari, some few miles further up the river.

The Dutch had pushed so far up most of the rivers, that it seems probable that if the country had been left in their hands it would now have been fully utilised. But when their rule was confined to the comparatively small district of Surinam, their interest in the whole of Guiana cooled, and the development of the colony received a check from which it has not yet begun to recover.

After a three days' stay at Arinda, having got rest and provisions, we once more started on our way. After a few hours we passed the mouth of a creek, called Haimarakura by the Indians, from which a path leads across to the Demerara River. Neither the path nor the creek are marked in any of the maps of Guiana. The courses of the two rivers are almost parallel, and not far apart, and there are several of these connecting paths between the two. They are made and used by the Indians of the Savannah, who go by that way to work for short periods on the wood-cutting grants of the Demerara River.

At noon on the second day after leaving Arinda, we reached the falls

at Ouropocari. On the rocks at the side of one of the channels of this are some more rock-drawings, very similar in character to those at Warraputa. The channels at Ouropocari being often impracticable for loaded canoes, there is a portage, or path, along which the Indians carry their canoes and their goods separately from the bottom to the top of the fall, where they reload their canoes. These portages exist at the side of nearly all the larger falls on this river, and are frequently used; but on the less-frequented rivers of Guiana it is often necessary for each traveller to make such a portage for himself. This is no easy work. The trees have to be felled and the ground cleared; and skids have to be laid at very short distances from each other along the whole path. When this has been done, the travellers harness themselves by a rope attached to the bows of the boat, like a team of horses, and the boat is very quickly drawn over.

In seven days we reached the cataracts at Rappoo. These take their name from a kind of bamboo which grows on the islands among them, and which is much used by the Savannah Indians for making arrow-heads, which are, we were told, as poisonous as those tipped with ourali. I afterwards tried one of these rappoo arrows; but the fowl which was shot showed no symptoms of poison; and an Indian who was standing by ingenuously remarked that a rappoo arrow is only poisonous when it enters far enough into the body.

From Rappoo, driven once more by want of bread, we pressed on and reached Apooterie, a Carib settlement at the junction of the Rupununi and Essequibo, long after dark on the same day. During our two days' stay here, much amusement was afforded by the tame animals which, as usual in an Indian settlement, thronged the place. Among them were more than a dozen parrots of various kinds, two macaws, two trumpet-birds (*Psophia crepitans*), two troupials (*Icterus Jamacii*), three monkeys, a toucan, some powis or curassow birds (*Crax alector*), and lastly, a sun-bird (*Eurypyga solaris*). It has been supposed that the great frequency of tame animals in the settlements of South American Indians indicates a fondness in these people for animals. As a matter of fact, an Indian regards his tame animals as so much coin, with which he can purchase what he wants from other Indians. A rude system of division of labour exists among the tribes. Those of one tribe spin cotton; those of another weave this cotton into hammocks; those of a third make pottery; of a fourth make the graters on which the cassava-roots are reduced to pulp; in short, each tribe has its own particular manufacture, the products of which it exchanges with the other tribes for the things made by them. And in this system an Indian, instead of always paying in the goods which he has made, often pays for what he wants with tame animals, that is, with coin. The birds or animals once made over to other Indians, their former owner will often, if he gets a chance, neglect them, or even treat them with cruelty. It is a fallacy to sup-

pose that Indians, at least those of Guiana, have any natural affection for animals.

After two days' stay at Apooterie, we started again, and leaving the Essequibo passed up the Rupununi River. The water of the latter, unlike the clear, dark-red water of the Essequibo, is of an opaque, yellowish-white colour. The river is about 500 yards wide. Its banks are wooded, though far less luxuriantly than those of the main river. The water, being at that time excessively low, in places left exposed much of the high, cliff-like banks of white clay, crowned by weather-beaten trees, shrubs, and palms; in other places, long even stretches of water-guava bushes (*Psidium aromaticum* and *P. aquaticum*), looking like English osier-beds, edged the river. The palms, here much more numerous than on the Essequibo, gave character to the scenery.

The withered, scrub-like appearance of the vegetation was no doubt partly due to the neighbourhood of the Savannah, to which we were now coming near; but it was also doubtless partly due to the abnormal dryness of the previous seasons, for when I afterwards passed down this river in the high rainy season, the plant growth, at least near the mouth, was far more luxuriant, though even then greatly inferior to that on the Essequibo.

On the first day of our journey up this river, we travelled long, and at a fairly rapid rate. But on the second day the sandbanks began to delay us; and from that point they increased so greatly in size and number, that they offered a most serious obstacle to our progress. These sand-ridges, often covered only by an inch or two of water, sometimes extended right across the river. Over these it was impossible to float our large and heavily-loaded canoes. Sometimes it was possible to drag them over by main force, as over dry land; but often it was necessary to dig a channel for them with the paddles. Once we had to wait for six hours while one of these channels was dug through a sand-bank of not more than 300 yards in width; and so on some occasions we did not advance 1000 yards in the day. These times of waiting were rendered almost unendurable by the great abundance of a small black fly, here called *kaboora*, and in the Brazils *pium* (*Simulium?*). From the Atlantic to the mouth of the Rupununi, the country is quite free from these terrible little blood-suckers; but on this river they abound, as they do generally westward, especially on the rivers of the Amazon system. Wherever they settle on the flesh, a small round patch of raised skin, distended by blood, is formed, and is very sore and troublesome. The naked bodies of the Indians, who, their hands being occupied with the paddles, could not protect themselves, were so covered with the marks of these insects that it was sometimes difficult to detect any sound skin. Where these insects occur they are far more annoying than mosquitoes, which, abundant and almost universally distributed as they are on the coast-land, are only very locally distributed in the interior.

We slowly crept on for some time, but gradually made less and less progress each day. The labour of digging through the sandbanks and of dragging the canoes over by main force began to tell on the Indians, who grew weary and disheartened. Cassava bread, which is almost essential to their health and comfort, had again failed us. Some of them who, like most Indians, had been sleek and fat, suddenly and in the course of but a day or two, became so thin that they looked hardly more than skin and bone. Nothing about Indians is more striking than the extreme rapidity with which they lose flesh and strength, and as suddenly regain these when circumstances become more favourable. This is probably due to the immense amount of paiwarie, a drink made of chewed cassava bread allowed to ferment in water, which they consume, and which makes them sleek and fat without giving any real stamina.

One after another, ill, weary, or lazy, our men gave up working. One afternoon when with infinite pains the canoes had been got halfway across a sandbank in a wide reach of river, the Indians declared they could not and would not move them further that day; so we had to wade up the river for about a mile until we found camping ground. Then the men spoke of a small settlement called Morai, not far from where we were. We sent there to get bread, but the messengers returned without any. They found the huts, but the people were almost famishing; and they brought back most ominous accounts of the famine which the long continued drought had caused in the Savannah.

The next day the crisis came. We had been creeping on, even more slowly than usual, for about two hours, when we again stuck on a sandbank, and the men declared it to be utterly impossible to move the canoes forward or backward. There was nothing to be done but to form a camp in the bush and consult as to the next move.

We were then about a day's walk—the distance by land being considerably less than by water—from a considerable Macusi settlement called Quartama. Eddington, who was at the time the strongest of the party, undertook to go on to this settlement, and there, if possible, to procure fresh crews, as well as a supply of provisions.

Four most tedious days we waited for him; but in the middle of the fifth night he returned with a set of merry, shouting Macusis very different from the disheartened set who had brought us so far. He also brought back an abundant supply of cassava, and the welcome news that a further supply would be waiting for us at Quartama.

Very hopefully did we start the next day. The new men worked splendidly. The character of the country also began to change. For some time past a comparatively narrow belt of forest on each side of the river had alone separated us from the Savannah; but now even this belt failed in places, and the open Savannah came down to the river. After having been shut up for nearly two months in a dense, damp

forest, to reach open country, to see a really wide plain, and to feel a real breeze, seemed to give new life. So we soon reached the "waterside" of Quartama.

After this the rest of our canoe journey passed quickly and pleasantly. The only drawback was the growing report of famine which met us at the settlements which now became more numerous. At Quartama we had certainly found abundance, but everywhere else there seemed to be great scarcity. Whole settlements were deserted, and in others, where a few old or infirm people remained, nothing but the seeds of palms and other plants were eaten.

The change in the scenery continued and grew greater. The places where the Savannah came down to the river became more numerous; and in no place were the two separated by more than a very narrow line of trees. In one spot a mountain, bare of trees up to its very top and with rocks cropping up here and there from the scanty herbage on its sides, afforded an entirely new feature in the scenery. A mountain, or even a hill, is most interesting in Guiana.

One evening, at a creek called Mopai, we camped near a pond full of the splendid flowers and gigantic leaves of the royal water-lily (*Victoria regia*). Such a scene, in the soft and yet intense evening light of the tropics, is exquisite beyond description. Round the pond was a wall of dark forest. Water-fowl abounded. Dainty spur-wings (*Parra jacana*) ran about on the lily leaves, and one of these birds had a nest on a leaf. High over head a flight of large white cranes passed in Indian file to their night's rest. Flocks of vicissi-ducks (*A. autumnalis*) rose and flew by, whistling out their name, "vicissi! vicissi! vicissi!" and—a more practical matter—several fine muscovy ducks (*A. moschatus*) rose, and fell to the guns.

At last, on the 22nd of March, about midday, we reached our destination at Pirara landing, and so came to the limit of our canoe journey, having taken forty-nine days to do what, under ordinarily favourable circumstances, ought to be done in about twenty.

That night the Indians kept up a great firing of guns to attract the people from Quatata and Karenakru, two settlements respectively nine and fifteen miles distant, across the Savannah. They were wanted to carry our goods; for our own men when they reached the landing place considered their duties at an end. At earliest dawn, the shrill sounds of Indian music were heard from a distance, and grew louder and louder. Then the Macusis began to arrive in family parties, walking in single file, many of them playing on flutes made of the bones of jaguar or deer. In each party the men and boys came first, carrying only their bows and arrows; after these came the women, burdened with the hammocks and other chattels of the whole party. This went on at intervals throughout the day, and again early the next morning; probably about 60 Macusis came down in all.

When the last packet of goods had been carried off, we ourselves started to walk to Quatata, which was to be our head-quarters for some months. The undulating Savannah is chiefly arranged in parallel ridges, hills and valleys, sometimes large and sometimes small, rapidly succeeding each other. The soil changes often and abruptly; sometimes it is peaty (pegass), sometimes hard and impregnated with iron, sometimes gravelly, sometimes sandy. But whatever its nature, the soil, on the hills, is somewhat scantily covered by tufts of coarse grass, from which rise a few wind-blown, sunburnt shrubs; occasionally the tops of these hills are even so thickly covered by shrubs, that from a distance they look almost well wooded. But in the moist valleys, of which some are mere strips, lying between the ridges of higher ground, while others are vast perfectly level plains, many miles in extent, the grass is high and luxuriant; and these level plains are made beautiful by groups and forests of Æta palms (*Mauritia flexuosa*), each with its exquisite crown of green fan leaves rising from a hanging fringe of older, withered leaves. The rising ground is everywhere dotted over with the huge nests of ants or termites, from two to ten feet high, built of yellow clay, and looking like very pointed haycocks. Sometimes again, but at long intervals, stand palm-thatched, domed Indian houses, looking like haystacks. As a background to all this, in the far distance, on the right, is the Pacaraima Range, and on the left are the Canakú Mountains.

On high ground midway between these two ranges stands the settlement of Quatata, within half a mile of the site of the now extinct settlement of Pirara, which, about the year 1840, was the scene of a dispute between the British and Brazilian authorities. An English missionary having settled at Pirara, Brazilian soldiers were sent from Fort S. Joaquim on the River Branco, to seize the place and turn out the missionary, on the plea that the place was within Brazilian territory. Troops having been sent up from Georgetown to re-assert British rights, the Brazilians quietly retreated back to their own territory. Since that time, though the Brazilians have never formally resigned their claim, there has been no attempt to dispute our title to the country as far as the Takutu and Ireng rivers.

At the end of our walk to Quatata, it was not pleasant to find that not only food, but water also, was fearfully scarce. In ordinary times there is a sufficient supply of the latter in a small river which runs past the foot of the hill on which Quatata stands. But in this extraordinary season, in one pool only was there a little water, thick and milk-white with clay, and unpleasantly tainted with iron.

Quatata, which is one of the largest settlements in the Savannah, consists of ten houses, all oval or round. These, as always on the Savannah, are not mere open sheds, as in the forest, but have very thick walls of wattle and mud, surmounted by high conical roofs of palm

thatch. The very cold winds which at night blow across the Savannah, have probably induced the building of these walls. Another distinctive feature of the Indian house on the Savannah, is that there are no signs of cultivation round them.

At first, constant attacks of fever, and the difficulty of moving about in a famishing country, prevented our undertaking any distant expeditions; but there was very much to interest even in the immediate neighbourhood. From the foot of the ridge on which Quatata stands a vast and level plain, covered by luxuriant grass, extends toward the Brazilian frontier. In the far distance this plain is bounded by the Pacaraima Mountains. The plain is the so-called Lake Amuku, or Parima, or the "White Sea," the supposed site of the fabled golden city of El Dorado or Monoa. The so-called lake is at almost all seasons a dry plain, on which lines of Æta palms mark the courses of small streams, the overflow of which, in very wet weather, occasionally turns the plain into a lake.

Once, about this time, when I was suffering from slight headache and fever, a peaiman, or medicine man, offered to cure me. It was too good an opportunity to be lost, and I accepted. An hour or two after dark I carried my hammock to the house where the man was living, and there re-slung it. According to request, I had brought with me a pocketful of tobacco leaves. These were now steeped in a calabash of water, which was then placed on the ground. The peaiman had provided himself with several bunches of green boughs cut from the bushes on the Savannah. The entrance to the house having been closed, we were completely shut in; for the house, as usual among the Savannah Indians, was walled and without windows or chimneys. The fires having been put out, all was dark. Beside the peaiman and myself, there were about thirty Indians in the house, most of them attracted by such a novel performance as the peaiing of a white man. We all lay in our hammocks; and I was especially warned not to put foot to the ground, for the kenaimas, or evil spirits, would be on the floor, and would do dreadful things if they caught me.

For a moment all was still, till suddenly the silence was broken by a burst of indescribable and really terrible yells and roars and shouts, which filled the house, shaking the walls and roof, sometimes rising rhythmically to a roar, sometimes sinking to a low, distant, and sounding growl, but which never ceased for six hours. Questions seemed to be thundered out and answers shouted back, words and sentences, questions and answers, following each other so closely that there was no pause in the sound. To me, knowing very little of the Macusi language, the meaning was unintelligible; but so long as I kept my senses, a Macusi boy, who spoke English, and who had slung his hammock close to mine, did his best to whisper into my ear some sort of a translation. It was the peaiman, he explained, roaring out his questions

and commands to the kenaimas, who were yelling, and shouting, and growling their answers.

Every now and then, through the mad din, a sound was heard, at first low and indistinct, and then gathering in volume, as if some big winged thing came from far toward the house, passed through the roof, and then settled heavily on the floor; and again, after an interval, as if the same winged thing rose, and passed away as it had come. As each of these mysterious beings came and went, the air, as if displaced by wings, was driven over my face. They were the kenaimas coming and going.

As each came, his yells were first indistinctly heard from far off, but grew louder and louder until, as he alighted on to the floor of the house, they reached their height. The first thing each kenaima did, was to lap up some of the tobacco-water, with an ostentatious noise, from the calabash on the floor. But while he lapped, the peaiman kept up the shouts until the kenaima was ready to answer. When each kenaima had given an account of itself, and had promised not to trouble me, it flew rustling away. They came in the form of jaguars, deer, monkeys, birds, turtles, snakes, and of Ackawoi and Arecuna Indians. Their voices were slightly different in tone and were supposed to be appropriate to their forms.

It was a clever piece of ventriloquism and acting. The whole long terrific din came from the throat of the peaiman; or perhaps a little of it from that of his wife. The only marvel was that the man could sustain so tremendous a strain upon his voice and throat for six long hours. The rustling of the wings of the kenaimas, and the thud which was heard as each alighted on the floor, were imitated, as I afterwards found, by skilfully shaking the leafy boughs and then dashing them suddenly against the ground. The same boughs, swept through the air close by my face, also produced the breezes which I felt. Once, probably by accident, the boughs touched my face; and it was then that I discovered what they were, by seizing and holding some of the leaves with my teeth. Once, too, toward the end of the performance, and when I had lost nearly all consciousness, a hand was, I thought, laid upon my face. That, as will presently appear, was the crisis of my illness.

The effect of all this upon me was very strange. Before long I ceased to hear the explanations of the boy by my side, and passed into a sort of fitful sleep or stupor, probably akin to mesmeric trance. Incapable of voluntary motion, I seemed to float in the midst of a ceaselessly surging din; my only thoughts a hardly-felt wonder as to the cause of the noise, and a gentle, fruitless effort to remember if there had once been a time before the noise began. Now and then when the noise all but died away for a few minutes, during intervals in which the peaiman was supposed to have passed out through the roof, and to be heard from a great distance, I woke to half consciousness; but always as the peaiman came back and the noise grew again, I once more fell

into a state of stupor. At last, when toward the morning the noise had finally ended, I awoke thoroughly. The bars being taken away from the entrance to the house, I passed out on to the open Savannah. It was a wild and pitch-dark night; rain fell heavily; thunder pealed incessantly, and every now and then the lightning, flashing from behind the far off Pacaraima Range, vividly showed the rugged and dark edge of the mountains against the sky. Bareheaded, barefooted, and coatless, I spent the short time before dawn out in the storm; and the Savannah, the night, and the storm seemed strangely fresh and pleasant after the dark, close, noise-filled house.

It is perhaps needless to add that my head was anything but cured of its ache. But the peaiman, insisting that I must have been cured, asked for payment. He even produced the caterpillar which, he said, had caused the pain, and which he had extracted from my body at the moment when his hand had touched my face.

For some time after our arrival the famine continued to increase; wherever we went, the houses were either deserted or the people were living on seeds, caterpillars, ants, and boiled grass and leaves. But just when matters were at their worst, when it was almost impossible to get food, rain at last came. It was never very abundant, but it served to revive the dying cassava and other plants. The effect on the Savannah was wonderful. When the rain came, in two days the Savannah began to look bright, green, and flowery.

On one of the early days in May, Eddington and I started to visit the frontier fort of S. Joaquim, in Brazilian territory. In that neighbourhood there are large cattle farms belonging to the Brazilian Government, and our chief object was to visit these. Three days' walking across the Savannah brought us, after crossing the Nappi River near its head-waters, to Euwara-manakaru, a Nikari-karu settlement. Here we hoped to get guides and interpreters, and to hire canoes in which to descend the River Takutu. In both these matters we succeeded; but we had, as usual, to wait some days before we could get our new allies to move.

Very little is known about the Nikari-karus, who are an ill-defined group of hybrids between Brazilian Portuguese on the one hand, and Indians, possibly Wapisianas, on the other. Their language is a much corrupted form of Portuguese, almost unintelligible to speakers of genuine Portuguese. Perhaps the most striking thing about them is the habit, which some of them have adopted from various Brazilian tribes of Indians, of filing each tooth to a sharp point, thus giving to their faces a most savage and hideous expression.

One point of interest in this neighbourhood was the comparatively frequent occurrence of stone hatchets and other similar instruments. Stone implements, though no longer used in Guiana, are to be found in greater or less abundance throughout the district.

At last, after four days' stay, we got off. The two or three people from Euwara-manakaru who came with us gave their wives knotted strings or quippus, each knot representing one of the days they expected to be away; so that the whole string formed a calendar to be used by the wives until the return of their husbands.

On going down to Yarewah on the Takutu, we found the two canoes which we had engaged, and from there we once more started on a river journey. But now, instead of being on a river of the Essequibo system, we were descending the watershed of the Amazon. The Takutu runs into the Rio Branco, that into the Rio Negro, and that into the Amazon, at Manaos. From Yarewah the boundary between the Brazilian and British territories passes along the Takutu, until that river is joined by the Cotinga, which flows in from the north, and up which the boundary line passes. This is the line laid down by the boundary commission under Sir Richard Schomburgk about 1840, and is really accepted by both nations, in spite of the vague claims which, as I have said, have been advanced by the Brazilians to the land between the Takutu and the Rupununi. The commandant of S. Joaquim, an educated Brazilian gentleman, and the chief resident official on that frontier, in his conversation fully recognised the boundary line thus described. I have been led to say so much on this subject because this part of the boundary is generally wrongly laid down in even the standard English atlases; and it is much to be desired that this, as well as the boundary line between British Guiana and Venezuela, should be more correctly represented.

We paddled gently down the Takutu, which is a river of considerable size, getting an occasional shot at one of the many turtles which lay basking in the sun on the logs at the river-side, or at an ibis as it fed on one of the innumerable ridges of sand. The journey led us, for two days, past the mouth of the Ireng and Cotinga rivers; past many flocks of beautiful rosy spoonbills; past porpoises, which our men said were omars, or water-women, and had frocks; past manatees, which venture up the Amazon rivers even as far as this; past ugly green guanas climbing on the trees on shore; past high cliff-like banks capped with long lines of white lilies (Hippeastrum), well defined against the sky; and past long reaches of bush-covered banks densely matted with wreaths of passion-flowers, at that time heavily loaded with large purple blooms. By the third day the river had become considerably wider, and the Rio Branco appeared before us, the Takutu running into it almost at right angles. On the left, in the angle formed by the junction of the two rivers, the high bank was crowned by a little stone fort. It was S. Joaquim, and our destination.

This fort was built more than a century ago by the Portuguese. It consists merely of a two-roomed house, under which is a lock-up, a rampart surrounding the whole. When Schomburgk visited the place

about 1840, he found a Jesuit mission with a chapel and a few houses. But these have now disappeared, and the fort and the range of low huts, serving as soldiers' quarters, alone remain. For many years past it has barely been kept in repair, and, as it is now perfectly useless as a military station, the Brazilian authorities intend to abandon it. It is certainly quite time; the gates are never shut—indeed, only one of them is left; no sentinel paces the ramparts, no bugle ever sounds.

The nearest settlement of white men is many days' journey away; and the only communication with the outer world is by the boats which occasionally come up the Rio Negro to fetch cattle produced on the farms which surround the fort.

The cattle on these farms are left almost entirely to nature. The farms were established about the end of the last century, but were again destroyed, the cattle being dispersed over the Savannah during revolutionary times. When the farms were again re-established, the cattle, which had in the meantime greatly multiplied, were not all again gathered together; the greater number were allowed to roam and breed where they pleased. Once a year a certain number of the younger of these wild cattle are driven into the strongly stockaded pen which forms the central point of each of the gigantic farms into which these savannahs are divided. These impounded cattle, after being branded, are let out every day, but are driven back into the pen at night. Every now and then a large number of them are taken down the Rio Branco to Manaos, the nearest Brazilian town, and are from there distributed along the Amazon. Much of the cattle is also slaughtered on the farms; the meat, after being cut into thin slices, is slightly salted, and dried in the sun, and is then carried down to the Amazon and there sold.

At the central farm of the district resides a Government official, who is responsible for all the cattle in his district. His only assistants are a very few cowherds, a few of whom are Brazilians of a low class, a few are half-bred between Brazilians and Indians, but by far the greater number are the Indians of the district. Most of the work of these herdsmen is done from the back of small but strong horses, which, when not in use, roam all but free on the Savannah. All the food required is produced on the spot. For meat the men are allowed to kill a certain number of cattle for their own use, and the milk, which, however, as always in the case of any but thoroughly domesticated cattle, is very small in quantity, is at their disposal. Game, especially deer, is abundant. Cassava is grown at the principal farms, where it is made into farina, a coarse but most excellent and nutritive flour, which is distributed twice a month to the men of all the farms. Vegetables, such as yams, potatoes, and plantains, and fruits are but little grown, except in the fields of the Indians, where, however, they flourish so well that they might evidently be cultivated with advantage elsewhere.

After spending a very pleasant time at San Joaquim, we turned

homeward. Calling on our way at one of the farms, we were able to purchase an ox for three-quarters of a pound of gunpowder. About four hundred head of cattle were driven into the pen, and from these we selected an animal.

For many days it had rained incessantly, and as we were generally without shelter by day or night, we were most anxious to get back to Quatata as quickly as possible. Travelling once more up the Takutu we reached the mouth of the Ireng or Mahoo River, and turned up this, purposing to force our way home up the Pirara, a small river, then much swollen by rains, which rises not far from Quatata, and runs into the Ireng about one day's journey above the point at which that river joins the Takutu.

The water in the Pirara had risen above the low banks, and the narrow belt of trees which generally separates the river from the Savannah now rose from the flood. As there was, therefore, little current, we advanced rapidly. At noon on the day on which we entered the river we reached a point which, according to the Indians, was the highest to which a canoe could at the time pass. It afterward appeared that we might have kept to the river much longer; but, believing the Indians, we disembarked, and walked the rest of the journey. Our way led across the bed of Lake Amuku. This, as I have said, is usually dry; but now we found that the water was out, and that for once the lake was a lake. For long distances we had to wade through water up to our waists, and often up to our necks. I was much struck by the way in which the Indians managed to follow the path, which, even when there is no water, is hardly discernible to an unpractised eye, and which now was completely hidden under a sheet of water; yet we emerged from the flood exactly where the track led out. But before this, when we came to the deepest part of the flood, the Indians became frightened, as they generally are in water, though they can swim like fishes; it was hard work to persuade them to advance. At last we came to higher and therefore dry ground, and after a twelve miles' walk came to Quatata.

June came, and it was quite time to be thinking of returning to Georgetown; but at first it seemed almost impossible to get Indians or to get possession of our canoes. The Indians were very unwilling to go with us, partly because food was still so scarce that we could expect only scanty rations on the journey, and partly, as they said, because a party of English soldiers were on their way up from Georgetown to capture and press Indians as soldiers. The same rumour has been heard by nearly every traveller in the interior; it is probably due to a half-remembered tradition of the slave-hunting expeditions which the Brazilians, as lately as forty years ago, used frequently to make among these people; and also to the tradition of the visit of English soldiers to Pirara in 1840. Whatever the origin of the rumour, it is a constant

excuse used by the Indians when they are unwilling to undertake the fatigue of a journey. The other difficulty which delayed our immediate return to the coast was that some strange Indians had carried off my canoe from the waterside. Indians have a large, but occasionally inconvenient code of hospitality. An Indian thinks nothing of walking into the house of any other Indian of the same tribe and appropriating the food which may be in it; nor do the owners in any way resent this. In the same way, when an Indian, in his frequent wandering, finds a canoe in a convenient spot he takes it and leaves it wherever his own journey happens to end; rumour, passed from Indian to Indian, at last tells the owner of the craft as to the whereabouts of his property, and if he wants it he must fetch it back himself, or must wait till some other chance Indian, travelling, brings it back into the neighbourhood from which it was taken. In this way my canoe was out of reach just when I most wanted it, and the Indians who had removed it were surprised by my objecting to this conduct. However, at last we were ready to start. Moreover, very severe ophthalmia had broken out among the Indians, and had attacked my two companions; this was a further reason for speedy departure.

The Indians of Quatata carried all our goods down to the river side, and though this work occupied two days, they wanted no payment. At Pirara landing all but those of our own crews said good-bye to us.

It was in the very middle of the long rainy season, so that the currents in the river swept us down very rapidly. At night it was often very difficult to find dry ground on which to camp, and even when in the evening we slung our hammocks over dry land we sometimes found ourselves over water when we awoke in the morning, so rapidly was the water still rising. The creepers which festooned the trees on the banks were in most brilliant and full flower. It was one of the rare occasions on which I saw anything of that splendour of flower which dwellers in colder climates sometimes suppose to be characteristic of and universal in the tropics.

We soon reached the Rappoo, and below that had to maintain an almost constant struggle with falls. Every morning the Indians rubbed red peppers or lime-juice into their eyes to keep them awake, as they explained, in the falls. Once when neither limes nor peppers were at hand, rather than omit this self-torture, they soaked pieces of their blue cloth laps, and squeezed the indigo dye into the eyes. When this was done they were ready to shoot the falls.

During the high rains the falls are very difficult to pass, and long reaches of the river are transformed into vast rapids, through which the Indians steer their canoes with perfectly marvellous skill. Shooting a big fall, or running down a rapid of any size, is certainly exciting work. The canoe floats in smooth water at the top, and from there the bowman and steersman examine the fall and agree as to the particular course

to be taken; this once decided, the rush begins. Suddenly the canoe, caught by the eddying, rushing water, bounds forward; it perhaps rushes straight towards some threatening sunken rock, but one strong, swift turn of the bowman's paddle saves it from that danger; it rushes on again, turned here and there by waves and contrary currents, the bowman and steersman contriving to guide it, until in its headlong rush it in some way reaches smooth water at the bottom.

It is difficult to find words to convey a picture of such a rapid or flood to one who has never seen any of the great rivers of South America. It is no ordinary river falling down a step of rocks, but a great and wide sea of contending waves and currents, surging and breaking in most chaotic confusion in, over, and round countless rocks and obstructions.

Sometimes, however, as happened to us on this occasion at Etannime, the main fall is too high and too rough to make it safe to shoot it. There are generally side channels, called itabors, to all these falls, and Etannime was no exception, so we made up our minds to lower the canoes down one of these. A rope was fastened to the bow of the canoe, and some of the men, standing on the bank, firmly held the other end of this. Then the canoe was allowed to glide stern foremost down into the narrow, rushing channel. This is a rapid of some two miles in length, but hardly ten yards in width, down which the water rushes fast and foaming, in and out among thick, overhanging trees, and round corners, and down low, but abrupt falls. As soon as, by slow paying out of the bow line, the canoe had been safely lowered down the first of the short reaches, those who were on board kept her in position by holding fast to the overhanging tree-trunks and branches, while those on shore dropped the rope, and then hurried through the bush to a point commanding the next reach, down which, as soon as they had again grasped the rope, the canoe was allowed to drift. In this way most of the reaches were passed, but sometimes the course of the channel was so crooked and rocky that it was impossible to pay out the rope from the shore. In these latter cases all got into the canoe, which was then allowed to hurry down the turning rapid, and was fended from the rocky banks as well as might be with poles, and much grasping of overhanging trees. So we got to the bottom of Etannime Falls. It was very tedious work, but far safer than shooting the main fall.

At last all the adventures of the expedition were over, and we reached Georgetown after an absence of six months from the civilised world.

The following discussion took place:—

Sir Henry Barkly said a good many years had elapsed since he was in Guiana, but the very interesting account which Mr. im Thurn had given of his travels in the interior of that country had awakened reminiscences of many happy days which he himself had spent in British, Dutch, and French Guiana, and had vividly recalled to his mind the impressions made upon him by the beauty of the scenery, the pleasantness of the climate, and the wonders of the vegetation. There were, however, as

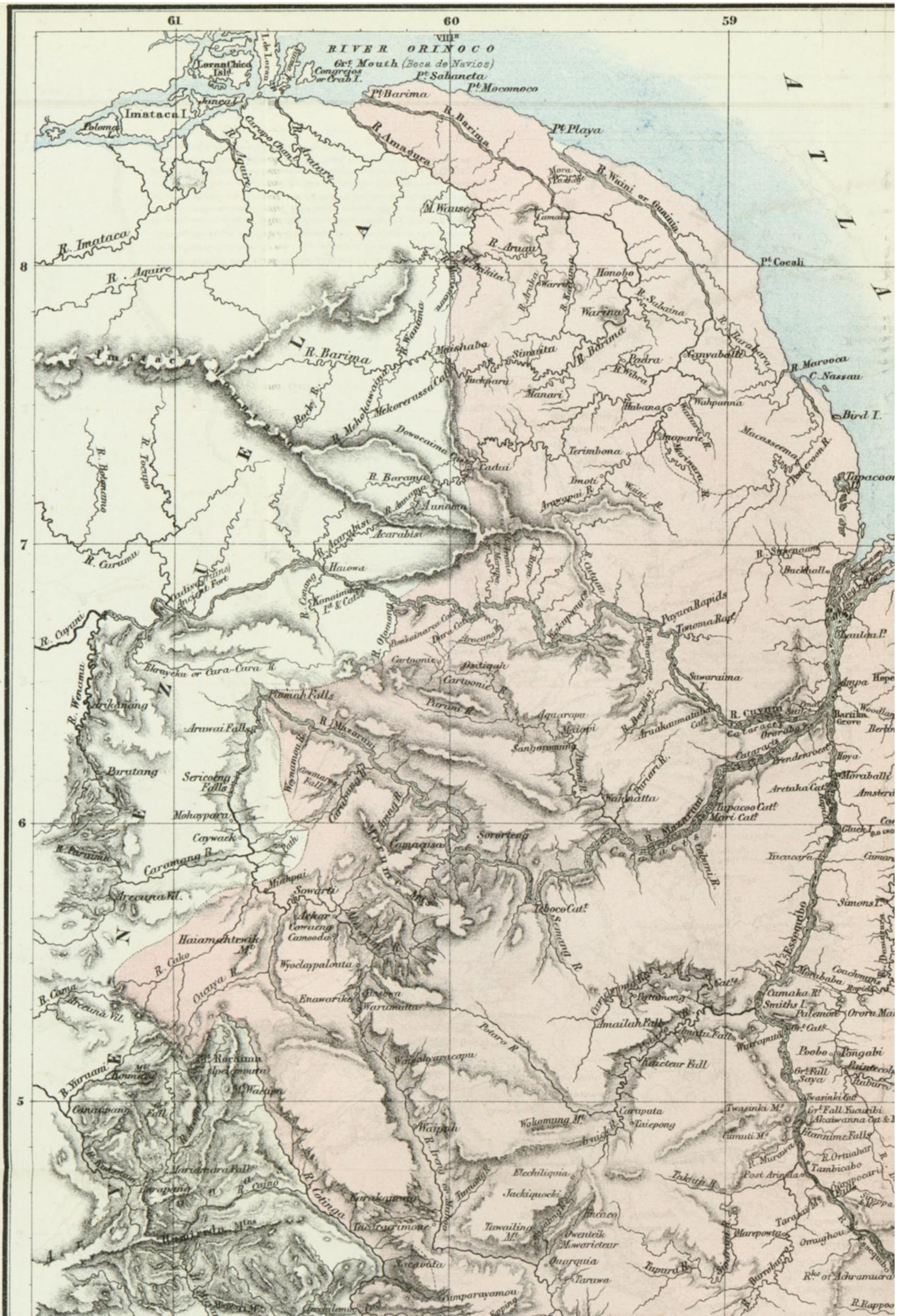
had been mentioned in the paper, drawbacks; consisting principally, so far as he was concerned, of the immense number of insects, but in Mr. im Thurn's case it appeared there was a want of bread, in consequence of the exceptionally dry season. He himself was abundantly supplied by the Indians with cassava, and with fish and game fared sumptuously. He was glad to learn that the colonists were doing more than they used to do for the study of natural science; that they had established something like a museum, and were willing to contribute towards the expenses of such a journey into the interior as that of Mr. im Thurn. In his day, all that they seemed to think about was sugar and coffee. When his predecessor, Sir Henry Light asked for a vote in support of the explorations of Sir Robert Schomburgk, it was opposed on the ground that there was nothing in the interior besides bush and water. Mr. im Thurn had alluded to the very curious picture writings to be found on the rocks near almost all the rivers in Guiana, and he believed near many other rivers in South America. No satisfactory explanation had yet been given of the origin of those writings, or of the people who wrote them. Humboldt had a paper on the subject, but did not appear to throw any great light upon it. His theory was that the writings were the work of the ancestors of the present inhabitants, the Caribs; but the present inhabitants had not the slightest idea of the origin of the writings, and had no superstitious feelings with regard to them. On the Corentyn River, he (Sir H. Barkly) was told by a Carib chief, that the writings were made by the Great Spirit, who stretched out his foot from the heavens and wrote them with his great toe on the rocks. The chief, however, did not appear to pay any respect to that theory; and he would like to ask Mr. im Thurn if the Indians with whom he travelled had any feeling of veneration for the writings, and whether he had made any copies of them in order to assist in tracing the race by whom they were executed —a race which at one time extended over the greater part of North and South America. It was well known that the *Victoria regia*, which could now be seen at Kew, was to be found at one time covering many acres in the lagoons on the banks of the Essequibo, at no great distance above the Aretaka Falls. He had seen it himself, and some few travellers went out from England on purpose to see it. He had been told that in a subsequent dry season the plants had perished, and he would like to know whether they had sprung up again, or whether it was necessary to go above the Christmas Cataracts of the Berbice River in order to see them. As far as he could judge, the paper gave a very true and accurate description of the interior of Guiana.

Mr. IM THURN said that Humboldt's account of the picture rocks, to which Sir Henry Barkly had alluded, was not very satisfactory, but that traveller had done more to elucidate the subject than anybody else. It was quite true that similar drawings were found in other parts, such as St. Thomas, St. Vincent, and Dominica. He hardly thought they were made by Caribs, because the Caribs, he believed, reached Guiana at a very much later period than that to which the drawings must be referred, and they probably did not reach even the islands till after the execution of these drawings. However, that was a point about which little was known. As to any feeling of veneration entertained by the Indians for these pictures, whenever they came to a high cliff or mountain on which there were these drawings, the Indians rubbed red peppers into their eyes, to avert the ill-will of the spirits who were supposed to reside in the rocks. During one of his short expeditions he had the drawings at Waraputa photographed, and he had deposited copies in the Library of the Geographical Society. He had made sketches of other rock pictures, of which he hoped to make further use some day. The spot to which Sir Henry Barkly had referred in connection with the *Victoria regia* was a sort of lagoon on Glück Island, about a day's journey above the first falls on the Essequibo, perhaps 80 miles from the mouth. It

was a well-known place, and had been frequently visited. In November 1878, on his way up to the Kaieteur Falls, he stopped there purposely to see the water-lily. It was at the end of a most extraordinarily dry season. The pond was quite dry, and the lily had disappeared, except at the further end, where there were one or two small seedling plants. He had never been to the spot since, but he had very little doubt that the plant had grown again, because during that same year it disappeared from the spots where it had been planted in the neighbourhood of Georgetown, and with the following wet season the young plants sprang up again, the waters there being now covered as thickly as ever with the *Victoria regia*. Probably the same thing had taken place on Glück Island.

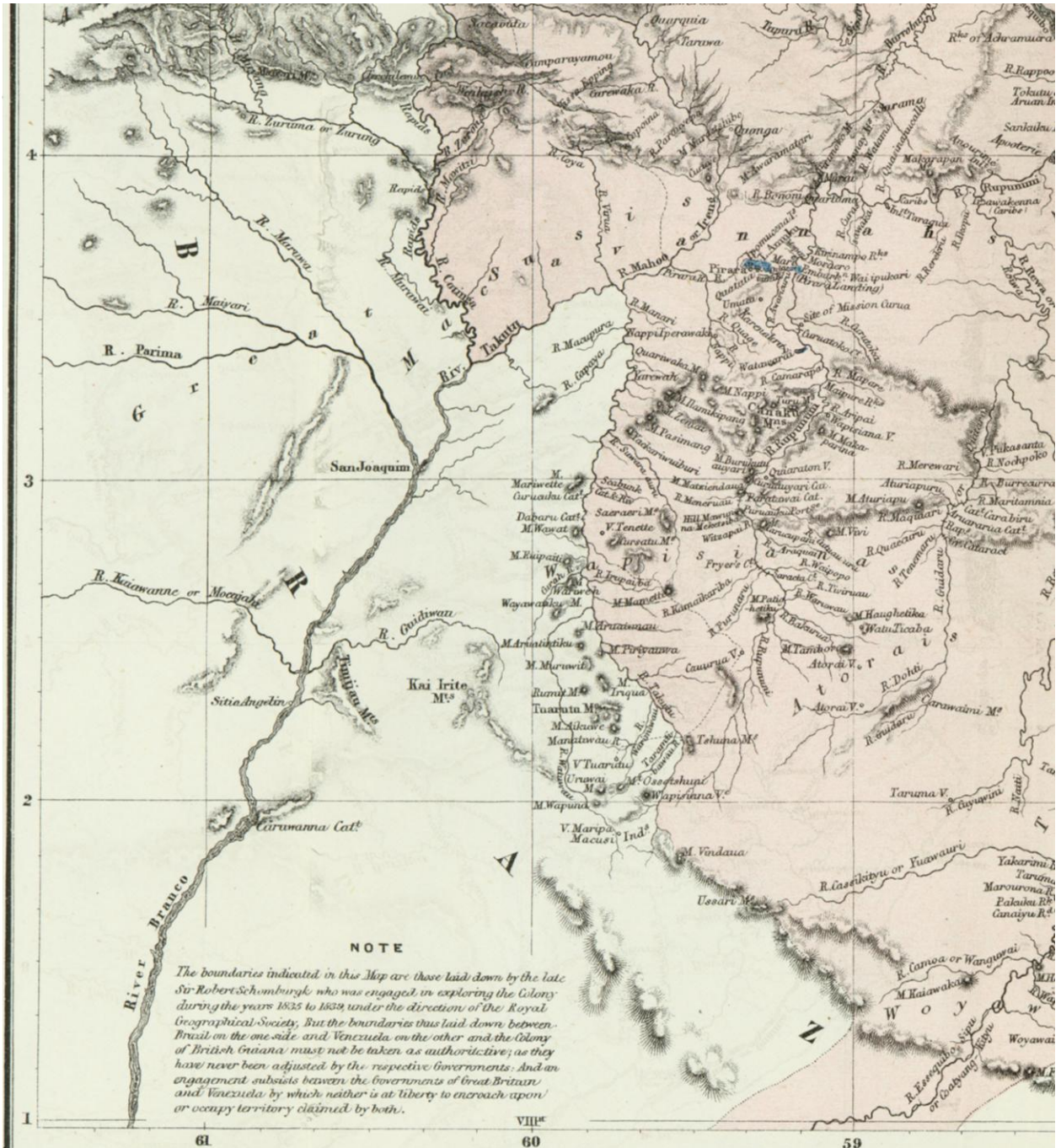
Mr. Flint said he accompanied Mr. im Thurn on the expedition which had formed the subject of his paper, but having on a previous occasion made a journey in another direction to the extraordinary mountain in the interior, Mount Roraima, he thought the Meeting would like to hear some observations on that subject. Roraima is situated in the western corner of British Guiana, on the borders of Brazil and Venezuela, in lat. 5° 9′ 40″ N., long. 60° 48″ W. Sir Robert Schomburgk visited this district in 1838, when he defined the boundary for the Government between these countries, making the line pass right across the mountain, half thus remaining in Venezuelan territory and half in British. Roraima is a duplex mountain, two large plateaus or blocks of sandstone standing side by side on one large mound. From the northernmost block comes the River Kukenam, which rolls down the bare face of the rock, making a magnificent cascade of over 1500 feet: Schomburgk calls this half of the mountain Kukenam and the other Roraima, but frequent conversations with the Indians in the immediate neighbourhood proved to him (Mr. Flint) that the one name, Roraima, was used for both. In July 1877, with his friend G. Eddington, he left Karenacru, where they were then staying, to try and see if there was any way of ascending this mountain, no one as yet having even tried to reach the top. Taking with them eight Macusi Indians, two Aracoonahs, the Carib chief Cephas and his son as interpreters, they started. They made their head-quarters at the village of "Toorooie," after a walk which occupied, including halts, sixteen days. Here they found an old Indian chief who remembered Schomburgk's visit, and undertook to provide them with guides, at the same time trying all he could to dissuade them from the ascent, as their presumption would be sure to enrage the spirits of the mountains. The two guides asked exorbitant wages, but a bargain was eventually struck, and they walked along the southern face of the mountain until they came to the western end of the first block, passing several streams on their way, all of which had their rise on the summit. The names of the principal are Arapoopooh, the Hokkoi, and the Cowar, near to which last-named stream they thought they saw a cleft in the precipitous walls of the mountain which seemed to offer some hope of ascending; they therefore climbed up some grass-covered slopes till they reached the belt of dense bush that encircles the cliff, and, building a banùboo or shed of leaves, stayed there for the night. From this position they had a splendid view of the other block, with the Kukenam pouring over the top, then becoming lost to sight in the thick bush, to emerge again a mile or two further on as a fine river meandering through the grassy undulating land of Venezuela. The noise was deafening. They were close to the Cowar, which is a considerable fall, but does not fall in the same perpendicular manner as the Kukenam, it having worn for itself a slanting bed half-way down the face of the rock. In the morning, at six o'clock, they started to cut their way up through the dense vegetation. At one o'clock P.M. they reached the foot of the cliff, and were enveloped in a thick cloud, which presently clearing away opened to them a magnificent view over the borders of Brazil and Venezuela, the landscape being bathed in most glorious sunshine. The

immense block of sandstone towering high above seemed to overhang them, in fact the position was not very safe, as pieces of stone freshly broken lay scattered about, evidently having fallen from the upper parts of the mountain, for the Indians afterwards showed them in the valley below some huge masses that they said had come crashing down during a thunderstorm. The cleft in the rock proved to be nothing more than discoloration, which at a distance gave an idea of depth; water was slowly trickling down, which doubtless caused this appearance. Finding this spot utterly impracticable they tried in vain to induce the Indians to help in cutting a path through the bush along the mountain base to the Cowar or beyond. From their position close to the vertical walls of the mountain no place in the immediate vicinity was visible which held out hopes of ascending, but on the way back they saw two places that appeared extremely promising. The Indians could not be persuaded to accompany them the next day to these places. He had no doubt that some future traveller, taking negroes instead of Indians, would succeed in ascending the mountain, although Mr. Barrington Brown and Mr. Boddam Whetham had both pronounced it inaccessible except by means of a balloon. Neither of these two gentlemen had, however, approached nearer than three miles from the cliff. One of the chief difficulties in the way of travellers in these elevated districts is the almost entire absence of animal life. A few birds only were to be got, and small fish like gudgeon which the Indians catch in traps and nets. On their return journey they passed through Brazilian territory, a well-watered mountainous country, in which some of the smaller hills were found to be composed of red jasper (hornstone), which the Indians use in the place of flint for procuring fire; for tinder they use either dried cotton or a kind of spongy composition in which the coushi ants place their larvæ, this with great difficulty they dig out of the nests, getting horribly bitten during the process. In the beds of some of the streams which passed through some strata of this jasper he noticed that large rectangular blocks were fitted closely together forming regular terraces or steps as if fashioned by the hand of some skilful mason. The party were twenty-two days in reaching Karenacru, having been nine days at the villages of "Toorooie" and "Manoopotahpooh," making in all forty-seven days.



61
60
59
VIII
RIVER ORINOCO
Grt. Mouth (Boca de Navios)
Pt. Sabaneta
Pt. Mocomoco
Pt. Barima
Loran Chico Isld.
Congrejos or Crab I.
Imataca I.
R. Barima
R. Amacura
Pt. Playa
R. Waini or Guainia
M. Wause
R. Imataca
R. Aquire
Pt. Cocali
Honobo
R. Sabaina
R. Marooca
C. Nassau
Bird I.
Manari
Terimbona
Macasseema
Pomeroon R.
R. Barama
Acarabisi
Haiowa
R. Cuyuni
Payuca Rapids
Tonoma Rapt.
R. Supenaam
R. Mazaruni
Cataracts
Caramang R.
R. Cako
Potaro R.
Kaieteur Fall
Mt. Roraima
R. Essequibo
Camaka Rt.
Smiths I.
Poobo
Pongabi
Wokomung Mt.
R. Cotinga
Tawailing Mt.
Jackiquock
Elechiliquia
Quarquia
R. Yuruani
Rks. of Achramucra
R. Rappoo
8
7
6
5
A T L A N
V E N E Z U E L A


58
57
REDUCTION OF THE
MAP OF
BRITISH GUIANA
COMPILED FROM THE SURVEYS
EXECUTED UNDER
HER MAJESTY'S COMMISSION
FROM 1841 TO 1844.
AND UNDER THE DIRECTION OF
THE ROYAL GEOGRAPHICAL SOCIETY
FROM 1835 TO 1839.
BY SIR ROBERT H. SCHOMBURGK, K.R.E., Pr. D.
REVISED AND CORRECTED TO THE PRESENT TIME
BY CATHCART CHALMERS ESQ. CROWN SURVEYOR OF THE COLONY.
AND JAMES GAY SAWKINS ESQ. DIRECTOR OF THE GEOLOGICAL SURVEY OF THE
WEST INDIES AND BRITISH GUIANA.
With additions by Charles B. Brown, Esq.
1875
English Miles.
8
7
6
5
ATLANTIC OCEAN
River Berbice
River Corentyne
River Demerara
River Essequibo
GEORGETOWN
NEW AMSTERDAM
Great Cataracts



W. J. Turner, R. G. S. Del.

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The Ascent of Mount Roraima

Everard im Thurn

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PROCEEDINGS

OF THE

ROYAL GEOGRAPHICAL SOCIETY

AND MONTHLY RECORD OF GEOGRAPHY.

The Ascent of Mount Roraima. By EVERARD IM THURN.

Map, p. 560.

I LEFT my home on the Pomerun river on the 10th of October, taking with me seventeen Indians, of various tribes, from that river, in my own two boats. One of these was a very large corial dug out of a single cedar-tree (*Icica sp.*?) which I had procured about two years before at the mouth of the Orinoco; the other, also a "dug-out," was somewhat smaller. On the 12th of the same month, having passed along the sea-coast and turned up the Essequibo, we reached the point where that river is joined by the Mazaruni. Here, partly because I was so unwell as to dread the start, partly because I had to wait for my companion, Mr. Harry Inniss Perkins, an assistant Crown Surveyor, who by the kind permission of His Excellency Sir Henry T. Irving, was to accompany me, and partly because I found it necessary to seek and purchase a third boat and to engage two more Indians, we waited until Thursday the 17th. On the morning of that day we made our real start, passing, during the first half hour, at the junction of the Mazaruni with the Essequibo, a Mr. Siedl, a professional orchid-collector, who had already visited the foot of Roraima some six months before, and who, having on that occasion met with a very fine new *Cattleya*,* was then starting, to collect more of the same plant, on a second journey to its home almost at the same moment as that of our own start, but by way of the Mazaruni, whereas we were to travel by way of the Essequibo and Potaro.

There is no need to dwell on any of the incidents of our journey up the Essequibo and up the Potaro as far as the mission of Ichowra, which we reached on the 24th of October; for the reaches of those rivers thus traversed by us have often before been described, and no special events distinguished this journey. At Ichowra we found the Bishop of British Guiana, who was then paying his first visit to that mission.

* This *Cattleya* has since been described by H. Reichenbach, jun., and named by him *C. Lawrenceana*, in honour of Sir Trevor Lawrence.

Referring to the paper, on our then proposed journey to Roraima, which I submitted to the British Association at Montreal,* it will be found that I had proposed to stay some days at Ichowra mission especially on account of the visit of the Bishop. For this, I had been led to believe, would attract to that place many of the Indians who live near Roraima; and from among these I hoped to select guides and porters to take us to their homes, following the Upper Potaro as far, perhaps, as its head.

We did indeed find a considerable number of Indians at the mission, though far fewer than I had been led to expect; but among those thus present were none from the immediate neighbourhood of Roraima, and even from any part of the savannah region in which that mountain stands only one party of Makusis. This party of Makusis, nine in all, under the leadership of one of the finest and best Indians I ever met, named Lonk, had come from a village called Konkarmo, on the Ireng river, in sight of, but very far distant from, Roraima, and by no means in a direct line between our then position at Ichowra and that mountain. As, however, it proved that of the Indians at Ichowra, these were the only available guides into the district into which we wished to penetrate, we engaged them to take us as far as their home. Consequently we had to abandon our purpose of ascending to the head of the Potaro; and instead we went up that river to a distance of but one day's travel beyond its great fall, the Kaieteur, and from that point, leaving the river, we walked back to the old mission station at Chinebowie.†

But before we reached the last named place some serious difficulties presented themselves. The portages on the Potaro, at all times long, steep, and difficult, were on account of the dryness of the season more than usually formidable. Once, in hauling one of the boats, luckily empty, through a cataract it sank, and was recovered not without difficulty; another time my favourite large cedar boat, while being dragged through the forest, past the impenetrable cataracts at Amutu, was pierced by the stump of a tree, and we not wishing then to delay to mend her, was abandoned until our return. On at last reaching the great Kaieteur Fall with the remaining boats, it became evident that the transport of these, as well as of our necessarily very great but indispensable stores of baggage up the portage path, which in many places is very steep and is some five miles in length, though possible, would occupy an undue time; so that we determined to leave our boats below and to use for the further short journey which we could still make by river two extraordinarily long, narrow, and very cranky "dug

* Proceedings R.G.S., 1884, p. 667.

† This station is marked in what is practically the only available map of the colony as Enapowow.

out" boats which we were lucky enough to find moored at the head of the fall.

Chinebowie we ourselves reached on the 8th of November; but we had to wait there till the 14th while sending back the two small boats twice for the baggage. Then began our walk, and at the same time began our constant and often serious difficulties in finding a sufficient number of Indians to carry the baggage. On the first occasion, at Chinebowie, we had to leave more than thirty loads behind, purposing to send back for them at the first opportunity.

Three days of most dreary and wearisome walking through the forest in a south-westerly direction, the path very frequently leading up hills of steepness very formidable to us heavily loaded as we were, brought us to the first human habitation, a small settlement of Partamona Indians,* called Araiwaparu. Here a day's rest became necessary, and was especially welcome, in that from that tiny clearing made for the settlement in the wide forest we were able, for the first time for three days, to see the sun and the clear and open sky.

The next morning we plunged at once back into the forest. Any kind of walking more wearisome than this long progress, lasting so many days, under a dense roof of leaves hardly broken anywhere sufficiently to let in any but the smallest gleams of light, over an apparently endless and universal floor, renewed throughout the year, of fallen and moulder-ing leaves, can hardly be imagined. Moreover one's whole attention is ever occupied and strained; for, under foot, the apparently smooth carpet of dead leaves is really most treacherously spread, not on the earth, but over, and hiding, a dense and intricate network of tree-roots of all shapes and sizes, any one of which may at any moment throw the unwary traveller heavily and dangerously to the ground; while overhead, hang down numberless coiled and looped and tangled bush-ropes and pendant branches of trees, each ready to catch round the neck of the walker or at least to sweep off his hat and cause him to stop, to his great discomfort and the disturbance of his many burdens. Long walking through such changeless gloomy places induces, if I may judge from my own experience, a curious and painful feeling. The senses of sight, sound, and touch are dulled to annihilation, except, and it is a great exception, so far as each of these senses is intensely and painfully on the watch for trap-like root or branch, threatening head or foot, for sound of water to break the stillness, for light to dispel the gloom; and corresponding with this cessation of the activities of the senses of the body comes a dreamlike activity of the mind, which either races back through a long series of just such of the past scenes in one's life as are of most painful or most unwelcome memory, or flies forward along the anticipated course

* The Partamonas are a branch of the Akawois. I propose to give some further account of them in a special paper which I propose to devote to the ethnological facts noted during our journey.

of one's life, which then seems one long vista of pains and sorrows and dangers. Thus on the fourth morning of our journey through the forest life seemed to me as gloomy as it could possibly be; the difficulties which lay before us seemed insurmountable; success seemed impossible.

So it was for the first few hours of our walk that morning. Then suddenly, at about 10 A.M., the forest ended in a distinct line and the path passed out of its shades on to the wide open savannah—and such a glorious savannah! It ran along the ridges of the mountain, down its slopes, over wide, well watered and green plains, up on to other ranges of curiously terraced mountains, and on, ever over mountain after mountain until it lost itself, to our eyes, in the blue misty distance. A most refreshingly cool, almost cold, and strong wind, loaded with sweet wide-gathered scents, hurried a few light clouds across the bright blue sky, lighted by a glorious sun; and the shadows of these clouds racing over the mountains and the valleys and over the many well-wooded ravines completed the intense and glorious beauty of the scene. From out of the long black prison of the gloomy forest, a step had brought us into this splendidly wide world with its atmosphere of freedom and welcome promise of success.

Soon, in the distance, perched on a flat and high grassy hill-top, a valley lying between us and it, we saw the high conical thatched roofs of a large Partamona village, which, like all the villages of that district, is situated so as to possess an outlook of quite ideal magnificence. Coming to this village, called Euworra-eng, an hour later, we found it full of people, many of whom were at the moment occupied in a large building, which they called a church, in singing, shouting, and talking, in curious attempt to imitate the service which some of them must have seen in the mission church on the Potaro.

Yet another day's walking brought us to Konkarmo, the village of our guides. From it the promised distant view of Roraima was indicated to us; but the mountain, if really visible, was so distant as to be discernible rather by the eye of faith than of the body.

Since we had left the forest—and this is equally true of our onward journey from Konkarmo to Roraima—the path, leading for the most part along the crests of long ranges of savannah mountains, was, in its circumstance of scenery, of probably unsurpassable magnificence; but it led often up or down most precipitous mountain sides and always over ground very rough and very stony. Our Indians, who, coming into those rough places from the plain of the Pomerun, where the almost universal mud is soft to the feet of the walker, and where, moreover, the denseness of the forest and the wide-spread network of river and stream cause almost all travel to be done by boat, were totally unused to carrying heavy burdens for long distances, and still less used to walking over stony ground, were so knocked up by the time we reached Konkarmo that it was evidently out of the question to send them back

for the baggage left at Chinebowie. However, we found no difficulty in getting a sufficient number of Indians to go back from Konkarmo; and these, in the wonderfully short space of a week, returned with all that we required.

I may here take the opportunity of stating that at each inhabited place to which we came we left a certain amount of provisions, to be used on our homeward journey; a circumstance which afterwards proved of the greatest advantage to us.

While our messengers were fetching the baggage to Konkarmo, we found plenty to occupy us. There, as we had found throughout the course of our journey to that point, the country had been so long without rain that hardly a flower was to be seen; and but very little botanical collecting was possible. But at Konkarmo there were other circumstances of interest. There, for the first and only time in Guiana, I saw stone implements made, and indeed actually learned to make them myself, after the rather peculiar manner there followed. There, too, the people, who were very numerous and most hospitable and kind, tried to interest us, and effectually succeeded in so doing, in many ways, especially perhaps by dancing and playing games for us after their own manner. Not the least curious or the pleasantest matter to be studied at Konkarmo was the extraordinary ecclesiastical mania which then possessed the people of that place and of that whole neighbourhood, inducing them to give up almost all work and to devote themselves instead, throughout the day, to an extravagant and perfectly unintelligent imitation of such church services as some few of the party had seen, when on their travels, at the distant mission. But these are all subjects which must be told of on some other occasion.

From Konkarmo, too, we sent for certain Arekuna Indians, living in the direction of Roraima, who were said to know the path to that mountain; and they, on their arrival, indeed, themselves pretended to know the way and agreed to take us. In the event, as far as their carrying powers were concerned, and in their willingness and good temper—the latter no unimportant considerations under such circumstances as ours—this party of Arekunas proved themselves right good men and true; but they caused us no little trouble in that none of them knew the path beyond the Cotinga river more than very imperfectly, and knew it not at all beyond the Arapu river, and in that their leader, "Arekuna John" as we called him, under a mask of good temper, concealed the most cunning, and almost the most grasping disposition that I ever met with even among his tribe.

It may be as well here very briefly to distinguish the various Indian tribes with which we came in contact. The Potaro river is almost exclusively occupied by Akawois Indians of the Partamona branch; and these same Partamonas have spread through the forest which reaches from that river toward the Ireng, and have even emerged from this

forest and occupied, as at the village which I have mentioned, of Euworra-eng, the edge of the savannah which extends from the limits of the forest to the Ireng. It was, therefore, through their country that we first passed. Next, when we were well on to this savannah, we came to the land of the Makusis, just at its most northern point. Upward from that, we passed at once into the land of the Arekunas, which stretches from there to and beyond Roraima. All the three tribes, the Partamonas, Makusis, and Arekunas, through whose districts we thus passed, are of Carib race and speak but slightly divergent languages. The three tribes differ from each other, however, considerably in appearance and still more in character. The Partamonas are large, strongly built people, ugly in body and in features, and dirty in habits. The Makusis, smaller, more slightly built men, with limbs of curiously beautiful form and wonderful agility, with unusually good features, cleanly in habit, most hospitable, obliging, and generous, are by far the pleasantest of all the Indians of Guiana. Lastly the Arekunas, people of large strong bodies and generally of ugly features, are physically the most powerful of all, and are of great good temper, but as companions of the traveller are objectionable on account of their extreme greediness of disposition; among all the many of their number whom I employed I never succeeded in satisfying one by the payment I gave, whereas I do not remember ever leaving a Makusi unsatisfied.

Early on the morning of the 28th of November we said good-bye with regret to Lonk and our other Makusi friends at Konkarmo, and started with our new Arekuna companions toward Roraima. The footpath led us, winding much, but always over the open savannah, to the Ireng river, which we crossed, at the customary Indian ferry, in three very long, narrow, and cranky dug-out boats which we found there. After another stretch of savannah, distinguished from a botanical point of view by the first appearance of a dwarf and very graceful bamboo which afterwards became a very common and characteristic plant along our path, we wound for a long distance through a light wood, the underbush of which consisted entirely of a beautiful scarlet-flowered shrubby *Justicia*, then in full and picture-like bloom. Next came another stretch of savannah; then, most wearisome of all, an Indian cassava field; and at last we reached our destination for the night, the first Arekuna settlement, called Nunie, on the Wotsa creek.

Here there were two complete houses and one unthatched and unwalled frame. For almost the only time within my experience the hospitality of the Indians was insufficient to induce them to give up even a part of either of their own houses, and we slung our hammocks to the unfinished framework. Immediately behind the houses was a hill of considerable height, up which we were taken just before sunset to see our first real view of Roraima, still far away to the west, or rather north-west. It was certainly a beautiful picture that lay before us. In

the furthest distance, reddened by the setting sun, rose the famous mountain of our quest; between it and us a vast mountain-covered plain, its hollows filled by the dark shades of evening, its highest points touched into wonderful clearness and colour by the last light of the sun. Soon all was dark; and then again, even while we strolled down to our hammocks at the foot of the hill, the mountain-encircled valley in which we were was new lighted by the strong white light of the moon; and in many places far up on the mountains round us, rose and fell, with most weird effect, the flames of great fires which in that season of dryness were burning the scanty vegetation of the mountain sides and sending up to heaven many a pillar of fire by night and cloud of smoke by day.

We got off from Nunie the next morning not without considerable difficulty in apportioning the extra loads among some additional carriers whom we were fortunate enough to find there. The pleasure of the start in the early mornings was nearly always spoiled by such difficulties as this, I having to wait behind adjusting loads, imploring people to take up extra loads, and then, after perhaps half-an-hour's delay or even three-quarters, having to hurry forward to get to the head of the long procession of carriers, often forty or fifty in number, who, in twos and threes at a time, had been able to start so long before.

The first half of our walk from Wotsa was through country very similar to that passed the previous day. So far, though we had climbed numerous steep hills only to descend almost immediately into almost correspondingly deep valleys, we had on the whole made a comparatively small ascent. But this morning, just after passing the last inhabited house which we were to see for three days, we climbed a tremendous hill and walked for the whole afternoon along a very curious long and narrow tableland of which our recent ascent was one boundary. The view was bounded on either side and close at hand by slight swellings of the ground some twenty or thirty feet in height; or if anywhere a more distant view could for a moment be obtained it was only of rolling, grass-covered, white hills. The soil on this tableland consisted for the most part of pure white sand, or rather of sandstone rock of so soft a nature that almost the lightest touch powdered it to sand; the vegetation was chiefly a low, hoary grey grass; and the general effect was of a desert white with hoar-frost. Water was very scarce; there was not a tree in sight with the exception of two small coppices seen in the far distance. Late in the afternoon we had still come to no trees to which we could hang our hammocks. Then we reached a tract where, as is not infrequent, the sand soil was overlaid by a thick layer of hard yellow clay, so sun-dried and so cracked as to resemble a very irregular tesselated pavement. Ground of this kind is called by the Indians "eppeling." On this special eppeling, in one place rather higher than the surrounding ground were scattered a considerable number of

low straggling rhododendron-like shrubs (probably a *Clusia* or nearly allied to the genus) with most exquisite flowers deceptively like those of an English dog-rose. Here, in default of a better place, we determined to spend the night. Three or four old hammock-poles lying on the ground showed that we should not be the first occupants of the spot. These poles served for my companion's hammock and mine. The men cut branches of the rose-flowered shrub, and with these made themselves romantic, but scarcely comfortable, beds on the ground.

The next morning, after following the tableland for yet a little further, we began to descend along an extraordinarily broad and almost perfectly smooth jasper rock, the sloping bed of a stream which was then almost dry. Wherever a little peatlike soil had accumulated on this rock grew sphagnum-like mosses, embedded in which, among other characteristic plants hitherto only met with on the Kaieteur savannah, were numerous, but singly-standing, plants of the curiously formed and coloured *Brocchinia reducta*, its two or three pale yellow leaves, overlaid with a greyish bloom, looking like a loose roll of two or three sheets of paper stuck on end into the ground.

After this, ascent and descent, both generally very steep, followed each other in rapid succession; and many streams, mostly jasper-bedded, were crossed, their white water contrasting beautifully with the smooth-topped step-like layers of polished red, or more rarely pale green, jasper over which they flowed or fell. One stream, the Wayanok, its bed not of jasper, but of ugly mud, had its banks well wooded, the trees meeting over its gloomy Styx-like waters; otherwise hardly a tree was to be seen, except where in the valleys long lines of æta palms (*Mauritia flexuosa*) marked the moist bed of a stream.

At last, at midday, we came to the Cotinga river just below Oriniduie cataracts, at a point where two coppices, one on either bank, faced each other, between which the stream ran, so broad and deep, that to cross without a boat seemed hopeless. Yet to stay where we were seemed almost equally impossible on account of the enormous numbers of sandflies which there, for the only time during our journey, filled the air and made life a burden. But some of our men saying they knew of a boat which they would fetch, we endured the sandflies as well as we were able for the rest of the afternoon; and in the evening the boat was brought.

The crossing of the river with all our baggage occupied an hour and a half the next morning before we could start once more on our savannah walk. Towards midday we ascended a very high grass hill and, resting just before reaching the summit, we saw a very beautiful scene. One of our party while in the valley below had carelessly thrown down in the dry grass the match with which he had lighted his pipe; and now down in the valley below us already a great field of fire was moving almost as rapidly as the shadow of a flying cloud across the vast plain.

Again, ten minutes later, having reached and passed the top of the

same hill, we suddenly faced another most glorious view of different character. Nearest and right opposite, across a narrow valley, rose the grand rocky mass of Waetipu, its highest point, a somewhat conical mass surmounting sloping sides covered in places with turf, in places with forest. On the right, the central mass of Waetipu passed down into a long wooded ridge, which on the extreme right rose once more to form the two most remarkable and pointed peaks of Macrobang; on the left of Waetipu, seen for once clear in the distance, appeared the tremendously magnificent south-eastern corner of cliff-walled Roraima, which was still a day's journey from us, and behind that again the equally rugged and magnificent end of Kukenam.

One more magnificent distant view of Roraima we had the next morning, just after rounding the south-eastern end of Waetipu; then we lost sight of it till the afternoon, when from a high ridge it appeared again close to us, while between us and it, far below us, lay the village of Turoiking,* at the junction of the Ipelima creek with the Arapu river.

When we reached the village it was empty, and, though there were signs of recent occupation, we were persuaded by the assertions of our Arekuna guides, who had now reached the end of the world as known to them in that direction, that it really was a deserted village. Most of the houses were more or less dilapidated, and the large "church," of the kind already mentioned, was almost in ruins. Matters did not look very bright for us just then. No one of our party knew the way across the low range which still lay between us and the towering cliffs of Roraima, that is from the valley of the Arapu river, in which we then were, into the valley of the Kukenam river, from which latter valley our first attack on Roraima was to be made; nor did any of the Arekuna carriers who had come with us so far wish to proceed further with us into lands quite unknown to them. Nor again, owing to the absence in our present position of the inhabitants of Turoiking, did it seem possible to procure either new guides and carriers or the supplies of fresh provisions which were very necessary for our large party.

It was, therefore, a pleasant sight when, late in the afternoon, a few of the inhabitants of the village straggled back into it. Among these was an old, but most extraordinarily strongly built Arekuna, named Simon, whose every word, corresponding to the size of his body, was an hilarious roar. He promised, if we would wait till the next day, to send his son the next morning to a village somewhat nearer Roraima to fetch guides, and perhaps carriers, who would take us to that mountain; and even that night he managed to procure for us a small supply of provisions. Unfortunately at noon next day his son returned with the

* Marked in the ordinary maps of the country as Ipelemuta, i. e. the place (*uta*) on the Ipelima creek. It is no uncommon thing to find a village with two names after this fashion.

unwelcome news that another white man had just arrived at the foot of Roraima, from the north, had taken away every available Indian as guide or carrier, and had bought up all the food, which was said to be very scarce in the valley of Kukenam. The white stranger could of course be no other than Mr. Siedl, who having started on his journey viâ the Mazaruni on the same day as we started by the Essequibo, had reached the point at which we were both aiming, one day in advance of us.

Our prospects were certainly gloomy; and we nearly determined to send back without delay, not only the Arekunas, but also all but three or four of the Pomerun men, and with these to push on to Roraima as best we might, finding our way by compass and leaving almost all our baggage behind us. Luckily, however, just before sunset two men were seen coming down the mountain from the direction of Roraima; and these, on their arrival, proved to have been most kindly sent by Mr. Siedl, who had heard of our arrival, to guide us farther. After this new arrival a second night was spent at Turoiking far more pleasantly.

Next morning, the Arekunas, who had come with us so far, suddenly announcing their wish to come farther, we advanced with all our party and baggage, and, after fording the Arapu and passing the ridge which here separates the water-system of that river from that of the Kukenam, we came soon after midday to the village of Teruta, which stands on a small eminence only separated from the southern slope of Roraima by the narrow bed of the Kukenam. Our arrival at this point was on the fourth of December.

The village where we now were was very full of people; and from the hill on which it stood various other houses were to be seen. There seemed therefore good prospect of obtaining sufficient Indians to help in our work. Food too, in the shape of cassava, yams, and pumpkins, was evidently abundant, despite the assertions that had been made to the contrary; and the only thing to disturb the comfort of our prospects was the unanimous and apparently truthful statement of every one that game and fish were so scarce as to be almost non-existent in the district.

Siedl, who had arrived at Teruta the day before, had gone up that morning to a house which he had built for himself far up Roraima, at the nearest available point to the base of the cliff-like part. We took up our quarters for a day or two in Teruta itself, in order to determine our further plans.

The view of the two mountains Roraima and Kukenam from the village of Teruta is of indescribable magnificence; yet, though words must fail to give any adequate idea, some attempt must be made to describe the main features of the picture.

The two mountains, the greatest length of both of which is from north to south, lie directly east and west of each other, only separated by a gorge, which is at one point very narrow and is apparently

throughout the greatest part of its length of no great width. Roraima, the easternmost of the two mountains, roughly speaking forms at its southernmost point a right, or perhaps a slightly obtuse, angle. Westward from the apex of this angle the side of the mountain runs upward in a generally straight but really slightly concave line for about four miles, almost directly north-west, and then, forming at that point a somewhat similar angle, which angle is the most western point of the mountain, its side then turns to the north-east. On the other hand, Kukenam, the westernmost of the two mountains, ends at the south in a somewhat rounded point, from which its eastern side runs upward for somewhat less than four miles in a north-easterly direction, till it almost meets the extreme western point of Roraima, and after there forming its eastern angle, thus exactly opposite the western angle of Roraima, turns again to the north, or perhaps slightly north-west. Thus the south-west face of Roraima forms with the south-eastern face of Kukenam a very obtuse angle, at the apex of which the two very closely approach each other, being only separated by the gorge at its narrowest point. Supposing, next, that a straight line were drawn to join the southernmost points of the two mountains, this would form a base-line making, with the above-mentioned angle, a triangle; and on this base-line, about midway between the southern points of the two mountains, stands the village of Teruta, which thus immediately faces the gorge between the two mountains and commands a full view of the south-western side of Roraima and of the south-eastern side of Kukenam.

So far I have been attempting to describe the real relative positions, as determined by actual observations, of the surroundings in which we now found ourselves. From this reality the appearance of these surroundings, as is not unfrequently the case, differed somewhat. From Teruta the two mountains seem to rise from a common sloping base; and, placed on this, each seems to consist in itself of a sloping portion surmounted by the cliff walls. Looking directly north, we saw straight into the narrow forest-filled gorge, on either side of which, like Titanic gate-posts, rose slope surmounted by cliff, on the right that of Roraima, on the left that of Kukenam. Thick woods entirely clothe the slope of the latter, fill the gorge between the two mountains, and have climbed up from out of the gorge just on the extreme western shoulder of Roraima. The greater part of the slope of this latter mountain, much broken into curious terraces and often fluted, if I may use the expression, in a very remarkable manner at right angles to these terraces, is for the most part grass-covered, though in places occupied by coppices; while on the extreme right, i.e. on the southern shoulder of the mountain, thick woods again occupy the entire slope. But even on Roraima the entire upper part of the savannah slope is as thickly wooded as is the whole of that of Kukenam. And, alike in both mountains, above the slope,

springing directly from out of the highest woods, rise the huge perpendicular cliff-walls, tremendous, and bare but for great patches of vegetation, really dwarf enough, but appearing at that distance merely as moss and lichen. Alike, again, in both mountains the sky-line, straight enough, is yet curiously jagged as is a very rough-torn edge of paper. And alike from both mountains fall streams of water, more or less visible according to the season, the most constantly conspicuous being, from Kukenam, the river of the same name, from Roraima the Kamaiwa and a river, of unknown name, with which we afterwards had close experience.

One very characteristic feature of the scene has not yet been mentioned. It has been stated that, on the extreme right as seen from Teruta, the whole southern shoulder of Roraima is wooded. From the cliff of that mountain where, at its southernmost point, it rises from these woods, a portion has at some time been vertically detached, and this still stands, a rude obelisk of naked rock rising from out of the forest to tower above the closely neighbouring cliff of Roraima.

Lastly, this mountain panorama, the key-note of the scene, as one looks at it from Teruta down in the valley below, being of gigantic vastness and overpowering size, is almost always rendered more gigantic, much more mystic, by the clouds and vapours which almost always float around it, often gathering into one mass so vast as to obscure the whole, still oftener piling up smaller, but still dense, masses here and there on the mountain or in the gorge. Rarely did we see the scene quite clear; a fact which, as the Indians were never tired of explaining to us, was owing to the habit of the mountain—they regard both mountains as one —of veiling itself whenever approached by white men.

This latter point reminds me to note the extreme veneration, and even affectionate regard, with which the Indians of that district, even those who live far from, but yet in sight of, Roraima, regard that mountain, vividly personifying it, it always seemed to me, in a more real fashion than even their wont.

By a lucky chance, on the day of our arrival the mountain was fairly free from cloud; so that we saw a ledge, running diagonally from the bottom to the top of the opposite cliff of Roraima, which, from where we were, certainly seemed to offer a very practicable way of ascent. Yet, knowing that of the few other than Indians who had visited Roraima and had pronounced its summit inaccessible almost all had tried to attack it from the very point at which we now were, we failed to persuade ourselves that our ledge was really practicable. And only at one other point on this face of Roraima did it seem in the least possible even to think of attempting an ascent; and this second point afforded but the very smallest gleam of hope.

The day after our arrival at Teruta, Perkins and I, with two of the Pomerun Indians, went up the savannah slope of Roraima as far as

the spot where Siedl had built his house. We found him some four miles up the slope, almost at the top of the savannah, at a point which afterwards proved to be 5405 feet above the sea-level and 1654 feet above the village of Teruta. He had made a tiny clearing within the edge of the forest where it met the savannah and had there established himself. He had visited this same point on Roraima in the previous April, and had then found, and collected, considerable quantities of his *Cattleya;* but the plants had perished on the way home, and he had now returned for a fresh supply. He had noticed our ledge, but was convinced of its impracticability; and he had moreover heard a tradition, which I afterwards heard but always discredited, that some Indians had once attempted to ascend by it to the summit, but had been stopped almost before they made any progress up it by a great ravine which, invisible from below, really separated it from the summit. No other point seen by him seemed, he said, to afford any hope of access.

The question which now had to be decided was whether to delay for a time on this south-western face of Roraima, which had been, comparatively speaking, so often visited and always pronounced inaccessible, in the hope that, with our greater advantages in the way of the longer time at our disposal and the sufficient, though by no means too abundant, supply of provisions, we might succeed in finding a way where others had failed; or whether it would be better at once to follow out our programme of walking round the mountain till perchance we might find an accessible way up one or other of its less known sides. While debating this, a glance at the ledge decided us to try it at all risks; and we returned down the mountain to our old quarters at Teruta, there to make preparation for reascending and building a house close to Siedl's.

The next day, Saturday, was spent in telling off twelve of our Pomerun Indians, who were to leave us and start for home the next morning, in order to reduce the demand upon the provision store; in writing letters to be carried home by these messengers; and in sorting the baggage so as to take up with us only the most necessary things, and even of these only such as our four remaining Pomerun Indians with a few Arekunas could carry up. Early on the morning of Sunday, our twelve companions who had come with us from home filed off in one direction across the savannah, while we who remained marched in the other direction up the slopes of Roraima.

The house which we built, and, as it turned out, inhabited for nearly a month, was close to Siedl's. Externally it was an ordinary Indian house, thatched, however, on roof and walls with the leaves of a large and handsome palm, a *Geonoma* of a species new to me but very abundant higher up the mountain. Inside, in the centre of the house, between our two hammocks, was a gridiron-like staging or babracot of hard green wood, under which a large fire was kept burning day and night; this arrangement being partly suggested by the extreme coldness of the

temperature, which at night sank as low as 48° Fahr., but was chiefly intended to afford means of drying the botanical paper, which, because of the great dampness of the air and the feebleness of such few rays of sun as forced their way through the almost constant mists, it was quite impossible to dry by ordinary means. Even though the paper not in use was thus kept constantly over the fire, and although almost every minute of my day during which I was not working in one way or another away from the house was devoted to turning and changing these papers, it was a matter of most extraordinary difficulty to dry the plants.

Our own house was finished even on the day on which we ascended; and the next day our Pomerun Indians built a similar but larger house for themselves. Later on we built another house for the living plants collected; and two parties of Arekunas who came up and attached themselves to us each built a similar house. Moreover, Siedl, beside his own house and that for his men, had two very large buildings which he gradually filled with the *Cattleya*. In fact, before we left the place it had become quite a large and picturesque settlement.

But I must return to the account of the beginning of our stay on Roraima. The savannah immediately in front of our houses was that same wonderful swamp which Richard Schomburgk had visited forty years before, and had so enthusiastically described as a "botanical El Dorado."* Nor was the inscription inapt. It extends over a considerable space of undulating ground, occupying in fact the whole of the upper part of the savannah slope, and, except where, in many places, rocks crop up, either singly or piled in masses, appears to the eye to be chiefly occupied by long waving grasses over which are borne innumerable rich large violet-coloured flowers of the lovely *Utricularia Humboldtii* and, on equally tall but branched flower-stems, the quaint yellow-brown flowers of an orchid (*Cypripedium Lindleyanum*). But, on looking more closely it will be found that almost equally abundant with the grasses are many small and various yucca-like plants, many heath-like *Befarias*, many more dwarf but lovely orchids, especially the beautiful and sweet scented *Zygopetalon Burkii* and a rosy flowered *Cleistes* (*C. rosea*), many ferns, and innumerable other plants. In not very frequent places, where the grass is not so long, are considerable patches of the "pitcher-plant" of South America (*Heliamphora nutans*), with its grotesquely pitcher-shaped leaves and delicate white flowers, borne on ruddy stems. On the rock patches, on the other hand, grow pretty flowered shrubs of many species, and among these many orchids, especially a long sprayed black and yellow flowered *Odontoglossum* (*O. nigrescens?*) and an *Epidendron* (near *E. imatophyllum*) with flowers curiously various in colour, mauve or rose to white and from yellow to fawn, many ferns from the low creeping kinds to the tall bracken (*Pteris aquilina*) and, yet taller, various species of tree ferns; and, though this is not abundant in that

* 'Reisen in Britisch Guiana.'

position, there also grows, most striking and suggestive of all to the Englishman who has been long in the tropics, a real blackberry (*Rubus Schomburgkii*) very similar to the hedge brambles at home. And again, very sparingly on the higher open parts of this savannah swamp, but more abundantly and luxuriantly inside the small coppices which break its extent, stands the remarkable aloe-like *Brocchinia* (*B. cordylinoides* Baker), which, occurring there in very far greater abundance and luxuriance, forms the chief physiognomic vegetation of the Kaieteur savannah. And again on the edges of the coppices of the savannah slope and on the edges of the forest in the midst of which this lies, are many other striking plants, a peculiar climbing bamboo, tree ferns of several species, especially a great cycas-like fern, thick stemmed with erect dark green fronds (*Lomaria Schomburgkii*), and among these, wonderfully luxuriant examples, with flowering stems of seven and eight feet high, of the various coloured *Epidendron* which has already been mentioned as growing, with far dwarfer habit, on the dry rocks of the savannah. It is no wonder that Schomburgk was enthusiastic about such a place as this.*

Many days we spent in exploring and visiting every accessible portion of this savannah slope and of the forest belt above, even as far as the base of the cliff, partly in order to examine the vegetation, but chiefly in order, when a few rare hours of clear weather admitted of this, from every available point to study the ledge up which we hoped to ascend. Sometimes it looked possible, sometimes impossible. To make clear the nature of the position some further account of the contour of this aspect of the mountain must be given.

The gradual savannah slope has already been distinguished from the much more abrupt forest slope. But in this latter again three regions or belts may be quite clearly distinguished. First, and immediately above the upper edge of the savannah slope, is a belt of very dense wood in which the trees are small, but stand very closely together, great quantities of the *Geonoma* already described and a few curiously dwarfed manicole palms (*Euterpe edulis*) occurring in it, the whole being much matted together by the long winding stems of the small bamboo. The path upward through this is steep and slippery, but there are few boulders. Next comes a belt of bush in which the vegetation is chiefly low and bush-like, averaging not more than from six to eight feet in height, and indeed consisting in great part of *Brocchinia cordylinoides*. The ground here is almost completely covered by boulders, though these are not often of any very great size. Next comes a belt of rock and tree, where the boulders, many and large, often tower overhead, and the trees few, stunted, gnarled and twisted, grow round, over and under the rocks, and their branches meeting overhead there intertwine to make a dense rock. In making a path through this belt one passes now over the

* The botanical observations made during the expedition will be dealt with in a separate paper.

branches now under the roots. But perhaps the most striking character of this belt, though it is evident in somewhat less marked degree on the other tree-covered parts of the mountain, is the universal coating of long and dense, green mosses which wraps rock, branch and trunk, and indeed every visible thing underhead and overhead, suggesting a feeling of muffled stillness much as does a coating of snow at home. And yet another feature, present in all the belts, but in much the most marked degree up here, is the sponge-like saturation of earth, moss, rock and trunk with moisture; and, consequent on this moisture, the vast abundance of luxuriant ferns, especially filmy ferns, is everywhere noticeable.

Lastly, immediately above this belt, between it and the foot of the cliff is a narrow zone chiefly occupied by vast quantities of the blackberry already mentioned, growing here among the loose débris which seems almost constantly to fall from the summit of the mountain. This latter belt reminds one strangely of home, not only because of its bramble-growth, but because interspersed in the latter are vast quantities of the South American form of our English bracken (*Pteris aquilina*), with a fern externally resembling the English male-fern, and large quantities of heath-like *Befaria*. Only the abundant clumps of *Geonoma*, a few tree ferns and many small but beautiful tropical plants of the same family, and the occasional flight of a humming-bird, remind one that one is in the tropics.

Having passed the bramble tract, to ascend just at the feet of the cliff and to look up offered a wonderful experience. The wall runs for the greater part of its two thousand feet height straight up, but at the actual top it overhangs. Water, falling continuously, even in the dry season in which we were there, from every part of the upper edge, reaches the ground not at the base of the cliff, but some four or five feet, or even sometimes further, from that base.

After due examination, it appeared that there would be especially three points of possible difficulty to be met in making an ascent by the ledge. In the first place, that part of the forest slope which we should have to pass before reaching the foot of the ledge had, as we then thought, never been penetrated by man and was of quite unusual density, chiefly on account of the great quantities of rampant bamboo which matted together the trees of which it was composed; and, while, at first, we had only our four Pomerun Indians, it really seemed almost out of the question to cut our way through this. Fortunately for us, many Arekunas came up the mountain to us, before many days, and, building a house for themselves, placed their services at our disposal; whereby we were enabled to have the path cut up as far as the foot of the ledge while we spent the time in other work. But a second difficulty, evident from below, was presented in the fact that the lower part of the ledge seemed much broken, and indeed appeared to be not so

much a continuous shelf but rather a shelf which had at some time been broken up into large masses of rock, which, towering over the forest, looked formidable enough from below. Siedl, till the time when we practically proved the possibility, maintained that it would be impossible to climb over this broken part of the ledge and even eventually on this account declined to accompany us on our ascent. But the most doubtful point of all was where, some two-thirds up the length of the ledge, a considerable stream of water fell on to it from the summit of Roraima. This stream, falling on the ledge, had eaten away, and made a deep gap, impenetrable to the eye from below, in its surface. It certainly appeared that this might well be impassable; and our only hope was that we might just possibly be able to climb down into it, and up its further side and so on to the upper part of the ledge, which from that point to the summit of the mountain seemed accessible enough.

The path to the foot of the ledge once cleared, and all such observations as could be made from below having been completed, we still had to wait for a tolerably clear day on which we might make our first attempt to ascend with some prospect of success. This we did not get for some time, to the great trial of our patience, we almost fearing to spend so much of our time on that side Roraima unless we could be more certain of success there than we then felt.

At last, on Sunday, the 14th of December, though the morning did not seem to promise an altogether fine day, yet, unwilling to lose another day, and fearing yet more to leave the Arekunas longer unoccupied lest they should have time to discover the discomforts of the place, we made a start for the top by way of the new path, at 9 A.M.

We found that the path had been cleared only just sufficiently to allow us to pass, and that not without considerable difficulty. The ground was exceedingly slippery, in consequence of the heavy rains which had recently fallen; and this special difficulty was enhanced by the fact that much of the ground was occupied by a large flag-leaved *Stegilepis* which, trodden or cut down as we advanced, gave us many a fall, on account of the great slipperiness of the whole plant and by the big *Brocchinia* (*B. cordylinoides*), the latter so densely placed that we had to walk over their tops, plunging and slipping about in the considerable quantity of water which each of these plants holds in its axil. Seldom, if ever, did we step on the real ground, but instead we climbed, hands and feet all fully employed, over masses of vegetation dense enough to bear our weight, over high-piled rocks and tree-stumps and not seldom under boulders of vast size, up tree-trunks and along tree-branches, across the beds of many streams so filled with broken rocks that the water heard trickling below was unseen. Nor did the dense and universal coating of moss, filmy ferns, and lungworts, afford any but the most treacherous foot-hold and hand-hold.

At last, about 11 A.M. we reached a station near the foot of the ledge,

at the base of the cliff, where some old cutlass marks on the trees attracting my attention, it appeared after inquiry from the Indians that Mr. Whitely had been some years before. How he reached it I do not know; certainly our path did not seem in any way to have touched his until just before the base of the cliff. I presume, but am not sure, that the station at which we now were was the highest to which Mr. Whitely attained, for there were no traces of any further advance having been made, up the ledge.

Our Arekunas had cleared the path a little further than the point where we now were; but on following this up we found it did not go far. From the point where their work had ceased, I sent them on to clear further, while I laid between papers such plants as I had already collected; but they soon returned declaring they were frightened and could go no farther. Then the Pomerun Indians came splendidly to the front, especially one named Gabriel, who declaring, on the strength of having once been between the mouth of the Pomerun and Georgetown in a small provision sloop, that he had been a sailor, went first with me up one of the stiffest pieces of climbing that one need wish to remember, till we reached the top of a shoulder, a considerable way up the face of the cliff; and from this point advance did not seem possible. The boiling-point thermometer here showed a height of 7321 feet.

For more than an hour past, thick mist had enveloped us; and not only did this now become thicker, but heavy rain also began to fall. The thermometer, though it was midday, fell to 54° Fahr., so that the cold, to us accustomed to the tropics, was intense. Moreover all the bushes and moss-covered trees which we had to grasp, and by their means to raise ourselves, had been like sponges filled with iced water, so that we could hardly hold on to them for the numbness of our hands. Under these circumstances we determined to turn homeward for that day, satisfied with having proved the practicability of making our way for a considerable distance up the ledge and even, as it afterwards appeared on examining the place from below, to a point above that at which the broken nature of the shelf had seemed to offer so serious a difficulty, so that only one doubtful point still remained to be passed, that at which the stream fell from Roraima on to the ledge. Our next attempt would, we hoped, be made on a finer and drier, and more especially on a clearer day. And whenever that attempt might be made we determined not to keep so near the inner edge of the ledge, under the base of the cliff, for we had found that this led us to an impassable point, but to keep as close as might be to the outer edge.

The journey downward was quick but far from pleasant. As in coming up we had got over much of the ground by crawling on all fours, so in going down we passed much of the way, but involuntarily, by sliding in a sitting posture.

For the next three days, heavy rain and thunder were almost in-

cessant. Then on Thursday, the 18th, came a bright morning, but with a few small clouds floating about down in the valley below us; but in consequence of the late rains the bush was still very wet and the stream falling from Roraima on to our ledge was very full of water. However, fearing that the rainy season had really set in, we determined to try to get at least as far as the foot of the fall—the one remaining doubtfully practicable part of the ledge—in order at least to know whether this last point was passable or not.

When we reached Whitely's station at the base of the cliff the weather was still clear. From there we followed the previous Sunday's path for a short distance, but soon, instead of going up to the top of the first spur on the ledge, to our Sunday's station, we began to cut a new path round the spur.

It should perhaps before have been explained that what had appeared from below the broken part of the ledge really consists of three rounded spurs, or shoulders, running from a little way up the cliff down on to the ledge; and that these spurs are all wooded, though not so densely as the ground below the ledge, while in parts a few huge boulders stand out over the tree tops. These three spurs occupy about two-thirds of the ledge as seen from below; then comes the part of the ledge on to which the fall dashes from the cliff above. After that the shelf slopes gradually upward to the top of the mountain, its surface, as we saw it through the field-glasses, covered with rocks and low vegetation, its upper part passing behind a sort of false face to the cliff.

To return to our progress after we left Whitely's station. The way, which was very difficult and wearisome though at no point dangerous, was again over, under, and along more tree-roots, branches, and trunks, again over, under, and along more rocks and boulders, and over and up steep slopes of wet slippery mud,—tree, rock, and mud being alike wrapped in the usual covering of wet moss. Over such ground as this we made our way round the three spurs, and at last came in sight of the part of the ledge on to which falls the stream from above. A fairly gentle slope, covered with coarse grass, taller than ourselves, led down, for a considerable distance, to the actual point on to which the water fell, which to our great delight, we saw was no deep impassable pool or ravine, but a broad, sloping reach of broken rocks; on the other side of this the ledge sloped almost as gradually upward, but this upward slope consisted for some distance of a slippery expanse of rock, broken by faintly marked step-like ledges, over the whole of which in the heavy rainy season a continuous flood of water must pour, but which was now almost dry. At last the way to the top lay before us clear and, if somewhat difficult, certainly passable.

We hurried down the slope before us, cutting our way through the long grass as quickly as we could. Then we came to the fall, under which we had to walk for some 150 yards. Luckily, comparatively little

water was coming over at the time; and this, descending from the great height of two thousand feet, fell upon us only as very heavy rain. In wet weather—and even two or three hours of rain, as we sometimes saw, swell these streams in a wonderful way—it would probably be quite impossible to walk under this fall, though even then it would perhaps be just possible to walk behind it, between it and the cliff, clinging closely to the face of the latter.

Just where the water fell on to the rocks grew in great abundance a low compact shrub, with small dense leafage and pretty little white flowers which I never saw anywhere else. The fall once passed we made our way up the slippery rocky part of the slope beyond, till we reached the upper part of the ledge, after its interruption by the cascade. This proved to be mainly covered by a dense growth of the *Brocchinia cordylinoides*, still very dwarf as compared with the habit of the same plant on the Kaieteur savannah; and through this it was neither easy to make our way, simply by reason of the density of this plant growth, nor was it pleasant, by reason of the immense quantity of water which, held by the curiously arranged leaves of these plants, was poured over us as, in advancing, we crushed and sank into their leafage. Interspersed with this *Brocchinia*, almost on every inch of ground where the former was not, and indeed more abundantly than its rival plant as we neared the top of the ledge, were large quantities of the remarkable, dwarf, and compact yucca-like plant which we had noticed as one of the most prevalent forms of vegetation in the swamp near our house and had seen in very widely separated patches on the savannah even as far as the valley of the Arapu river. The exceedingly stiff habit of this plant and the very acute point on the top of each of its leaves, together with a reputation which we heard assigned to it—as, after much subsequent practical but involuntary experiment, I now believe most unjustly—of poisoning every wound which it might inflict, made us walk over it as over carefully arranged rosettes of poisoned daggers. But interspersed among these two most prominent plants was a vegetation new and lovely enough to reward much suffering. Of this the most striking plant was a gloriously beautiful crimson flowered *Befaria*, a small, very dwarf, and compact heath-like shrub with very dark-green leaves, thickly incrusted with many wide-open star-shaped flowers, each some half inch across and of the richest and most intense crimson. A second *Befaria*, pink-flowered, was also either new to me or at least a much more dwarf and at the same time a very much larger-flowered variety of a species occurring in the swamp below. Another tiny shrub had its leafage and wiry stems completely obscured by wonderfully large pink flowers, clustered and shaped after the manner of those of the rhododendron. A curious fritillary-like flower was in abundance; and there were numerous small and delicately pretty, but not showy, ground orchids. The pitcher-plant (*Heliamphora*) was there too in

abundance, and of a size and luxuriance so far surpassing its habit in the El Dorado swamp that it seemed to us a new plant.

Up this part of the slope we made our way with comparative ease till we reached a point where one step more would bring our eyes on a level with the top—and we should see what had never been seen since the world began; should see that of which, if it cannot be said all the world has wondered, at least many people have long and earnestly wondered; should see that of which all the few, white men or red, whose eyes had ever rested on the mountain had declared would never be seen while the world lasts—should learn what is on top of Roraima.

Then the step was taken—and we saw surely as strange a sight, regarded simply as a product of nature, as may be seen in this world; nay, it would probably not be rash to assert that very few sights even as strange can be seen. The first impression was one of inability mentally to grasp such surroundings; the next that one was entering on some strange country of nightmares for which an appropriate and wildly fantastic landscape had been formed, some dreadful and stormy day, when, in their mid career, the broken and chaotic clouds had been stiffened in a single instant into stone. For all around were rocks and pinnacles of rocks of seemingly impossibly fantastic forms, standing in apparently impossibly fantastic ways—nay, placed one on or next to the other in positions seeming to defy every law of gravity—rocks in groups, rocks standing singly, rocks in terraces, rocks as columns, rocks as walls and rocks as pyramids, rocks ridiculous at every point with countless apparent caricatures of the faces and forms of men and animals, apparent caricatures of umbrellas, tortoises, churches, cannons, and of innumerable other most incongruous and unexpected objects. And between the rocks were level spaces, never of great extent, of pure yellow sand, with streamlets and little waterfalls and pools and shallow lakelets of pure water; and in some places there were little marshes filled with low scanty and bristling vegetation. And here and there, alike on level space and jutting from some crevice in the rock, were small shrubs, in form like miniature trees, but all apparently of one species. Not a tree was there; no animal life was visible, or it even seemed, so intensely quiet and undisturbed did the place look, ever had been there. Look where one would, on every side it was the same; and climb what high rock one liked, in every direction as far as the eye could see was this same wildly extraordinary scenery.

To complete such picture as I am here able to give of the scenery on the top of Roraima some few words further concerning the vegetation there occurring seem necessary, even though all details of this subject must be deferred to a future occasion. It has been said that the general character of all the plants there present is dwarf; it may be added that it is in this respect almost alpine. It almost all occurs in the little swamps, on level water-saturated ground, to which reference has already

been made; but a very few plants, hardly differing in character from those on these levels, occur in the crevices of the rocks. Those on the level ground appearing to the eye from a distance to be grasses, are in reality chiefly one or two species of grass-like *Pœpalanthus*; a few real grasses occur; great quantities of most splendid and luxuriant pitcher-plant (*Heliamphora*) and of the yucca-like plant said to be poisonous. An interesting feature connected with this latter plant was that on the summit of the mountain this plant was in full flower, though only expended seed-pods were visible on it below; and its yellow crowns of flowers surmounting the tall stiff stalks, which in external appearance may be very closely likened, both as to form and colour, to that of the well-known Crown Imperial (*Fritillaria imperialis*) at home, were sufficiently abundant and remarkable to lend a character of their own to the scene. Most, if not all, of the lovely flowering plants already described as occurring at the top of the ledge were also very abundant on the top; from which latter place, indeed, they had probably originally reached the ledge. The stunted tree-like character of the only shrub, five to six feet in height, occurring on the summit has already been mentioned. As regards the very scanty vegetation in the crevices of the rocks, this was almost entirely composed of two or three insignificant ferns, resembling in external character the European *Asplenium septentrionale*, and of a most exquisite and large flowered *Utricularia*, one of the three species to which I shall have to refer fully in dealing in another paper with the plants of Roraima.

Only after some time was the perception felt that there was after all some trace of order in this apparent disorder. What this order is, is rather difficult to explain briefly. The top of the mountain seems to be not, as was supposed, quite flat, but to have the form of a basin, very shallow relatively to its extent, its edge being formed by the actual rugged edge of the cliff. The surface of this basin seems to be divided up, in a manner which if it were artificial would be very irregular, but which as the work of nature is singularly regular, into a vast number of much smaller, yet still very shallow basins, these small depressions forming the amphitheatre-like level spaces, of which I have already spoken, the separating walls between them being represented by the curiously terraced ridges of rock, which, it appeared, are really irregularly semilunar, or even in some cases ring-like, in arrangement.

Moreover it is to be remarked that of these ridges each is of by no means one height throughout its extent; each of them, like a miniature mountain chain, rises, at curiously regular intervals, to form rugged pinnacles or pyramids, up the sides of which the rude step-like terracing, just as elsewhere along the ridge, generally runs, as though to offer a means of access to the traveller even up to the highest points.

The greatest depth of the general basin occupying the whole top of Roraima we had no means of ascertaining; nor can I estimate the depth

of the smaller basins in other parts than those seen by us. Elsewhere they may possibly be of considerable depth, forming large receptacles or ponds of water. But where we were I should say that the actual greatest depth of none of them was more than from 10 to 20 feet, and that they varied in diameter, roughly speaking, from 100 to 500 yards. The height of the highest pinnacle we measured, this one being the highest we saw, was about 80 feet.

These basins or depressions hold a considerable quantity of water, some of this being visible in the many small streams and pools described, much more being stored in the super-saturated vegetation of the marshes. Moreover the very rocks which bound these basins are themselves saturated and super-saturated even up to their highest points with water, which, constantly percolating slowly down into the basins, is constantly renewed from atmospheric sources. Even at the time of our visit, after so long a dry season, rock and hollow alike were almost full of water; so that but little was then flowing from them over the cliff-face to fall below, yet each single, not very heavy, shower of rain sufficed to swell the water in them to such an extent that the cascades over the cliff at once became of considerable size. It should be added that the edge of the cliff is not, as it appears from below, an even line, but is cut at right angles by various more or less deep channels, which, shielded from observation from below by the fact that they often pass parallel to the cliff behind false faces to the cliff, allow an outflow of water from the summit of the mountain down the cliff long before the water has reached the actual average level of the edge of the cliff.

These circumstances sufficiently explain most of the phenomena noticed from below by previous travellers. They explain the constant flow of water over the cliff, the rapid increase of this flow at certain intervals, and the rhythmic, intermittent or wave-like nature of the overflow in dry weather—for this latter phenomenon is evidently due to the fact that the water, which is not at those times at a sufficient level to reach the points of overflow, is then blown at short intervals from the surface of the shallow pools by the varying force of the breezes which are almost continually battling over the top of the mountain. They explain also Robert Schomburgk's statement that the water seems to flow not from the top of the cliff but from points some distance below; for the water flows through deep and narrow sloping channels, which it has cut for itself so as to issue at some distance down the face of the cliff, the channels themselves being indiscernible from below, sometimes because they are lost to sight in the general irregularity of the rock surface, sometimes because issuing from behind a false face to some portion of the cliff.

The one observation of previous travellers which I find it somewhat difficult to reconcile with facts, is that in which it has frequently been asserted, that the top is covered with trees. As regards the northern

end of the mountain, as I have not seen this, I cannot positively assert that there are no trees on it. But the remark has chiefly been made with reference to the southern end, at the point at which we ascended. I can only suppose that previous travellers, obtaining only a distant view, have mistaken the many and extraordinarily rugged pinnacles and points of rocks for the tops of trees.

Small fleeting masses of clouds were passing over the top during the whole of our visit, though it was a fine and otherwise a bright day. So many and changing were these clouds that I only managed to secure sketches by seating myself on a high pinnacle of rock from which four or five interesting points were visible at once, and turning to sketch each of these as each in turn became visible. I suppose that there are few days in the year when it is really clear on the top of Roraima. And these constant mists and the frequently prevailing heavy clouds and rain-storms, together with the constant and varying, but ever powerful winds, account for the super-saturation with water of everything on Roraima. Furthermore, the soft sandstone rock, always thus saturated and always exposed to the strong blasts of many winds, owes its fashioning into its very remarkable forms simply to extraordinarily active aerial denudation.

There would be great difficulty, almost amounting under present circumstances to impossibility, and only to be overcome by a very considerable expenditure of time and money, in clearing the path through the forest slope and up the ledge so as at least to be able to carry up hammocks and provisions, so as to be able to remain for a night on Roraima, or even to sleep at any point much nearer the top than "our house." It is also equally impossible to reach the top early enough in the day to explore more than a certain short distance from the point first reached. As far, however, as I could see from the summits of the tallest pinnacles, and this is no inconsiderable distance, the character of the whole of Roraima is that of the part more directly examined. And the summit of the neighbouring mountain of Kukenam, visible from Roraima because considerably lower than that mountain, is also of the same character.

There is no need to describe our climb down the mountain to our house. Once there, it became necessary to consider our further plans—whether to ascend again from this same point; or to proceed round the mountain with a view, not of trying any new point of ascent, but of ascertaining the practicability of such attempts in the future; or whether, satisfying ourselves with the fair measure of success with which we had already met, to turn homeward. The growing scarcity of provisions, the even much more serious exhaustion of our stock of beads, gunpowder, and other articles of barter, and the increasing symptoms of ill-health which I and some others of the party had for some time felt, decided me in favour of a return homeward.

Till the 24th of December we remained at our house on Roraima, occupied in finishing the various sketches, measurements, collections, and other tasks which we had undertaken. Then, on Christmas Eve, we descended to the village of Teruta, where we found that, without any prompting from us, the Arekunas had built a very large new house for us to spend our Christmas in.

Christmas Day at Teruta was wet and gloomy as far as the weather was concerned. By the evening the fall of the Kukenam river and the two falls, of the Kamaiwa and of the nameless river on to the ledge, had swollen to a very great size, so that the sound of their thunder was heard loud and far; and in addition to them eight other cascades, most of them hardly discernible in ordinary weather, now fell in great volume down the face of Roraima alone.

One other feature of that day deserves record. The *Cattleya* before mentioned had been brought to Siedl in enormous quantities and in splendid flower; and to us too it had been similarly brought until, fearing to increase our already too bulky baggage, I declined to take more. It grows abundantly, not far up Roraima, but along the bed of the Kukenam and other rivers, at the foot of that mountain, at an elevation of from 3700 feet to perhaps 4000 feet. Each walk by the side of these streams disclosed abundant specimens. But on Christmas Day I was lucky enough from one tree, overhanging the bathing pool in the Kukenam, close to Teruta, to collect two most glorious clumps of this orchid, the better of the two having five spikes of flower, of which one bore nine, each of the others eight, blossoms, in all forty-one of some of the largest and finest coloured *Cattleya* flowers ever seen, on a single small plant, the roots of which easily lay on my extended hand. Our Christmas decoration then, consisting of an enormous pile of these flowers, was a fitting farewell to the glorious flower forms of Roraima.

The next morning we started homeward, and returning along our old path, after some serious misfortunes, causing much delay, and not a few adventures, which must be told, if ever, on some future occasion, we reached our old starting-place at the junction of the Essequibo and Mazaruni rivers on the 28th of January. Siedl, who left Roraima two days after we did, arrived at this same point two days after us.

ART. VI.—*On Urao;* by THOMAS M. CHATARD.*

IN this Journal for August, 1888, p. 146, I gave the analyses of the waters of some American alkali lakes, among them, Owens Lake, Cal. The salts now to be described were obtained by the spontaneous evaporation of the water of the lake, and in connection with the results obtained from other localities, throw much light on the true character of the composition of the native sodium carbonates.

* Condensed from "Natural Soda, its occurrence and Utilization," a forthcoming bulletin of the U. S. Geological Survey. Published by permission of the Director.

The occurrence, in Venezuela, of the mineral urao has been described by Faxar* and by Boussingault.† The latter gives the following analysis:

		Hypoth. Comp.	
Na_2O	41·22	Na_2CO_3	46·98
C_2O	39·00	$NaHCO_3$	37·24
H_2O	18·80	H_2O	14·80
Impurities	0·98	Impurities	0·98
	100·00		100·00

By deducting the impurities from this analysis, Laurent‡ obtained as the formula of the pure salt,

$$Na_2CO_3, NaHCO_3 + 2H_2O.$$

The impurities in such salts are insoluble matter, with chloride and sulphate of sodium, all of which can be deducted when we wish to calculate the formula since they are, under the circumstances, anhydrous and merely diminish the percentage of urao in the material. If we deduct the impurities from this analysis and recalculate the residue to 100 per cent, and likewise calculate the theoretical percentages for the above formula, we shall have:

	Found.	Theoret.	Hypoth. Comp.		Theoret.
Na_2O	41·63	41·15	Na_2CO_3	47·44	46·90
CO_2	39·38	38·94	$NaHCO_3$	37·61	37·17
H_2O	18·99	19·91	H_2O	14·95	15·93
	100·00	100·00		100·00	100·00

If we take the theoretical proportion between the Na_2CO_3 and the $NaHCO_3$ we have $Na_2CO_3 : Na_2HCO_3 :: 106 : 84 :: 47·44 : 37·51$ while the amount of $NaHCO_3$ found in 37·61, a difference of only 0·11 per cent. Hence Boussingault's urao is an almost theoretically pure salt, showing only a small loss of water and a trifling increase of $NaHCO_3$.

The existence of a native sesquicarbonate of sodium, Na_2CO_3, $2NaHCO_3 + 3H_2O$, to which the mineral name trona has been given, rests on an analysis by Klaproth,§ and under this head the numerous analyses of natural sodas to be found scattered through the literature of the subject have been referred. A careful revision and recalculation of these analyses, in the manner described above, show that none of them, excepting those of Popp,‖ agree, even reasonably closely, with this formula,

* Faxar, Ann. de Chimie, II, ii, 432.
† Boussingault, ibid., II. xxix, 110.
‡ Laurent, Ann. de Chimie, III. xxxvi, 348.
§ Klaproth, Beiträge, iii, p. 83, 1862.
‖ Popp, Ann. der Chem. u Pharm., 155, p. 348.

but that on the contrary, the salts were uraos with a widely varying excess of one or the other of the two carbonates. A repetition of Winkler's* method for the artificial production of sodium sesquicarbonate gave additional proof, for the salt obtained was physically and chemically a urao having an excess of $NaHCO_3$, as would be expected from the conditions of this formation. Hence the conclusion that *there is no such salt, either natural or artificial, as sodium sesquicarbonate*, but that the true salt is a union of one molecule of Na_2CO_3 with one of $NaHCO_3$, although the presence of an excess of $NaHCO_3$ may occasionally give results approaching the composition of a sesquicarbonate. Many analyses, notably those of Wallace,† who suspected the non-existence of sesquicarbonate, show uraos containing an excess of Na_2CO_3, while de Mondesir‡ was the first to publish a method for the artificial production of the pure salt to which, on account of the relation of $3NO_2O$ to $4CO_2$, he gives the name "carbonate quatre-tiers" or "four thirds carbonate." It might be called the "tetra-trita" or "tetrita-carbonate."

The five salts now to be described, were obtained by spontaneous solar evaporation of natural water and hence are "minerals." Nos. 1 and 2 are from the same specimen and were formed in an artificial ground vat. When the water of Owens Lake is allowed to evaporate, the first crop obtained is granular crystalline and retains much mother liquor. The mother liquor is therefore drawn off and this first crop, as far as practicable, redissolved in lake water, thus forming a new solution which deposits a sheet of crystals much larger and purer than the first product. The specimen of this sheet taken for analysis was about two inches thick; the upper portion was well crystallized and translucent (No. 1); the intermediate part showed an interlamination of thin, translucent, crystallized sheets and of fine-grained crystalline, white material (No. 2), the undissolved portion of the first product; the bottom part of the specimen was a layer similar to the upper portion but thinner, the crystals being much smaller. No. 1 presented a radiated columnar structure, the crystals being so grown together that the terminations alone were visible and these so combined that each combination had a curved ridge-like termination or cock's-comb form. The specific gravity of this material was 2·1473 taken in benzol at 21·7° C.

No. 3 or "Twig" was formed on a branching grass-root which chanced to be suspended in the water of a small lagune on the east side of the lake. It has the form of a stout twig or of a

* Winkler, Buchner's Repert. f. Pharm., xlviii, p. 215.
† Wallace, Chem. News, xxvii, p. 203.
‡ De Mondesir, Comptes Rendus, civ, p. 1505, May 31, 1887.

branching coral, each of the branches forming a cylinder, a section of which shows the radiated structure, while the surface of the cylinder is rough, the curved edges of the crystal aggregates giving a lenticular appearance. The color is brownish and one side of the specimen shows crystals of NaCl and much sand as the evaporation of the water finally left it lying on the mud of the bottom.

No. 4 or "Lagune" is from another small lagune near by, and consists of a thin sheet, the surfaces of which are rough like the preceding specimen. Color pink, due to organic matter.

No. 5 or "Beach vat" was formed in a vat dug in the beach and allowed to fill by seepage from the surrounding soil. This seepage water differs somewhat in composition from the water of the lake.

	No. 1.	No. 2.	No. 3. Twig.	No. 4. Lagune.	No. 5. Beach vat.
Insol. inorg.	·02	·22	2·92	·40	4·10
" organic	....	....	·14	·12	·27
SiO_2	....	·10	·05	·09	·04
CaO	....	....	....	·06	....
MgO	....	....	....	·02	....
K_2O	....	....	....	tr.	....
Na_2O	40·995	41·26	40·22	40·08	39·36
Cl	·193	1·57	2·73	·21	1·83
SO_3	·702	·79	·76	·63	·84
CO_2	38·13	37·00	35·24	37·50	35·10
H_2O	20·07	19·62	18·31	19·94	18·58
	100·11	100·56	100·37	99·05	100·12
O=Cl	·04	·35	·61	·05	·41
	100·07	100·21	99·76	99·00	99·71

Calculating the hypothetical composition, deducting the impurities and recalculating to 100 per cent we have:

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Na_2CO_3	46·57	47·20	46·76	50·35	46·65
$NaHCO_3$	37·03	36·22	37·04	32·53	36·83
H_2O	16·40	16·58	16·20	17·12	16·52
	100·00	100·00	100·00	100·00	100·00

If we compare these new percentages with the theoretical figures for urao, previously given, we shall find the following differences.

	Theoret.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Na_2Co_3	46·90	−·33	+·30	−·14	+3·45	−·25
$NaHCO_3$	37·17	−·14	−·95	−·13	−4·64	−·34
H_2O	15·93	+·47	+·65	+·27	+1·19	+·59

These small differences show that each of the samples is urao. In each case there is a varying amount of other salts and impurities to be deducted, but when this is done the residue, in four out of the five samples, shows a very close agreement with the formula of the mineral. In the case of No. 4 or the "Lagune" the differences are quite large, but as the local conditions attending the production of each specimen are well known, the explanation is simple. Unlike the others which are products of undisturbed crystallization, this one is apparently the result of an interchanging concentration and dilution of the mother liquor in which it was formed. As the water in such a shallow basin evaporates the tendency is to leave a crust of very pure urao, at the edge of the basin, the deposit towards the center becoming more and more impure as the concentrating liquid deposits its chloride and sulphate and becomes, as experiments show, a comparatively pure solution of sodium mono-carbonate. If then the basin be refilled by seepage, as would be the case when the lake rises in the spring, the solution would contain a larger proportion of the neutral carbonate and, on reconcentration, would leave on its edges a urao containing an excess of hydrated monocarbonate. If we calculate the excess of monocarbonate and water present, we shall find that the two combine to form $Na_2CO_3+2H_2O$ and that the sample represents 84·71% urao, 12·06% Na_2CO_3, $2H_2O$, ·02% H_2O and 2·21% impurities.

Artificial Urao.

A series of experiments was undertaken, in order to determine the conditions under which urao is formed and also to find out if, by spontaneous evaporation, under known conditions the sesquicarbonate or any other combination of mono- and bicarbonate, other than urao, might be formed. For this investigation a number of solutions was prepared, each of which contained Na_2CO_3, $NaHCO_3$ and NaCl, the amount of each salt employed having a certain definite relation to its molecular weight. NaCl was added because its presence appears to exercise a favorable influence on the crystallization of the mixed carbonates. A full account of these experiments and results will be found in the Bulletin from which this paper is condensed; for the present it is sufficient to say that in no case, no matter what the relative proportions of the salts might be, was any other mixed carbonate but urao obtained. If the $NaHCO_3$ was present in excess a portion crystallized out first, as such, but this was invariably followed by crystallizations of urao. On the other hand if the Na_2CO_3 was in sufficient excess, the urao first obtained was contaminated with the former salt. The following examples will show this. The solutions were made up as follows:

	No. 1.	No. 2.	No. 5.	No. 6.	No. 7.	No. 9.
$NaHCO_3$ grms...	10·5	21·0	10·5	10·5	42·0	5·25
Na_2CO_3 " ..	53·0	53·0	53·0	53·0	53·0	3·50
NaCl " ..	29·25	29·25	14·62	58·5	58·5	29·25

The first products obtained from the solutions by spontaneous evaporation had the following compositions:

	No. 1, 1st. Acicular.	No. 2, 1st. Scales.	No. 5, 1st. Acicular.	No. 6, 1st. Acicular.	No. 7, 1st. Scales.	No. 9, 2d. Acicular matted.
H_2O....	19·58	11·78	19·54	19·42	11·63	18·91
CO_2....	38·73	51·69	37·88	37·76	51·52	36·46
Na_2O...	40·07	36·54	41·02	39·85	36·49	39·32
NaCl...	1·46	·51	1·72	2·88	undet.	5·58
	99·84	100·52	100·16	99·91	99·64	100·27

Hypothetical Composition.

H_2O....	15·37	1·25	15·96	15·55	·92	15·41
Na_2CO_3.	43·69	·42	49·00	45·29	·64	46·60
$NaHCO_3$	39·32	98·34	33·48	36·19	98·08	32·68
NaCl...	1·46	·51	1·72	2·88	undet.	5·58
	99·84	100·52	100·16	99·91	99·64	100·27

	Urao.	$NaHCO_3$	Na_2CO_3,H_2O	H_2O	NaCl
No. 1 corresponds to	93·15+	4·70+	....	·53+	1·46
No. 2 " "	·89+	98·01+	....	1·11+	·51
No. 5 " "	90·08+	....+	7·89	·47+	1·72
No. 6 " "	96·56+	·30+	....	·17+	2·88
No. 7 " "	1·37+	97·57+	....	·70+	undet.
No. 9 " "	87·92+	....+	6·27	·50+	5·58

A solution made up in the proportions of No. 6 would seem to be best for the production of this salt as the crystallizations were much finer than in any of the others. If the proportion of $NaHCO_3$ is increased, the excess separates before the urao is formed, while if it is reduced the urao contains monohydrated carbonate. The presence of NaCl is not absolutely necessary, for experiment has shown that a very good crystallization of urao can be obtained without its aid, and even a solution of chemically pure Na_2CO_3, if exposed to the air for some time so that it can absorb CO_2, will yield crystals of the double salt. It is therefore somewhat remarkable that this salt which seems to be the natural form of sodium carbonate, should receive no notice in the most extensive treatises on the sodium salts or, if mentioned, be confounded with another which, so far as my own observations extend, does not exist at all.

ART. IV.—*On the Pitch Lake of Trinidad;* by S. F. PECKHAM.

AT the risk of saying a superfluous word, I am led after a recent visit to Trinidad, to add my testimony to that of the numerous observers, who for more than a hundred years have written concerning this remarkable phenomenon.

The earliest account of a visit to Trinidad, accessible to English readers, was published in the Transactions of the Royal Society of London in 1789, by Alexander Anderson.* He describes point La Brea as a promontory fifty feet high jutting into the Gulf of Paria. Ascending to the Lake he describes it as three miles in circumference divided into "areola" resembling those upon a turtle's back, the surface of each being "horizontal and smooth." He was there in the rainy season, and concluded that evaporation on the clear afternoons removed the torrents of water that fell in other parts of the day, as there was no other outlet. He further states that the soil around La Brea consists of cinders and burnt earth, being evidently the product of subterranean fires, as there were hot springs in the neighboring woods.

The next visitor is Dr. Nicholas Nugent, who published an account of a visit made in October, 1807.† He landed on the south side of La Brea point which he describes as consisting of a bluff of porcelain jasper, "generally of a red color." Ascending to the Lake he perceived a strong sulphurous and pitchy smell, like that of burning coal, and soon after had a view of the Lake, which at first sight, appeared to be an expanse of still water, frequently interrupted by clumps of trees and shrubs, but on a nearer approach it was found to be a plain of mineral pitch with frequent crevices filled with water. "The surface of the lake was not polished or smooth so as to be slippery; the consistence was such as to bear any weight, and it was not adhesive; though it partially received the impression of the foot, it bore us without any tremulous motion whatever, and several head of cattle were browsing on it in perfect security. The interstices or chasms are very numerous, and being filled with water, present the only obstacle to walking over the surface. The arrangement of the chasms is very singular, the sides are invariably shelving from the surface, so as to nearly meet at the bottom, but there they bulge out towards each other with a considerable degree of convexity. These crevices are known occasionally to close up entirely, and we saw many marks or seams from this cause. The lake contains

* Philosophical Transactions, lxxix, 65, 1789.
† Transactions of the Geological Society of London, i, 63, 1811.

many islets covered with long grass and shrubs. It is not easy to state precisely the extent of this great collection of pitch; the line between it and the neighboring soil is not always well defined. The main body may perhaps be estimated at three miles in circumference; the depth cannot be ascertained, and no subjacent rock or soil can be discovered. The negro houses in the vicinage, built by driving posts into the earth, frequently are twisted or sunk on one side. In many places it seems to have actually overflowed like lava, and presents the wrinkled appearance which a sluggish substance would exhibit in motion. In some parts it is black, with a splintery or conchoidal fracture; in other parts so much softer, as to allow one to cut out a piece in any form with a spade or hatchet, and in the interior it is vesicular or oily; this is the character of by far the greater portion of the whole mass: in one place it bubbles up in a perfectly fluid state, so that you may take it up in a cup."

"In the southeastern part of the island there is a similar collection of this bitumen, though of less extent, and many small detached spots of it are to be met with in the woods; it is even said that an evident line of communication may thus be traced between the two great receptacles."

Dr. Nugent devotes considerable space to a discussion of the geology and origin of the bitumen. As his opinions are based on theories no longer accepted by geologists I will only remark *en passant*, that he associates the mud volcanoes of Cedros Point with the agencies that have been active in bringing the bitumen to the surface.

The next notice that appeared, was written in September, 1832 by Capt. J. E. Alexander, 42d Royal Highlanders.* He says, "at the small hamlet of La Brave, a considerable extent of coast is covered with the pitch, which runs a long way out to sea, and forms a bank under the water. The Pitch Lake is situated on the side of a hill, a gradual ascent leads to it, which is covered with pitch in a hardened state, and trees and vegetation flourish upon it. The pitch at the sides of the lake is perfectly hard and cold, but as one walks off towards the middle with shoes off, in order to wade through the water, the heat gradually increases, the pitch becomes softer and softer, until at last it is seen boiling up in a liquid state, and the soles of the foot become offensively warm. During the rainy season, it is possible to walk over the whole lake, nearly, but in the hot season a greater part is not to be approached. The Lake is about a mile and one-half in circumference; and not the least extraordinary circumstance is, that it should contain eight or ten small islands, on which trees are growing close to the

*Journal of the Franklin Institute, 1833, xv, 337. New Edinburgh Philos. Magazine.

boiling pitch. In standing for some time on the lake near the center, the surface gradually sinks until it forms a great bowl, as it were; and when the shoulders are level with the general surface of the lake, it is high time to get out. The flow of pitch from the lake has been immense, the whole country round, except near the Bay of Guapo, being covered with it; and it seems singular that no eruption has taken place within the memory of man, although the principle of motion still exists in the center of the lake."

Speaking of Point Cedros, he says, "what renders this point so interesting to the stranger is an assemblage of mud volcanoes, of which the largest may be about one hundred and fifty feet in diameter. At times the old craters cease to act, but when that is the case new ones invariably appear in the vicinity. The mud is fathomless, yet does not overflow, but remains within the circumference of the crater. From what I recollect of the Crimea, I should say that there is a remarkable similarity between it and Trinidad;—geologically speaking, in both there are mud volcanoes, in both there are bituminous lakes, and both have been frequently visited with earthquakes."

The next observer was Mr. N. S. Manross, who visited the lake in 1855, and has been widely quoted. He says, "the village of La Brea stands on a projecting tongue of land which owes its preservation from the inroads of the sea to the fact that it consists entirely of hardened pitch, which withstands the waves far better than the loose materials of the accompanying formations. The shore for miles, both north and south, consists mainly of the same material, and juts boldly out into the sea wherever it is thus pitch-bound. A road leads up from the landing to some sugar estates beyond the lake. It ascends a gentle slope of hardened pitch, which, where left to itself is covered with a dense growth of reeds and bushes. The road itself is a fine illustration of the adaptation of pitch to the purpose of paving. Where too much mixed with earth it has become pulverized to a depth of a few inches, but in many places it is still so pure and solid that the wheels of heavily loaded sugar wagons and the hoofs of horses make but a slight, and even that, a transient impression. In no part of the ascent to the shore of the lake does the stream of pitch appear to be covered by more than one or two feet of soil, while in most places it is entirely bare. In places where the surface is not protected by vegetation it becomes so far softened by the sun as to be still making progress downward.

"On nearing the lake the ascent becomes steeper. Here the pitch is bare, or but slightly covered with grass. Its appearance is not that of a sudden simultaneous overflow in a single

smooth stream, but that of a great number of streams each but a few yards or rods in breadth. Their surfaces are drawn out into all manner of contortions, and where the edges meet, small ridges have been thrown up and the pitch broken into fragments not unlike the scoriæ of lava currents. These fragments of pitch were on fire in several places, having been kindled by a fire that ran through the 'bush' a few weeks before."

"On ascending the last slope of this pitchy glacier a singular scene meets the eye. A black and circular plain of pitch one-half mile in diameter lies flush with the edge of the stream. It is surrounded by a dense wall of forest in which various species of tall palm are most conspicuous. The lake itself is entirely bare of vegetation, except about twenty small clumps of trees which are arranged in a sort of broken circle about one-half way from the center to the circumference."

"The entire surface of this circular plain is seen to be interspersed by a network of water channels. Its appearance is exactly that of marbled paper. The pitch is divided into flat or slightly convex areas, mostly polygonal but sometimes circular. They vary from one to eight rods in diameter. The intervening spaces are full of water. These channels (or spaces) have heretofore been described as crevices or cracks in the pitch. This description however is incorrect, for the material, though apparently almost as hard as stone, is yet far too plastic to admit of anything like a fissure remaining open in it. The channels are produced and maintained by the following singular process. Each of the many areas into which the Lake is divided possesses an independent revolving motion in this wise: at the center of the area the pitch is constantly rising up, not breaking out in streams, but rising *en masse*. It is thus constantly displacing that which previously occupied the center, and forcing it towards the circumference. The surface becomes covered with concentric wrinkles and the interior structure somewhat laminated. When the edge of such an expanding area meets that of the adjoining one the pitch rolls under, to be thrown up again at the center at some future period. The material is nearly soft enough to meet and form a close joint at the top but descends with a rounded edge and at a considerable angle. The conclusion then to which a close observation leads us in regard to the present condition of this singular lake is, not that it has suddenly cooled down from a boiling state, as heretofore described, but that, as the material is, it is still boiling although with an infinitely slow motion. As the descent of the glacier may be considered the slowest instance of flowing in nature, so the revolutions of the scarcely less solid bitumen of this lake may be set down as the slowest example of ebullition."

"Towards the center of the lake several detached areas are met with, the surfaces of which yield under the foot. On standing ten or fifteen minutes one may find himself ankle deep. A person standing long enough would undoubtedly sink and perhaps disappear in it; but in no place was it possible to form those bowl-like depressions around the observer as described by former travelers."

"The water which filled the crevices of the pitch is clear and very pure. It is the favorite resort of all the washerwomen for miles around. As the water is flowing now, the pitch has formerly flowed from the lake in all directions. The entire surface covered by it is estimated at 3000 acres. The pores of the pitch are full of water which oozes out on the slightest pressure, and by moistening the skin prevents adhesion. Streams of gas issue, sometimes rising through the water, but more frequently from small openings in the pitch above water level."

"In one of the star-shaped pools of water, a column of pitch had been forced up from the bottom, expanding into a sort of center-table about four feet in diameter. Pieces torn from the edge of this table sank readily, showing that it had been raised by pressure and not by buoyancy."

"About a mile and one-half south of the lake I observed numerous beds of indurated clay filled with the remains of leaves and vegetation. A little further on appears a bed of brown coal and lignite, about twelve feet thick. It has such a dip and direction that, if continuous, it would pass under the lake at a great depth. About a mile to the northwest of the lake another bed of brown coal crops out upon the shore. It is about twenty feet thick. From the occurrence of such considerable accumulations of vegetable matter, so situated as apparently to pass under the lake, it seems reasonable to regard them as the source of the pitchy matter. Indeed, many pieces of wood may be observed in the beds of brown coal, which differ in no respect in their appearance from many of the pieces thrown up in the lake itself."

Mr. Manross* is completely at sea in his points of the compass.

The observations upon which the descriptions of this lake, from which I have made careful abstracts, were based, were made from forty to one hundred and six years ago. I have been able to verify them in almost every particular, and these descriptions clearly portray the appearance and condition of the lake at the time I visited it in March, 1895. In addition to these descriptions, other observations quite different in character and purpose have been made concerning the island

* This Journal II, xx, 153, 1855.

of Trinidad, and incidentally of the Pitch Lake, during the last thirty-five years. In 1860 Messrs. Wall and Sawkins published quite an extended report upon the geology of Trinidad, including observations upon the occurrence of bitumen throughout the island.*

Dr. Nugent remarked in the article above quoted, "and it must be remembered that geological enquiries are not conducted here with that facility with which they are in some other parts of the world; the soil is almost universally covered with the thickest and most luxuriant vegetation, and the stranger is soon exhausted and overcome by the scorching rays of the vertical sun."† These observations exactly express the conditions under which these gentlemen performed their undertaking. It is therefore not surprising that errors should have been found in their conclusions and corrected by later observers.

Mr. J. R. Lechmere Guppy, in 1892, thus stated the conclusions that he had reached in reference to Trinidad Geology.‡

"It appears from the evidence derived from the nature of the Naparima rocks, their fossil contents, and the movements which have effected them and the other formations of Trinidad, that during the Cretaceous and Eocene periods, there was a sea having a considerable but variable depth of water, say up to one thousand fathoms and more. It is probable that this sea extended on the North to the base of the northern range of hills, a distance of some twenty or twenty-five miles from the northern limit of the Naparima deposits. During the Cretaceo-Eocene period the northern mountains probably formed an unbroken chain with the littoral cordillera of Venezuela. This chain may be called the 'Parian Range.' According to abundantly clear evidence given by me in 1877,§ the great chasms between Trinidad and Venezuela called the Bocas del Drago were produced by subsidence. Previous to this the 'Parian Range' probably formed the southern boun-

* Report on the Geology of Trinidad, by order of the Lords Commissioners of Her Majesty's Treasury, London, 1860.

† Loc. cit., p. 70.

‡ Quar. Journal Geological Soc., 1892, xlviii, 519-536. Ditto, xxii, 571; ditto, xxiv, 11; ditto xxvi, 413; ditto, xlviii, 221.

The "Naparima rocks" consist of an anticlical that abutting in a bluff near San Fernando, on the Gulf of Paria, extends across the island almost to the East coast. They also appear on the mainland of Venezuela near the Bay of Cumana. The lowest strata are Cretaceous and are called together with the Eocene above them the "Older Parian." The "Newer Parian" above is Miocene and contains lignites and bitumen. Here orbitoides and nummulites are found in a mass of rock projecting into the Gulf of Paria, supposed to be Miocene. In the Western Hemisphere orbitoides are supposed to characterize the Eocene. In the Eastern Hemisphere nummulites are characteristic of the same formation. The deposit that here contains them both lies between other Miocene deposits.

§ Proceed. Scien. Assoc., Trinidad, Dec., 1877, p. 103.

dary of the Carribean continent and was a barrier through which no large river found its way. The 'Parian Range' may be regarded as one of those 'stable areas' which has never been submerged since Paleozoic times."

"To the westward the Cretacco-Eocene sea probably extended as far as the present low-lying alluvial plains of Venezuela. In this direction it was no doubt bounded by the high lands now forming the Pico de Cumanacoa and the Cerro del Bergantin, ranges at present twice as high as any in Trinidad. Its southern extension went presumably near to the granitic and gneissic ranges and plateaux of Guiana."

"After the close of the Miocene period there was probably in the region south of the 'Parian Range' a slow and gradual upheaval which brought the oceanic deposits above the level of the sea, during which process they suffered great denudation. The Gulf of Paria was then land, and Trinidad was then united to the mainland. At that time the river Guarapiche probably flowed across Trinidad from Venezuela, while the Orinoco continued to pour its waters into the ocean at some distance southward. The disruption of the 'Parian Range' and the formation of the Bocas and the Gulf of Paria followed. There are paleontological reasons for believing that this submergence did not take place until a late geological epoch."

From this conclusion it is manifest that the Miocene period was one of frequent alternation of elevation and submergence, during which there were long periods when the different members of the formation were covered with tropical swamps having luxuriant vegetation, that are now represented by the great swamp at the east end of the island. The buried vegetation of these swamps has been converted into coal through Pliocene and recent times which has been distilled at low temperatures, probably initiated by fermentation within the mass of the coal itself, assisted by the water of thermal springs.

Messrs. Wall and Sawkins discuss at length the phenomena peculiar to the lake and disagree with previous observers to such an extent that, after a careful examination of their paper I am forced to the conclusion that their study of the subject was extremely superficial. In illustration: they say of the "areas," "the surface is frequently marked with ridges, especially near the edges; these are due to the constant expansion and contraction which is supposed to occur." A most singular explanation, resting on *supposed* phenomena that were neither observed nor proved theoretically. Although they quote Bischoff,* it is only to prove a possible origin for the asphaltum

* Bischoff, Chem. and Phys. Geol. (Cav. Soc. Ed.), i, 288, 290, 291.

by direct conversion from woody fiber, leaving entirely out of consideration the conclusions of this eminent author in reference to the production of hydrogen sulphide, to which further reference will be made. It is, however, just to these authors to remark that the general knowledge of the world concerning bitumens and their origin has been vastly increased during the thirty-five years that have elapsed since they issued their report.

Charles Kingsley and some others have written descriptions of the lake since 1860, but no new facts are stated by them.*

During 1892 the Hon. W. P. Pierce, then United States Consul at Port of Spain, at the request of the department, made a very full and able report upon the asphalt of Trinidad.† The fullness with which all sources of information are made to lend their quota towards a general conclusion in regard to all possible aspects of this question, is of itself the best guarantee, to any unprejudiced reader, of the eminent fairness of this report. Its appearance was almost immediately followed by another report made by Mr. Clifford Richardson, at that time Inspector of Asphalt and Cement for the District of Columbia.‡

This report of Mr. Richardson, while seemingly emanating from a wholly disinterested source, presents statements and conclusions in many respects quite different from those reached by Consul Pierce and previous observers. It was for the purpose of satisfying myself as to the facts, and also of studying the occurrence of bitumen in Trinidad in the light of such observations as I had made in California and elsewhere, that I lately made a trip to Trinidad and the Pitch Lake.

On approaching Point La Brea from the northwest, the reef of asphaltum that forms a barrier around the point and against the sea, is plainly visible. Upon the point itself and jutting into the sea are what appear like low ledges of rock, which a nearer inspection proved to be masses of asphalt taken from village lots, that had been p led for shipment, but had been so long left in the tropical sun that they had melted and flowed into a solid homogeneous mass, that looked at a short distance off like ledges of slate. The piles, which were originally about twenty-five feet in height, were not more than three feet thick. Near these masses were other piles of the same material, from which lighters were being loaded, and which had not remained in the sun long enough to melt. Many hundreds of tons were included in these masses, the original pieces of which had so far coalesced that the asphalt had to be again broken with a pick before removal.

* A Christmas in the West Indies, London, 1879.

† Consular Reports, No. 145, Oct, 1892.

‡ Reports of the operation of the Engineer Department of the District of Columbia, for the fiscal year ending June 30th, 1892, Washington, 1893.

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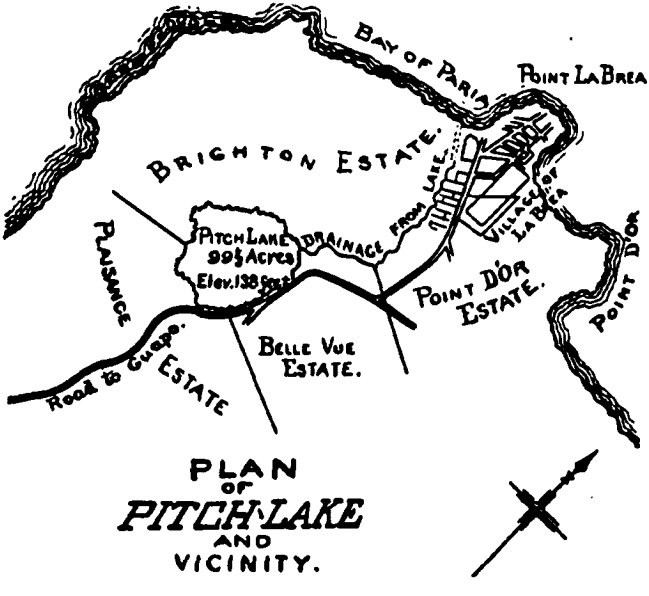

PLAN
OF
PITCH LAKE
AND
VICINITY.

Passing on shore and beyond these piles, the plant of the pitch lake concessionaires was encountered, in which the operation of boiling a mixture of so-called land asphalt, the ordinary lake asphalt and the soft pitch from the center of the lake was going forward. The operation is conducted in kettles, resembling open sugar kettles, and is a very crude and simple operation. Passing eastward, I next encountered a wide area

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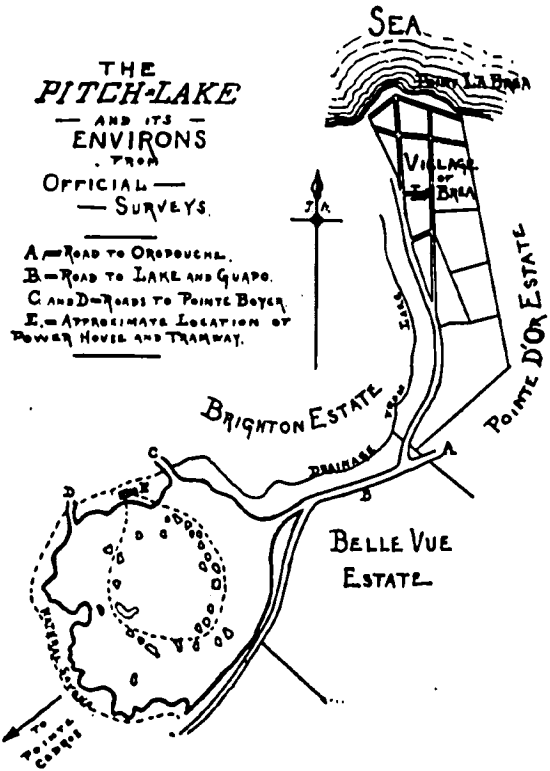

covered with asphalt, that had melted in the sun to a level surface perhaps two feet in depth. I was told that this asphalt was dug from a village lot, the ownership of which was in dispute; that originally the piles were at least twenty feet in height, but while the owners disputed the piles melted in the sun.

Farther on I struck the road to the lake, which appeared to me exactly as Mr. Manross had described it forty years ago. The houses in the village were in the same condition described by Dr. Nugent in 1807. The slope leading up to the lake was in exactly the condition in which all previous observers had described it, as resembling a lava flow—a black glacier. The several points at which asphalt had been and was being excavated, showed in the most admirable manner that the movement of the asphalt down the slope and towards the sea is still in progress. Every excavation was in a short time partially refilled by a movement of the asphalt up from the bottom and in from the sides, the cavity in time becoming filled full to the level of the surrounding area. One illustration of this fact was the spot from which the noted cargo of the Teneriffe was taken, every trace of former excavation having completely disappeared.*

The Trinidad Bituminous Asphalt Company were excavating a lot near the road, and had also recently uncovered a lot that had become almost completely refilled in a few months, after the removal of several thousand tons of asphalt. Farther up the slope the Trinidad Asphalt Company were taking out asphalt from lots on the Belle Vue estate. These lots, like most of the others, were covered with a dense tropical jungle, consisting of palms, sedges, canna and other plants, from three to ten feet in height. It did not need the testimony of Mr. Manross to show, that in all probability, fire had more than once consumed this mass of vegetation, producing a terrific heat, that had melted and converted into so-called "iron-pitch" much of the surface of the pitch. The "iron pitch" is present in greater or less quantity, both within and without the boundaries of the lake, wherever fire has consumed the vegetation, and consists simply of melted pitch which has been heated so hot as to deprive it of its water and more volatile constituents, causing it to flow in streams, often to considerable distances. Below these melted masses the pitch lies in its normal and unaltered condition.

It must, however, be constantly borne in mind, while reading the statements of different observers made on different occasions, that the lake and its principal overflow have presented different phenomena at different periods. While it was evident at the time I visited the overflow that fire had swept over its surface, it was equally evident that it had for a long time been free from any such visitation. I have seen similar flood-plains of asphalt in California that had been on fire for

* I was told by those who witnessed the digging of this cargo, that apparently no care was exercised in its selection. One gentleman declared that it was the dirtiest cargo of pitch ever sent from the island.

months, and others that had been burned some time previous to my visit to them. I can imagine that after such a fire the resemblance of the overflow of the lake to a "black glacier" would be much more pronounced than when covered with a rank growth of vegetation, as it now is. It is not, however, the surface that flows, covered as it is, by masses of coke, iron-pitch, vegetation and rubbish. The houses in La Brea now all rest on blocks. In this position they are much more stable than on posts, although anything resting upon the overflow is unstable. It is the cheese-pitch, full of water and containing more or less gas, buried beneath these surface accidents, that has flowed and still flows.

Although a large amount of clay and vegetable débris fills the interstitial spaces of the rough surface of the asphalt, the vegetation is not confined to such surfaces, but seems to flourish equally well upon the bare pitch, the roots penetrating the pitch without the slightest difficulty, except where it had been converted by melting into iron-pitch. There is also considerable coke where the fires have been hottest. All of these impurities are carefully excluded from the pitch that is mined, both for boiling and for shipment in the crude state, by all of the men employed by the different companies in extracting it. This selection is not difficult, as the appearance of the iron-pitch is very different, and the amount very small, as compared with the pure or cheese-pitch.

Near the crest of the ascent to the lake the road divides, one branch passing to the left and south ascends over the rim of the basin of the lake, and skirting the lake for about a quarter of its circumference passes over the hill to the southwest, as described by Mr. Manross. The right hand branch follows the flow of the pitch and enters upon the lake simply by a change of grade from a sharp ascent to a very slight inclination upwards towards the center of the lake. I was particularly impressed with this fact, and took pains to verify my first impression upon a second visit, as it proved conclusively that, notwithstanding the vast quantities of pitch that had been removed from the lake, there is still a movement out of the lake, glacier-like, down the slope to the sea.

My first impression as I looked over the expanse of the lake was a surprise. I had expected a scene of desolation. Nothing could be further from the reality. In the center were the islets so often described. Within and around them a dark area resembled the muddy bottom of a pond from which the water had been drawn off, with here and there patches and intervening streams of water remaining. From the border of this dark center, the vegetation arose higher and higher around almost the entire circumference of the lake, until it reached a

border of palm trees from thirty to fifty feet high. As I looked over the lake I beheld on a vast scale the appearance of asphalt beds that I had many times seen in California.

An examination of the borders of the lake showed that it occupied a bowl-like depression in a truncated cone that rested against the side of a hill that rises above the lake to the southwest. Along the line of ascent that I had followed, the slope towards the northeast to the sea is very gradual. In other directions the ascent is abrupt, sometimes steep, especially toward the south. These slopes are covered with tropical jungles consisting of palms of various species, sedges, canna and wild vines. The border of this depression presents upon the inside for the most part an escarpment of sand and clay, that has evidently been built up and afterwards broken down in many places by water. Wherever excavations have been made in the cone or the escarpment they show that the cone consists of both asphalt and earth. At a point on the south side, near where the road leaves the lake, the appearance of the surface indicates that the drainage of water from the lake was frequently in that direction to a considerable amount, notwithstanding numerous artificial drains lead out of the circumference of the lake and the wide natural outlet down the slope to the sea. To the northwest towards the sea, a heavy stream of asphalt has overflowed to the sea, forming a barrier reef for a considerable distance. Asphalt has also overflowed to the south, and the general appearance of the escarpment seemed to indicate that at some remote period the basin now occupied by the lake had been filled some three feet higher than the present level of the lake. I looked in vain for any evidence that the mass within the lake had been recently depleted; but I am aware that observations at considerable intervals of time would be necessary to establish that fact, by referring the mean level of the lake to some fixed point by means of a very careful trigonometrical survey.

A very careful study of the present appearance of the lake and its boundaries led me to believe that the suggestion of Mr. Richardson, that the lake occupies the crater of an old mud volcano, is correct, and that it has been built up of very unstable material, through contact of water issuing in large quantity from subterranean springs which has come in contact with strata identical with or resembling those described by Mr. Guppy.* Into this ascending current, resembling

*Guppy says, (Quar. Jour. Geol. Soc., xlviii, 527, note) "When a piece of the foraminiferal rock is placed in water, it absorbs it rapidly and falls asunder, and the water which enters into union with it is given up only to evaporation. . . . From these properties it follows that the natural soil roads passing over these rocks become in the wet season the worst quagmires it is possible to imagine." Of another bed, "In the presence of water this rock is the most incoherent of any I have ever met with. . . . It falls into powder at the mere contact of water."

a quicksand, was projected bitumen, at intervals in very large amounts, so that irruptions of mud have coincided with and alternated with irruptions of bitumen, the whole building up the cone and at times overflowing it, while the basin has gradually filled with bitumen to the exclusion of mud.

It is, however, equally evident that for an indefinite period there has been an outflow of bitumen from the crater towards the sea, at La Brea, not over its rim, but through a crevice in its side; in fact through its broken down side; and that, notwithstanding the vast quantities of asphalt now being taken from the lake by the concessionaires, the movement is still out of the lake.

Capt. Alexander, in 1832, spoke of the flow out of the lake as "immense." Manross, in 1855, says, "this stream of pitch has been dug through in several places, averaging from 15 to 18 feet in depth." A well dug at one point on the slope of the overflow, was abandoned still in asphalt, at the depth of forty feet. Several village lots have been excavated to a depth of twenty feet, still in asphalt. The invariable reply of the negroes to the question, "Have you ever dug through the asphalt?" was, "No, sir." The conclusion that I reached on the ground is, that the asphalt flowing down the slope to the sea fills a ravine excavated by water, and that it is slowly moving out of the lake with the pressure of the asphalt in the lake behind it. This conclusion is in harmony with the testimony of all of the observers above quoted for the last hundred years.

Concerning the condition of, and appearance of, the pitch within the lake, I think it is quite certain from all the observations above quoted that the pitch has gradually become harder and more stable during the last 100 years. I do not think that later observers have any right to question the veracity of those who have preceded them. Dr. Nugent says that in 1807, the center was so soft that it could be dipped up with a cup. Alexander describes it in 1832 as so unstable that the weight of a man produced a bowl-like depression to the depth of one's shoulders and that the heat gradually increases as one walks off towards the middle with his shoes off. Manross 23 years later, says, "It may be that the material has become much harder since the first accounts of it were written; but it is difficult to understand how the weight of a man can have displaced a mass of pitch equal to a 'great bowl' as deep as the shoulders." Kingsley 24 years later, is practically of the same opinion. At the time of my visit, a man was loading a cart near the center of the lake, and while they did not remain in one place long enough to secure a large load, there was no apparent danger of their being engulfed.

Yet it must not be assumed that the cosmical agencies that produced this deposit of bitumen have ceased to be active, or are even simply quiescent. Abundant evidence is to be found in the neighborhood and even within the lake itself, that such forces are still active. A few miles to the southwest of the lake, at Guapo, large springs of maltha or "liquid asphaltum" are now flowing, and within the boundaries of the lake near the power station of the tramway, and within only a few rods of the edge of the cone, I observed what the workmen called (and very properly) a "blowhole." This was a circular hole, about six inches in diameter, from which bitumen, more nearly fluid than any I saw elsewhere upon the island, had been ejected to the amount of perhaps a barrel. It was so soft as to flow readily, of a brilliant black color, and appeared to contain little, if any, mineral matter. I was told by a workman that such holes occurred quite frequently and so far apart as apparently to have no connection with each other.

Asphalt beds occur in California that are the product of the hardening of maltha, or mineral tar, which escapes over a considerable area. Sometimes it flows continuously from a central orifice, but oftener the flow through the hot summer seems to be arrested by the lower, winter temperature, when the orifice through which the flow took place becomes plugged. The succeeding season the maltha issues along a line of less resistance and flows through the summer, when it in turn becomes plugged. These plugged orifices are often several rods apart for successive seasons, and present the appearance of a cicatrix. I have no doubt that more extended observations than I was able to give would reveal a similar condition of outflow at and in the vicinity of the lake.

I carefully studied these phenomena as likely to offer some suggestion concerning the origin of the deposit. As a description of the observed facts, I can add nothing to that of Mr. Manross. I do not understand why Messrs. Wall and Sawkins observed nothing of the sort described by him, or thought it not "very obvious to what force or what influence this is attributable." These "areola" are very irregular in shape. I think their form may be, to some extent, determined by the weight of water pressing against their sides. The surface of each one is slightly rounded from the center to the edge of the water; they then round off at a very sharp angle, finally descending almost perpendicularly. These areas consist of pitch inflated with gas to such an extent, that when broken into, the structure exactly resembles an over fermented cheese —hence the term "cheese-pitch." The cavities are from one to three or more inches in dimensions. The gas that they contain is constantly rising to the surface, where it bubbles out

and bursts, thus forcing the center up and causing a slow but irresistible movement from the center towards the circumference, where the pitch continually rolls under, exactly as Manross has described it. His suggestions concerning the ebullition of the mass within the lake were confirmed to the very letter.

This action is explainable in this wise: Mr. Richardson's analysis of asphalt water shows it to be very rich in sulphates. As has been elsewhere shown, sulphates, especially those of the alkalies, when in solution are decomposed, when the water containing them flows through strata impregnated with organic matter, into hydrogen sulphide and a carbonate of the oxide present. When hydrogen sulphide infiltrates strata containing carbonate of lime, gypsum is formed and sulphur deposited, or converted into free sulphuric acid.*

The Miocene bituminous strata of Southern California are full of sulphur springs and numberless deposits of sulphur. One such deposit in the southern part of Kern County is supposed to contain several thousand tons of sulphur.

The reaction between sulphates present in the lake water and the bitumen or other organic material of the formation, furnishes a ready explanation of the presence of hydrogen sulphide; but I must confess that the odor of that gas was much less apparent about the lake than I had been led to expect. Analysis will alone show what the gases are that inflate the asphalt, but of their presence in enormous volume, there can be no question. At a rough estimate, I should say that from one-third to one-half the volume of the mass as it exists in the center of the lake, is gas. I also hazard the opinion that this gas makes the *mass* specifically lighter than water, else the tables described by Manross and Kingsley would not rise and spread on the surface of the water and further the masses of asphalt would coalesce, and the water would float upon the asphalt. Moreover it is without any doubt, that through this motion or ebullition which is produced, not by escape of vapor generated by heat, but by gases forced upward by their own specific gravity through a yielding mass, that the asphalt and mineral matter which forms the floors and sides of the crater, are mixed together until the asphalt is saturated; i. e. it reaches such a condition of plasticity and viscosity, that it will no longer absorb any more mineral matter in presence of water. I cannot account for the almost uniform character of the mixture of water, bitumen and mineral matter, on any other hypothesis.†

* Proc. Am. Philos. Soc., x, 445. Bischoff, Chem. and Phys. Geol., (Cav. Soc. Ed.) II. 28; Ibid., i, 15, 340. T. S. Hunt. Chem. and Geol. Essays, pp. 23, 87, 99, 111.

† Mr. Richardson asserts that 90 per cent of the 80 per cent of insoluble mineral matter in the pitch is silica. As a possible explanation of the presence of

Asphalt is very inert to changes of temperature. It is a very poor conductor of heat, and even under a tropical sun, the daily surface changes of temperature and consequent expansions and contractions are wholly inadequate to produce conditions affecting such enormous masses of material as the crater contains.

The frequent use of the term "volcanic" in connection with the supposed origin of this mass of bitumen is in my judgment misleading. With the term volcanic is usually associated streams of melted lava, scoria and pumice. The masses of porcellanite and jasper mentioned by all observers as found in the neighborhood of the lake, do not require for their origin any "subterranean fires." It only requires that hot water, holding silica in solution under high pressure, shall percolate a bed of clay. The distillation of beds of lignite, requires nothing more. In one case the product is red or yellow jasper, in the other a deposit of bitumen. The less the pressure, the more dense will be the bitumen. Water will inevitably bring the bitumen to the surface, unless it is held down by impervious strata. If the water accompanied by bitumen, encountered in its upward passage such strata, as have been described by Mr. Guppy, a mud volcano yielding bitumen would be the inevitable result. It appears to me that all of these conditions are present in and about the pitch lake. They are exactly the conditions that have produced enormous tar springs and asphalt beds in California, excepting that there the strata necessary to produce mud volcanoes are wanting, but the porcellanites, the hot springs, the sulphur springs, and the bitumen, are all there, and in some localities on a scale that vies with Trinidad.

I looked in vain for specimens of wood in process of transformation into asphalt. I enquired of many intelligent men, and others connected with mining the pitch, if they had ever seen such specimens; they invariably answered "no." Two or three remarked that the wood never decayed in the pitch, that it came out as it went in. One man replied that, "if it went in rotten it came out rotten." I saw in several excavations along the tramway masses of vegetable matter that appeared to have been converted into humus, and was told by the workmen that in time these masses would become incorporated with the pitch. Such masses account for the organic matter in solution in the lake water, and also for the amorphous organic matter not bitumen, observed by Mr. Richardson.

so much silica, I would suggest that the hot water that distilled the bitumen, might have held silica in *solution*, which has been precipitated within the pitch as it has cooled. The fact, if it be a fact, that so much silica exists in the pitch as hydrate, may account for the large amount of water held in the pitch.

The concessionaires of the lake, have recently put in operation a tramway and pier by which the pitch can be very rapidly and easily removed from the lake to vessels lying at the pier. The tramway forms a loop, which in a general way may be said to pass just outside the circle of islets. (See map.) In building the tramway much of the vegetation on these islets has been destroyed. The laying of the tramway presented some peculiar engineering difficulties, that have been successfully overcome. The islands float on the pitch, and I believe that they represent portions of the edge of the crater broken off during violent irruptions and placed in, and maintained in their relative positions through their relations to the various centers of ebullition into which the surface of the lake is divided. These islets, which largely consist of vegetable matter, float, while logs of wood and palm-tree ties sink in the pitch; it therefore occurred to Mr. Freeman, the engineer in charge of the work, to support his tramway on palm leaves, of which many specimens are twenty-five feet in length. This expedient has proved a complete success, not only upon the summits of the "areola" but in crossing the crevices that separate them. The tramway furnishes a succession of admirable points from which to view the lake, as no difficulty is experienced in walking upon the ties around the entire loop. The cars are run in groups of four, which when loaded have a gross weight of about six thousand pounds. I carefully watched the passage of successive groups of these cars and could not observe any change of level in the road bed, as they passed along; yet I am quite certain if a group had been allowed to stand for several hours, that both tramway and cars would have sunk in the pitch.

The pitch is excavated along this tramway upon the summits of the "areola." Wherever the surface of the pitch is broken, the vesicles are uniformly smaller as the pitch is taken from points removed from the center of the lake. As the water dries out, the vesicles collapse and the color changes from brown to bluish black. If left long enough in the sun, any of the pitch, no matter from what spot it may be taken, will first melt upon the surface and finally flow into a more or less compact mass. The pitch being dug by the Trinidad Asphalt Company, both within and without the lake, was brown when freshly dug, changing to black on exposure. The same might be said of that dug farther down the slope from village lots by the Trinidad Bituminous Asphalt Company. It was quite evident that as the pitch was taken from points farther and farther from the center of the lake it had been subjected to more and more pressure, the gas being forced out as a consequence, the vesicles made smaller and the specific gravity thereby increased.

There are enormous masses of pitch within the lake that could not in my opinion be distinguished by the eye, from the pitch taken from village lots by either of the companies before mentioned. I am therefore quite at a loss to determine why Mr. Richardson alleges such a specific distinction between what he is pleased to term "lake" and "land" asphalt. It appears to me to be a distinction without a difference.

For further facts concerning the commercial and economic relations of Trinidad Asphalt, the reader is referred to the report of Consul Pierce, which I believe to be one of the most complete and impartial of all the valuable consular reports issued by the State Department.

It was my intention to include in this paper some statistics regarding the enormous amount of asphaltum of different *varieties shipped from La Brea since January 1st, 1890.*

When a friend applied to the custom house in Port of Spain for an official statement, he reported that such information had been refused, on the ground that such a statement would make public private interests, inasmuch as the Trinidad Asphalt Company had shipped several cargoes of "land pitch" to the United States since that date.

By referring to the maps the reader can clearly distinguish the relative positions of the lake and the adjacent portions of the island.

University of Michigan, Ann Arbor, Michigan, April 15th, 1895.

An Exploration of the Sierra de Perija, Venezuela

Theodoor de Booy

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AN EXPLORATION OF THE SIERRA DE PERIJÁ, VENEZUELA

By THEODOOR DE BOOY

[With separate map, Pl. XVII.*]

For many years it had been the ambition of the writer to explore the Sierra de Perijá, one of the little-known areas of South America. Two attractions beckoned towards the mountain range: the ethnological mystery that envelopes the Motilone Indians who inhabit the mountains, and the scant nature of the reports, often contradictory, relating to the geography of the region. Thanks to a grant made by the American Geographical Society of New York, it became possible for the writer during the past summer to undertake an expedition to the mountains. He sailed on May 1, 1918, for the city of Maracaibo in Venezuela, from which point he set out on his overland trip. In connection with the geographical reconnaissance, ethnological and archeological surveys of the region were made under the auspices of the University Museum of Philadelphia, and reports on these studies will appear in the *Journal* of that institution.

On arrival in Maracaibo the writer found that the credentials furnished him by the Venezuelan Government were in the custody of the administrator of customs of the port. By order of the Government the baggage of the expedition was to enter duty free, and, furthermore, the Minister of the Interior had dispatched a document in which the civil and military authorities of the districts that might be visited were called upon to render all aid and protection in their power. It is indeed a pleasure to work in a country where the Government encourages scientific research, and the writer's grateful thanks are due to the authorities in Caracas not only for the facilities extended, but also for the kind telegram of welcome from the Minister of the Exterior that was awaiting his arrival in Maracaibo.

* Pl. XVII will accompany an article by the same author in the next number of the *Review*. This article, which the map likewise illustrates, discusses the geographical features of the plain between Lake Maracaibo and the Sierra de Perijá.—EDIT. NOTE.

Thanks are furthermore due to the Caribbean Petroleum Company of Philadelphia for its kindness in allowing the expedition to make its headquarters in any of its drilling stations near the lower slopes of the Sierra de Perijá. The hospitality shown by this organization and the help rendered by its local representatives were of the greatest value to the undertaking. Finally, the writer is indebted to Señor Eleodoro García, a landowner of Machiques, for aid in introducing him to certain Tucucu Indians and for courtesies in many other matters.

State of Knowledge

Name

The valley of the Magdalena River in the southern part of Colombia separates two spurs of the northern Andes, the Cordillera Central and the Cordillera Oriental (see inset, Pl. XVII). The latter runs along the eastern banks of the Magdalena to the northward, until at about 7° N. latitude it divides, one branch leading in a northeasterly direction and forming the Venezuelan Andes, the other continuing on towards the north. It is with this northern range that we are concerned. Its southernmost part is known as the Sierra de Ocaña and lies within Colombia. At about latitude 8° 30′ the range begins to form the boundary between Venezuela and Colombia and continues to do this as far as its most northerly spurs, the Montes de Oca. On the Colombian side the Sierra de Ocaña obtains the name of the Sierra de los Motilones when the 10th degree of latitude is reached and from here on continues under the names of Sierra de Manaure, Sierra Montaña, Sierra Negra, and Sierra Colorada. On the Venezuelan side the range is called the Sierra de Perijá and retains this name as far north as the Montes de Oca.[1]

Transmontane Trails

Since the Conquest the eastern slopes of the Sierra de Perijá have remained completely unexplored between the headwaters of the Palmar River to the north and the Rio de Oro to the south. Sievers,[2] one of the few contemporary geographers to discuss the Sierra de Perijá and an explorer who has done considerable work along its western (Colombian) slopes, states that "the eastern slopes of the Sierra de Perijá are covered from the

[1] On some of the older maps this range is shown as the "Sierra de Itoto," and this name is mentioned by Codazzi (Agustín Codazzi: Resúmen de la Geografía de Venezuela, Paris, 1841, p. 455). It is likely that the name Itoto was derived from an Indian tribe formerly frequenting the eastern slopes. Sanchez (Silvestre Sanchez: Geografía y Breve Historia de la Sección Zulia, Caracas, 1883, p. 43) speaks of the "Sierra de Perijá, or Itotas," the different version of the Indian name probably being due to inadvertence, as this author is frequently inaccurate. The first known map of the Maracaibo region, that of Oviedo (Rudolph Schuller: The Date of Oviedo's Map of the Maracaibo Region, *Geogr. Rev.*, Vol. 3, 1917, pp. 294-301) shows the Sierra de Perijá under the name "Siera (*sic*) de los Bubures," so named after the Bubures Indians, a subtribe of the Motilones. The writer can find no mention in any of the earlier or later historians explaining the origin or significance of the word "Perijá."

[2] Wilhelm Sievers: Venezuela und die deutschen Interessen, *Angewandte Geographie*, Ser. 1, Part III, Halle, 1903, p. 10.

foot to the top with dense woods, but are still totally unknown." Both Simons and Sievers speak of a trail which at one time was used for travel between the Colombian village of El Molino and the Venezuelan town of Perijá, the latter settlement being more generally known under the name of La Villa. Simons[3] states that "not many years ago a rugged footpath led across the high range of the Andes from Molino to Perijá in Venezuela," while Sievers[4] writes that "as late as the sixties a path existed from El Molino near Villa Nueva in the valley of the César which led to the lowlands of Lake Maracaibo at the Palmar River." From numerous inquiries in the Perijá district, the writer learned that this path originally led along the Palmar River and followed the bed of the Rio Tosas (or of the Rio Lajas, our informants were not quite certain which), one of the tributaries of the Palmar, as far as its source, where a pass gave access to the western slopes of the range and a consequent descent into Colombian territory. This information was from traditional sources, as the oldest inhabitant could not positively state that the path had been used in his time. One account was current that an escaping Colombian malefactor had some ten years earlier succeeded in reaching Venezuela after incredible hardships by making use of the traces of the path which are still said to exist. It is likely, therefore, that the path was formerly used by both Venezuelans and Colombians and that attacks by the Cocina Indians, robber bands belonging to the Goajira Peninsula, or possibly by the even more dreaded Motilones, who in former days may have ranged farther to the north, were responsible for its abandonment. It is interesting to note that the ethnographic map in Codazzi's "Atlas of Venezuela,"[5] which indicates the routes of the earliest explorers of the northern part of the South American continent, shows the route taken by the German Alfinger on his journey from Venezuela to Colombia in 1531 to have led him over the mountains in the self-same locality, and it is well within the bounds of reason to suppose that in pre-Colombian days this pass was in general use by the Indians.

Sievers[6] also mentions a second trail. "A second path led from the small settlement of Espíritu Santo . . . over the Sierra de Perijá to Venezuela." It is probable that Sievers was misled by native accounts in Colombia regarding this means of reaching Venezuela. All inquiries in the Venezuelan town of Machiques, which about corresponds in latitude to Espíritu Santo in Colombia, failed to elicit any information regarding a path that in former years had led to the neighboring republic, and it is almost certain that, had such a path existed, the Venezuelans would have known of it. Furthermore, the Macoa Indians inhabiting the interior of the Sierra de

[3] F. A. A. Simons: On the Sierra Nevada of Santa Marta and Its Watershed, *Proc. Royal Geogr. Soc.*, Vol. 3, 1881, pp. 705-723, with map, 1:780,000; reference on p. 711.

[4] Wilhelm Sievers: Die Sierra Nevada de Santa Marta und die Sierra de Perijá, *Zeitschr. der Gesell. für Erdkunde*, Vol. 23, 1888, pp. 1-158, with a geological and topographical map, each in 1:500,000; reference on p. 113.

[5] Agustín Codazzi: Atlas físico y político de la República de Venezuela, Caracas, 1840.

[6] Work cited in footnote 4, pp. 113-114.

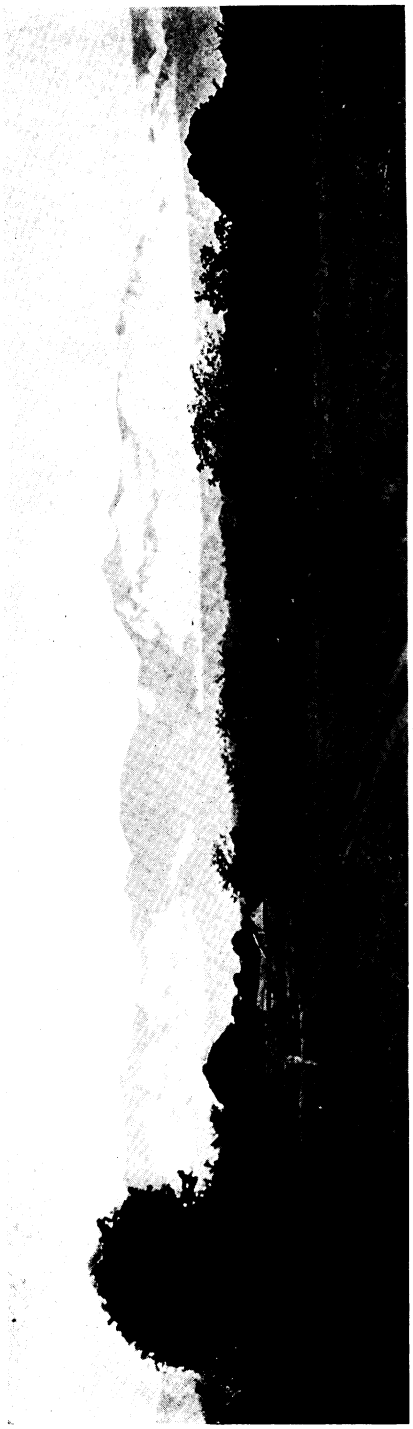

FIG. 1—General view of the Sierra de Perijá from high ground near La Villa.

Perijá were emphatic in declaring to the writer that they had, in their nomadic wanderings, never encountered the slightest trace of a former Spanish trail in the district where the headwaters of the Apon originate. The tribe had no legendary lore regarding such a trail, and from personal travel in the mountains over which such a trail would have led, the writer is positive that the hardships of the traverse, to say the least, would have rendered the journey from Colombia to Venezuela by this route impracticable.

LOCAL KNOWLEDGE OF THE RANGE

Except for the trail along the Palmar River, and the highly doubtful trail along the Apon, the Sierra de Perijá offers no facilities for travel and, as far as our knowledge goes, has not been ascended from the Venezuelan slopes by white men. It is probably for this reason that the Venezuelan population is today unacquainted with the range. The inhabitants of the region from the western shore of Lake Maracaibo to the foot of the mountains are not interested in the Sierra, as they find all the room they need for their farms and ranches in the lowlands; and the slopes of the mountains, while far more fertile than the savanas at their foot, are too precipitous to allow of ready cultivation. Furthermore, the Venezuelans stand in great dread of the Indians that live due west of the town of Machiques and even imagine the mountains to the northward peopled with Indians, although in fact there are none now living there. From the

headwaters of the Macoita River to the north as far as the Rio Lajas, the Sierra de Perijá is uninhabited, and it is not even certain that aborigines inhabit the region around the headwaters of the latter river.

The most modern map of the state of Zulia,[7] while relatively accurate for the lowlands as far as roads, settlements, and rivers are concerned, depicts the Sierra de Perijá in what can be called an imaginative manner. The heights of many peaks are shown in the interior of the mountains, as are the headwaters of the Apon, Aponcito, Macoita, and other rivers. The location of the several Motilone tribes, such as the Macoita Indians, the Aponcito Indians, the Rio Negro Indians, and various others is also indicated. The writer is at a loss to account for these topographical details in a region that not only has been unvisited for the last hundred years, but that probably was never visited by any but Indians since the days of the Conquest. The inhabitants of Machiques can see the higher peaks of the Sierra de Perijá from their doors (for similar view from La Villa, see Fig. 1) but are of course unable to see the even more elevated peaks of the interior. Nor have they any knowledge of the headwaters of the above-mentioned rivers. The map, for instance, ignores the fact that the Macoita rises in the interior of the mountains and is much larger than the Aponcito, which originates near the western slopes of the second range due west from Machiques. The location of the Indian tribes is also entirely faulty and was probably derived from hearsay information from such Indians as at various times visited the cattle farms near the mountains.

Indian Tribes

On the ethnographic map in Codazzi's "Atlas of Venezuela" the region under discussion is shown peopled by the Sabrites and the Guiriquires to the north of the Apon River and the Carates and Motilones to the south of this river. Codazzi indicates on this map that the Cocinas and Goajiras of the Goajira Peninsula are of the same stock as these tribes. The ethnological researches of the writer prove that the Motilones are of a different stock from the Goajiras and speak a language that is entirely different. It is of course not the purpose of this paper to go into a lengthy ethnological discussion of the tribes studied on the Sierra de Perijá expedition, but it may be said briefly that the Macoa Indians, among whom the writer took up his abode, belong to the Motilones and speak the same language as do the neighboring tribes to the south, the Tucucus, the Irapeños, the Chaparras, the Pariris, the Rio Negro, and the Rio Yasa Indians. Undoubtedly many other tribes exist as far south as the Catatumbo and Oro Rivers that belong to the same linguistic stock and have in the past been known under the generic term of Motilones. None of these tribes have names for themselves, the names used being derived from the streams whose headwaters they frequent. The word "Motilone" is unknown to them. According to

[7] Estado Zulia, 1:500,000. In series: Atlas de Venezuela, Vicente Lecuna, edit. Caracas, 1916.

FIG. 2—The Sierra in the vicinity of the Macoa settlement. Note the scattered Macoa huts and clearings. The larger of the two huts on the slope on the right is the author's hut (see Figs. 4 and 5).

Fray Nicolas de la Rosa[8] the word Motilone signifies "cut-haired," and this author gives a long and fanciful description of how the Indians came to adopt the custom of cutting their hair. This description is more ingenious than plausible, and it is more likely that the custom existed many centuries before the coming of the *conquistadores.* At any rate the practice is still followed today among the Macoas by men, women, and children.

For centuries the Motilones have had a bad reputation, and it is probably for this reason that no expeditions have penetrated the eastern slopes of the Sierra de Perijá. For many years the western slopes have also remained unknown, although the Colombian Motilones have held a great deal more intercourse with the Spaniards than have their Venezuelan fellow-tribesmen. In 1915 a Swedish ethnologist[9] collected certain data on the Colombian Motilones living in the lowlands below the Sierra de Perijá in the neighborhood of the former settlements of El Jobo and Palmira. The photographs made by this explorer of the Colombian Motilones bear a striking resemblance to those made of the Macoas by the writer. All references in works treating of the ethnology of the Indians of the eastern slopes of the Sierra de Perijá agree as to the ferocity of the aborigines, and one early geographer[10] goes so far as to put a terse notice on his map stating that the Motilones are "the worst Indians that exist." A modern ethnologist[11] in discussing the region says that "the mountain range west of Lake Maracaibo (Sierra de Perihá [*sic*]) is controlled by the wild and little-known Motilones." The few other authors who mention the Motilones speak in a like vein, and there appears to have been built up around this race a wall of superstitious dread that possibly may prove, ultimately, its strongest defense against the encroachments of its Venezuelan and Colombian neighbors.

Narrative of the Expedition

Preparation

The writer experienced considerable difficulty in obtaining servants to accompany his expedition once he left the petroleum station of La Horqueta, to which he had proceeded from Maracaibo after landing on Venezuelan soil. La Horqueta lies almost at the foot of the Sierra de Perijá. These mountains are not inhabited at that point, and information gained in the district indicated that it would be necessary to go to the town of Machiques before further information could be had on which to base an attempt to

[8] Nicolas de la Rosa: Floresta de la Santa Iglesia Catedral de la Ciudad de Santa Marta, 1739. Reprinted at Valencia, 1833. Parts of this work have been translated by F. C. Nicholas: The Aborigines of the Province of Santa Marta, Colombia, *Amer. Anthropologist*, Vol. 3, N. S., 1901, pp. 606-649; reference on p. 624.

[9] Gustaf Bolinder: Det Tropiska Snö-fjällets Indianer, Stockholm, 1916 (reviewed in this number of the *Review*).

[10] Juan Lopez: Carta plana de la provincia de Caracas ó Venezuela, Madrid, 1787.

[11] H. J. Spinden: Travel Notes in Western Venezuela, *Amer. Museum Journ.*, Vol. 17, 1917, pp. 15-23; reference on p. 17.

enter the Indian territory. It was an easy task to obtain men to go to Machiques with the expedition, but it became another question when these men were asked to make an ascent of the mountain range. Despite the fact that Machiques lies within full view of the higher summits and that the town is watered by the Apon River, which breaks out of the range within a distance of not over ten miles from the settlement, the inhabitants are not only absolutely ignorant of the interior of the chain but are content to remain so. They were unanimous in stating that a visit to the region was an impossibility and would be accompanied by the gravest danger. In

FIG. 3—Ranges of the Sierra de Perijá seen from top of second range west of Machiques at an altitude of 2,800 feet. Note the dense forest cover of the range in the foreground, characteristic of the eastern border of the mountains in contrast with the interior (see Figs. 9 and 12).

consequence no peon could be found who was willing to undertake the trip with the writer, although, after his return from his visit to the interior of the mountains, there appeared to be a number of eager applicants for the next trip. The writer was informed in Machiques that a Señor Eleodoro García owned a considerable cattle farm at the foot of the mountains some ten miles due west from Machiques, on the Aponcito River. Señor Garcia had also a residence in Machiques itself, and here I was so fortunate as to meet this gentleman. Señor García informed me that his ranch was frequently visited by some Tucucu Indians who lived among the Macoas in the interior; that these Tucucus worked on his property, felling trees and preparing the cleared land for pasturage; and that they did this work in exchange for ironmongery, which they afterwards carried to their mountain abodes and bartered with the Macoas.

As a result of this information a visit was paid to the cattle ranch, and it so happened that several of the Tucucus had just come from the mountains. A few of the Indians spoke Spanish, and, after the writer consulted with them, they undertook a special trip to their settlement to request permission from the Macoas for a stranger to visit their haunts. The Tucucus returned after four days with the information that the writer would be allowed to accompany them, but on the stipulation that he take not more than one companion.

Señor García was instrumental in procuring for me an excellent peon,

FIG. 4—View from a nearby elevation of the hut built for the author by the Macoa Indians.

Manuel Peñaranda, who was induced to go with the expedition to the Macoas. Peñaranda proved throughout my stay to be an excellent companion and one who was not easily daunted by the dangers that occasionally presented themselves. He was acquainted with some of the Tucucus through previous visits to Señor García's ranch, although he had, of course, never visited the interior of the mountains. Much credit is due to Señor García for having persuaded his *compadre* to accompany me and also to Peñaranda for having stood by me in what afterwards turned out to have been a rather hazardous undertaking.

It may be noted for the benefit of future explorers that there are but two means by which one can penetrate to the headwaters of the Apon and the Macoita Rivers. The first way would be to establish friendly relations with the Tucucus, as was done by the writer, and thus obtain permission to enter the Macoa territory. The Macoas are extremely jealous of their rights

of occupation and would resent by forcible means any intrusion of their haunts. Even if this first method were followed, it is not probable that the Macoas would allow more than a party of three to penetrate the mountains, and they certainly would not allow any larger number to enter. The second way would be to go into the country without Tucucu guides, by taking a large body of men and cutting one's way in the desired direction. The result of this procedure would undoubtedly mean the loss of a number of followers through ambushes prepared by the Indians, and it is doubtful if one could do much without from fifty to a hundred guards. At any rate, it is certain that if an explorer went in with ten men or so, without the sanction of the Indians, the expedition would be foredoomed to massacre.

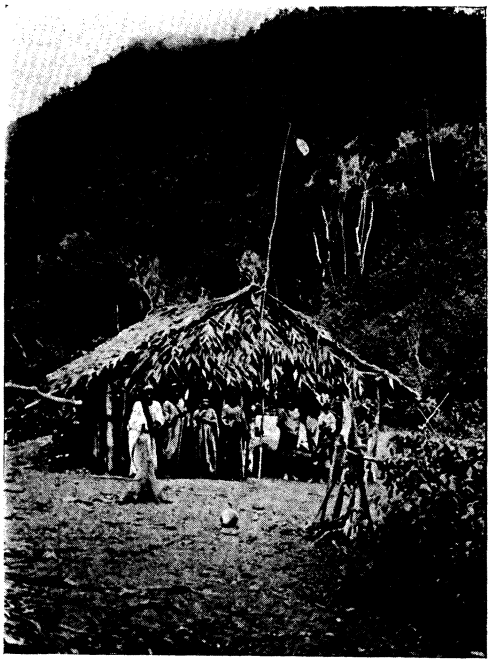

FIG. 5—The author's hut. Explorers' Club flag flying over hut.

By the time the Tucucus returned, the writer had collected his baggage at Machiques and also had laid in a supply of trading goods for the Indians. These loads were distributed among the men, who appeared to feel no discomfort in carrying weights up to 120 pounds. They arranged on their backs the bags in which our belongings were stowed and helped support them by a woven cord fastened over their foreheads; in this manner they climbed steep places which personally I had difficulty in ascending without any load at all.

THE JOURNEY TO THE MACOA SETTLEMENT

Leaving Señor García's ranch on June 2, we followed the trail to the Macoa country. First it leads along the banks of the Aponcito River (for route, see Pl. XVII). There is of course nothing but the most elementary path, as the Indians of the Sierra de Perijá are in constant dread of attacks from other Indian tribes and attempt to hide their trails as much as possible. Frequently there was no path at all, and one simply jumped from rock to rock in the river bed or else had to wade. After some three hours, the trail left the Aponcito and led through the denser forest of a precipitous mountain slope (see Fig. 3). It would be impossible to describe the diffi-

culties of this journey. The Tucucus appeared to be used to it; but what with the almost perpendicular ascents, the wet ground which caused constant slipping, and the dense vegetation, the writer suffered considerably. At an altitude of 4,800 feet a pass was reached which permitted descent into the ravine separating the first and the second mountain range. This descent proved even harder than the ascent, and it was not unusual to encounter a perpendicular cliff where one had to descend by means of *bejucos,* the parasitic creepers hanging from trees. Camp was made the first afternoon at an altitude of 4,400 feet, on the slope of the second mountain. The making of camp simply entailed cutting some sticks and thatching these sticks with large leaves. The baggage was spread in a dry place, and the party slept on the ground.

The next morning the journey was continued, and about noon, after having ascended the second mountain and descended to a larger valley in a northwesterly direction, we came to the confines of the Macoa country. Up to now no cleared ground had been visible, but after reaching the summit of the second range we could distinguish the agricultural clearings of the Macoas by their different shade of green. At length the first Macoa hut came in sight, and our Tucucus gave notice of the approach of the expedition by prolonged shouts from the hilltop. On reaching the outskirts of the Macoa settlement, I gained my first view of the Indians in their native land. The average altitude here was 3,600 feet.

The settlement consists of some fourteen huts spread over contiguous hilltops. No two huts are placed side by side and the Indians apparently are not of a congenial disposition. Perhaps the explanation of the widespread Macoa village is that in the event of raids from hostile tribes, there is a better chance of escape for some of the members of the community. Nevertheless, the arrangement is inconvenient in the extreme, as a visit from one hut to another frequently means a steep descent and then a steep ascent, while actually the huts are so near together in an air line that their occupants can converse from one to another without great difficulty. The Macoas also have their clearings at considerable distances from their huts, but why this is so the writer cannot tell. Frequently the hillsides directly under their huts are not cleared, and the Macoa undertakes a walk of an hour or more before he reaches his agricultural patch on a distant hill. Yet the first hill slope would be equally well suited for cultivation. (For general view, see Fig. 2.)

The greeting accorded me by the Macoas was quite friendly, and I appeared to be as much of a curiosity to them as they were to me. Their first act consisted in building me a large hut some 24 feet long and 14 feet wide (Figs. 4 and 5). This hut was far larger than their own huts. The Macoa men have an average height of a little over 5 feet 1 inch and the Macoa women a height of almost 4 feet 9 inches, and the aborigines evidently reasoned that the tall stranger needed a good deal of room. The building

of the hut took about a day and a half and was undertaken by practically all the male members of the community. All work was done in the most willing spirit, and seldom during my stay did any Indian show unwillingness to grant any request I might make. Food was brought to my hut daily and in enormous quantities. The Tucucus had at various times brought chickens from the lowlands to the Macoa settlement, and no day passed without their bringing in numerous chickens and eggs. Furthermore the supplies of yams, bananas, plantains, corn, sweet potatoes, and yucca given me far exceeded my necessities, and of the game killed a generous share was always reserved for my use.

Ethnic Status of the Macoas

Outside of the ethnological work undertaken for the University Museum of Philadelphia, the object of my stay among the Macoas was the exploration of the headwaters of the Macoita and the Apon Rivers and the possible undertaking of a journey to the west in order to reach the Colombian side of the mountains. As far as the ethnological work and the exploration of the headwaters of the Macoita were concerned, the expedition was successful. The headwaters of the Apon were not reached, nor did I succeed in crossing the last mountain chain dividing the valley of the Apon from the Colombian lowlands. The Macoa Indians were studied and photographed, and a vocabulary of their language was compiled with the aid of Tucucu interpreters. Reports on this work are to appear in the *Museum Journal*. Briefly, it may be said that the Macoas and Tucucus proved to have habits that differed greatly from those of the Goajiras to the north and the Arhuacos to the west. Unlike these tribes, the male Indians of the interior of the Sierra de Perijá do all the agricultural work, while the women do the weaving. The opposite is the case with the Goajiras and the Arhuacos. The feasts, ceremonies at birth and marriage and death, hunting customs, and games are also quite different. Perhaps the greatest distinction lies in the apparel, both male and female Macoas wearing heavy cotton robes, which are never discarded by the men and the upper part of which only is discarded by the women during the warmer hours of the day. For these practices the climate is of course the chief reason, heavy clothing being needed as a protection against the mists and the cold of the interior of the Sierra de Perijá. Furthermore, the Macoas are also one of the few tribes of northern South America who do not use the hammock. They sleep on woven grass mats.

Discovery of Waterfalls

The Macoa settlement lies within a few miles of the two principal tributaries that go to make up the headwaters of the Macoita River. It was on these two tributaries and on the Macoita River itself that I was fortunate enough to discover a series of waterfalls which had hitherto not been seen

FIG. 6—Upper Bolívar Falls, right fork of the Macoita River: upper and middle cascades, respectively 100 and 200 feet high. (The figure of the Macoa Indian at the bottom cannot serve as a scale because of the different angles from which the component parts of this view are seen.)

by any but the aborigines of the region. Their discovery came about in this manner. The second evening we passed among the Macoas happened to be a very still night with almost no wind, and I noted at intervals a subdued roar that appeared to proceed from some distant spot. Upon inquiry what this could be, the Indians repeatedly made use of the expression *kúna-torótpok*. The Tucucus appeared to be unable to inform me of the Spanish equivalent for these words. The following day, one of the Indian children happened to fall and set up a loud wail, and I noted that its mother, in speaking of the occurrence, frequently employed the word *torótpok*. The same day also, when I began compiling a vocabulary, I was informed that *kúna* meant water, and after this it needed no great amount of perspicacity to decide that *kúna-torótpok* meant waterfall. This solved the origin of the mysterious sounds. I determined to visit these falls at once and gave the Indians no rest until they agreed to guide me to them. In all, six waterfalls were visited and surveyed, an undertaking which took three weeks. Large wooded areas had to be felled occasionally in order to obtain proper light in the deeper canyons for taking photographs. The cutting of trails to the falls was also a laborious piece of work.

Three of the falls occur on the right, or western, tributary, two on the left, or eastern, and the sixth just below the junction of the two, on the Macoita proper (see inset on Pl. XVII). The writer would suggest naming the falls on the right fork Upper, Middle, and Lower Bolívar Falls, in honor of Simón Bolívar, the liberator of Venezuela and founder of five South American republics; the falls on the left

fork, Upper and Lower Arismendi Falls, after Doña Luisa Cáceres de Arismendi, the heroine of the Venezuelan War of Independence, whose history has been related elsewhere by the writer;[12] and the falls on the Macoita River itself, Venezuela Falls. The writer would feel honored if these names should meet with the approval of the Venezuelan Government, to which he is indebted for such numerous courtesies and so much good will.

FIG. 7—Upper Arismendi Falls on the left fork of the Macoita River: lower and upper cascades, respectively 70 and 80 feet high. Note the natural stone arch at the top through which the upper cascade plunges.

The Upper Bolívar Falls consist of a series of three cascades, respectively from highest to lowest about 100, 200, and 45 feet high, the altitude at the bottom of the lowest fall being 3,740 feet. The uppermost and middle falls are of comparatively small volume but their picturesque beauty is indescribable (Fig. 6). The lowest fall owes its impressiveness to its greater volume of water. About three-quarters of a mile in an air line downstream below the lowest of the Upper Bolívar Falls lie the Middle Bolívar Falls. Their height is about 40 feet and elevation at bottom 3,400 feet. At a considerable distance farther downstream lie the Lower Bolívar Falls, consisting, like the upper falls, of three cascades. These are respectively 80, 60, and 40 feet high. The altitude at the bottom of these falls is 3,000 feet.

Of the falls on the eastern tributary the Upper Arismendi Falls consist of two cascades 80 and about 70 feet high. The elevation at the top of the first is 3,400 feet, at the bottom of the second, 3,250 feet. The pool at the foot of the first cascade is spanned by a natural stone arch about 120 feet across, which serves as a charming frame for the upper part of the falls and the tropical vegetation that can be seen through its opening (Fig. 7). The Lower Arismendi Falls lie about half a mile south in an air line. The altitude at the top is 3,050 feet. The fall descends about 80 feet and then rushes through a ravine about 300 feet long.

The two tributaries now join and go to make up the Macoita River.

[12] Theodoor de Booy: Island of Margarita, Venezuela, *Bull. Pan Amer. Union*, Vol. 42, 1916, pp. 531-546: *id.*, La Isla de Margarita, Venezuela, *Bol. Unión Pan Americana*, Vol. 43, 1916, pp. 32-45.

From a pool at an altitude of 2,950 feet which is fed by the two tributaries descend the Venezuela Falls (Fig. 8). They consist of three cascades, 80, 60, and 15 feet high. The altitude at the foot of the lowest fall is 2,750 feet.

While our stay in the Macoa region was during the rainy season, it should be stated that the photographs of all the falls described were taken after fairly dry spells and that the Tucucu Indians informed us that at the height of the rainy season a far larger volume of water passes over them.

FIG. 8—Venezuela Falls, at the junction of the right and left forks of the Macoita River: middle and lower cascades, respectively 60 and 15 feet high.

Evidence of this could be seen on the rocks above each fall, which were waterworn above the level of the water at the time of our visit. The Indians also informed us that the falls never went dry and that in fact they seldom had less water than at the time the photographs were taken, probably because prolonged droughts are unknown in the interior of the Sierra de Perijá.

OTHER WATERFALLS

According to our Indian informants, the Macoita River has still another waterfall before it breaks its way through to the lowlands. The Indians, however, declared that the trail to the top of this fall was absolutely impassable during the rainy season and that even in the dry season there is no possibility of descending to the bottom of the cascade. They also de-

clared that this fall was higher than those visited by the writer. Owing to the precipitous formation of the easterly slopes of the Sierra de Perijá, it is likely that almost every river originating in the interior of these mountains has falls. The Indians informed us that the Apon River has a fall of considerable height below the place where we actually struck this stream in our journey westwards. Furthermore, the Cogollo River to the northward has a number of falls, three of which were visited by the writer during his stay at La Horqueta, previous to his journey to Machiques and his sojourn among the Macoas. While the Cogollo falls are nearer the extreme eastern slopes of the range and are not so high as the falls of the Macoita, they are very similar. The Cogollo falls are reached by following the bed of the river from the place where it breaks through the mountains. They have on two occasions been visited by geologists of the Caribbean Petroleum Company. The highest of the falls was not seen by the writer. He made the trip accompanied by a peon who was unfamiliar with the terrain and who in consequence guided him up the southern branch of the river where he should have followed the northern branch from the fork at an altitude of 1,600 feet. The falls visited by the writer had a height of 15 and 30 feet respectively and were located at an altitude of 1,700 feet. The higher falls on the northern branch of the Cogollo are reported to have a height of about 150 feet but contain a far smaller volume of water than those of the southern branch. They are distinctly visible from the lowlands and make a picturesque strip of white against the vivid green background of the woods that cover the Sierra de Perijá.

Trip Toward the Western Border of the Range

After having been with the Macoas about three weeks, the writer decided to make an attempt to proceed in a due westerly direction with the object of reaching the last chain of mountains dividing Venezuela from Colombia and of descending to the Colombian plains. When the subject was first broached to the Macoas and Tucucus, the Indians appeared to be very reluctant to take part in this undertaking. They said they were unacquainted with the mountains that lay more than a day's journey to the west. Furthermore, the journey would lead fairly close to the headwaters of the Rio Negro, the next major eastward-flowing river south of the Apon, where was settled a tribe with which the Macoas had been at war for a long period. On previous occasions, when a punitive expedition was organized by the Macoas for the chastisement of the Rio Negro Indians, a circuitous route was taken along the easterly slopes of the Sierra de Perijá to the south before striking west to reach the Rio Negro settlement; but the Macoas were uncertain whether the Rio Negro Indians were not in the habit of frequenting the regions we proposed to visit. It may incidentally be stated that, less than a generation ago, the Rio Negro and the Macoa tribes were all one tribe and that at a feast a dispute between a chief and another

Indian resulted in a general fight in which many Indians were killed. The two factions then went their respective ways and since that time have waged deadly warfare the one against the other. One Macoa showed the writer two scarcely healed arrow wounds received only about three months before in a fight with Rio Negro Indians.

The proposed expedition caused a great deal of perturbation among the Indians, and it was not until after a generous offer had been made of many beads and much ironmongery that the writer could prevail upon two Tucucus and two Macoas to take part in it. One of the Tucucus stated that his father had told him of an expedition he had made toward the west many years ago, and that on this expedition the members of the party had found an immense cave in a curiously shaped mountain peak. This cave was filled with large funeral urns (the Tucucu called them earthenware pots, filled with bones). It was probably similar to the cave found by Crevaux on the island of Cucurital in the Orinoco River near Atures.[13] As the present-day Motilones are in the habit of tying up the bones of their dead in sleeping-mats and subsequently depositing these bundles in rock shelters, it would appear as if the interior of the Sierra de Perijá was at one time inhabited by a different race. Archeological evidence in support of this theory was also found by the writer.

Difficulties of Travel

Leaving Peñaranda in camp, the writer started on June 25 with his four Indians. The first day's journey (for route, see Pl. XVII) led towards the summit of a peak due west from the camp. This trail had frequently been used by the Indians, and we were going over what to them was familiar ground. The peak had an altitude of 5,500 feet. After descending to a brook, tributary to the Bolívar fork of the Macoa, we spent the afternoon in crossing the southern ridge of this mountain, reaching an elevation of 5,250 feet, and then pitching camp for the night on the slope beyond at an altitude of 4,700 feet. The mountain traversed was densely wooded and had been partially cleared on its eastern slope by the Macoas some years previously, when some of the Indians had grown corn and other vegetables in this locality. Only very little game was seen on this first day, the total bag consisting of a toucan and a partridge, both being eaten that night by the Indians. While the writer had already come to know the intense cold of the Sierra de Perijá, it was in this camp that he first learned how much one can suffer from cold even in a tropical country. The mists which cover the mountain tops in the afternoon are not conducive to warm nights, and when one travels on such a journey as this, where every ounce of extra weight means retarded progress, one learns the intense discomfort of sleeping on boughs and leaves spread on the ground without even a single blanket for covering.

[13] Jules Crevaux: Voyages dans l'Amérique du Sud, Paris, 1883; description of burial cave on p. 561, illustrated on p. 563.

The following day our party passed the last landmark with which the Indians were familiar. We now proceeded in a northwesterly direction along a ridge connecting the elevation we had rounded with a higher summit farther on. It may be said here that travel with the Macoas and Tucucus was irritating in the extreme. It was not unwillingness on their part, but simply what one might term lack of concentration on the desired objective, which at times caused the writer great annoyance. The slightest reason, such as the sight of animal trails or supplies of bamboo from which arrow shafts could be made, caused the Indians to forget for the moment the object of the journey and to waste valuable time in other pursuits.

Lack of Game

On the second day, as we followed the mountain ridge in a northwesterly direction, it was noted that the summits of many of the spurs of this ridge were covered with large ferns which made an almost impenetrable thicket. Had the trip taken place in the dry season, these ferns could easily have been burned. As it was, the constant drizzle had made them so wet that our party was forced laboriously to carve its way through the tangle with cutlasses. The crests of the spurs were not covered with the deep soil that formed the basis for the heavier vegetation of the lower slopes. The summits of the mountains appeared to be formed of a soft volcanic rock in which were imbedded many granite boulders. Larger trees were but seldom found, and shrubs, together with giant ferns and wiry grasses, took their place. It was in these regions that the writer began to note the absolute lack of game which afterwards proved so disastrous to the undertaking. With the exception of hawks and eagles, birds were no longer seen. On the other hand, bear tracks were plentiful; and several of the larger trees showed numerous claw marks of this animal. During the entire journey, however, we did not have the good fortune to see one of these animals. Had we seen one, a plentiful supply of meat might have been secured and the expedition brought to a successful termination. It is probable that these tracks belonged to the "spectacled" bear, as our Indians told us the animal's pelt was black, but that its face was covered with white hair.

Owing to the undergrowth, our progress was but slow on the second day, and we finally camped at an altitude of 5,100 feet amid the ferns. By this time the food supplies brought from the Macoa settlement were getting low, one reason for this being the Indian habit of gorging when there is food and fasting when there is none. But while the Indians showed remarkable ability in gorging, they subsequently did not show any of the fabled endurance in fasting. When we broke camp on the morning of the third day, the writer insisted upon leaving a fair amount of yucca and plantains in a cache, to serve for the return journey. This left loads for but two of the Indians, the other two remaining free to proceed ahead and cut a way through the fern thickets. Our progress in consequence became

somewhat faster. We continued on the ridge to an elevation of 5,400 feet, where our progress was barred by a westward-facing precipice. Skirting this to the south, we then struck off in a westerly direction and at noon had climbed to an altitude of 6,000 feet, the highest elevation reached on the trip. To the west and to the north we could plainly perceive peaks that were far higher than the summit of the mountain we were on. It is in fact highly doubtful if the highest elevation at present stated for the Sierra de Perijá—the Cerro Pintado, by Sievers, who claims[14] from 2,800 to 3,000 meters for this peak on the western edge of the range in 10° 25′ N.—is not

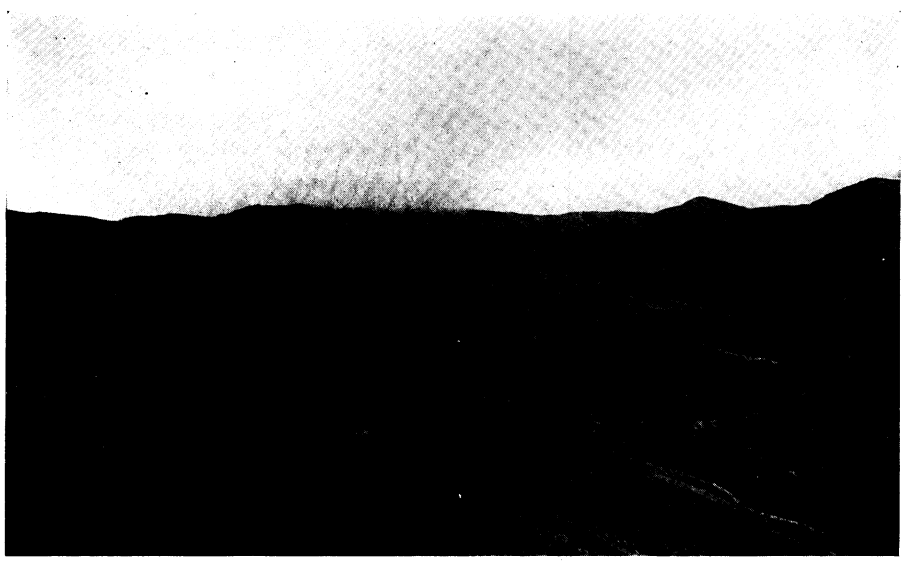

FIG. 9—Looking east along savana-covered ridge at point from which westward view, Fig. 12, was taken. Altitude 2,500 feet.

considerably lower than some of the peaks seen by the writer in the interior of the Sierra. He estimated several to have heights of at least 11,000 feet.

NERVOUSNESS OF THE INDIANS

The afternoon of the third day our path led northwest along a ridge with a serrated crest line which was still covered with ferns and the smaller, tangled undergrowth. In the late afternoon the ridge made a steep descent, and we once again reached heavy forests, whose trees consisted largely of the valuable cedar. The Indians had been palpably nervous all day, fearing possible encounter with members of hostile tribes, and this nervousness increased on entering woods where the high vegetation did not allow frequent climbing of trees to make observations. During the entire trip, however, no sign was seen of other Indians, nor were new clearings found to indicate agricultural activities on the part of other tribes. We camped in

[14] Work cited in footnote 2, p. 10.

FIG. 10.

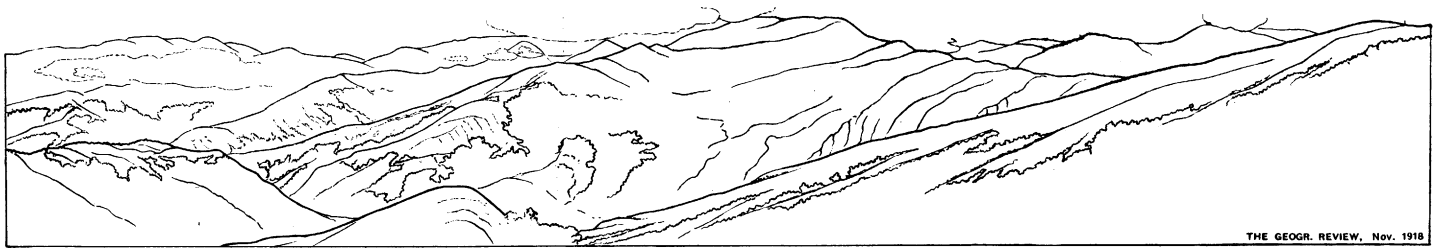

FIG. 11.

FIG. 10—Panoramic view, taken from an altitude of 4,100 feet and looking from west via southwest to south-southwest, of the Sierra de Perijá beyond the longitudinal course of the Apon River. The valley of the Apon lies in the middle distance. The farthest visible crest is in all probability on the westernmost range and overlooks the Colombian lowlands of the César valley.

FIG. 11—Outline sketch of panorama above to serve as key where the photograph is indistinct.

the woods that night at an altitude of 5,400 feet, and the entire party suffered intensely from the cold. The suffering furthermore was aggravated by a lack of food and a steady drizzle which continued through the night. The writer attempted to persuade his carriers to build a fire; but, owing to the Indians' fear of drawing the attention of other aborigines that might be about, the suggestion met with no response.

On the morning of the fourth day the writer noticed a great lack of enthusiasm in his Indians about continuing the journey. Of the party the two Tucucus appeared to be rather the more willing, but even they cast many a longing glance to the eastward. By this time the stock of food on hand was remarkable only for its lack of weight; and, as the writer insisted that half be left behind in order that there might be something for the return journey, the carrying of the remainder was no great hardship on two of the four bearers. After breaking camp our trail led us steadily downward in a southwesterly direction until about noon. Progress again became slow, as precipitous rocks had to be circumvented. At times we had glimpses of a mountain directly to the west whose altitude could not be less than 8,000 feet, while the mountains due north, with possible altitudes of 11,000 feet, also frequently became visible from points where the vegetation on our ridge was low enough to give an outlook.

Valley of the Apon

At about noon, when we had descended to an altitude of 4,800 feet, we left the woods and entered upon the ridge of a wide-flung mountain spur which was covered with wiry savana grass (Fig. 9). The view obtained after our party emerged from the woods was magnificent. To the west and southwest one could see the cloud-capped mountain ranges which undoubtedly form the last chain that separates Venezuela from Colombia (Figs. 10 and 11). An extensive valley, running north and south, spread out below, the grass-covered slopes leading down to the Apon River, whose course was marked by a belt of dense woods. The river apparently originates on a mountain forming the northern barrier of the valley and flows due south until it bends east to seek an outlet to the lowlands. The southern barrier also is composed of a wide mountain. The valley has an area of possibly as much as 80 square miles, its length being not less than 10 miles and its width in places as much as 8 miles. On the slope of the high mountains beyond the Apon yellowish-green patches indicating savana interrupted the darker green areas of forest, which extended to the crests (Fig. 12). Apparently only the exposed ridges of the spurs are covered with grass while the more protected slopes are wooded. According to the Tucucu whose father had visited this region many years before, the Indian name for the savana-covered slopes leading west and east down to the Apon River was "Manatara" and that of the river itself, "Yapon." He also stated that the Rio Negro was called the

"Atapshi" and the great river to the south (the Catatumbo), the "Shukumu." It was possible to see, here and there in the wooded regions of the slopes of the last mountain chain, evidence of former clearings. To an archeologist, accustomed to work in the tropics, these signs are unmistakable. A cleared area, even one dating from pre-Colombian days, never grows up in such a manner as to blend absolutely with the virgin forest.

The afternoon of the fourth day we continued along the sharp ridge, steadily descending. While at first walking through the grass was a welcome relief from the everlasting cutting of undergrowth in the woods, the pebbly, hard ground which characterizes the savana-covered areas owing to their thinner soil covering soon caused intense suffering to our unaccustomed feet. In the late afternoon camp was made on the southern slope of the ridge near a spring that was found in a small wooded patch at an altitude of 4,000 feet (Fig. 13). The noon meal had practically exhausted our food supply, and it was only after a heated argument in the evening that the writer was able to persuade his companions to proceed at least half a day's journey farther to the Apon River.

Vain Hunt on the Banks of the Apon

It was the writer's idea that perhaps the woods bordering this stream might contain game, and the shooting of a bird of any kind or of a monkey would save the day and encourage the Indians to continue the trip up the last mountain chain separating us from our objective. Incidentally, the Tucucu whose father had told him the story of the burial cave and had given him minute particulars of the peculiarly shaped peak in which the cave was to be found, had recognized this mountain on the slopes of the last chain and had pointed it out to the writer.

The next morning, which made the fifth day after leaving the Macoa settlement, we continued our journey on empty stomachs, our breakfast having consisted merely of tea, which offered but scant consolation to the Indians and did not serve effectively to still the writer's pangs of hunger. We proceeded along the ridge and at last, from an altitude of 2,700 feet, could clearly see the course of the Apon River (Fig. 15). The woods bordering the banks of this stream made us hopeful of game, and the rest of the morning was spent in a wild scurry down the slope in order to realize our hopes. At last we reached the river at an altitude of 2,200 feet, considerably lower than the Macoa settlement. At this elevation the Apon is already a wide stream with a considerable amount of water (Fig. 14). Its width is not less than fifty feet, and the velocity of the current perhaps as much as ten miles per hour. The depth in places is five feet or more and is nowhere less than three feet.

Turned Back by Hunger

The remainder of the day was spent in a futile attempt to find a victim for the writer's gun or the Indians' arrows. One solitary curassow was

flushed but did not allow us to come within gunshot afterwards, and with this exception no animal was seen. The Indians managed to secure some, to us, unknown roots, which they ate with no apparent relish. Fish were seen in the river, but all attempts to catch them without hooks proved vain.

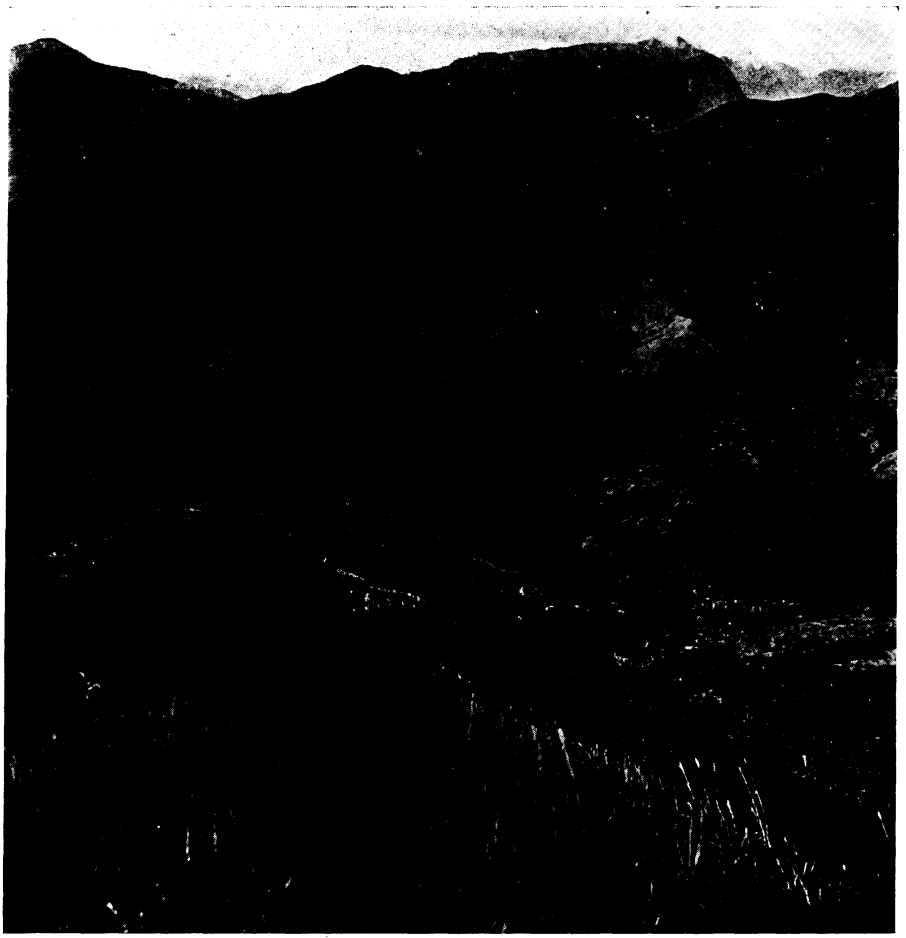

FIG. 12—A detail of the slopes of the mountains west of the Apon, seen closer by than on Fig. 10. Note the distribution of forest and savana. Two Indians on the ridge in the middle distance. Taken from an altitude of about 2,500 feet.

The writer even tried to shoot some of them but met with no success. In the late afternoon the Indians became positively sullen and proposed returning to the camp. This time there was no argument on the part of the writer, as in the first place he did not believe that a continuance of the trip would mean the finding of food on the slopes west of the Apon, and in the second place he considered the two Macoas in no mood for argument.

We therefore returned and reached our camp of the previous night at

about ten o'clock, having had to make the latter part of the trip by moonlight owing to the time we lost in our fruitless hunt on the banks of the Apon. The pangs of hunger that night were especially severe, and the grumbling on the part of the Indians was only rivaled by the unexpressed thoughts of the writer. To have actually seen the last mountain chain separating him from his goal and not to have been able to continue was a trial that far exceeded in agony the pangs of hunger. It was only aggravated by thoughts of the burial cave in the curiously shaped peak where untold archeological treasures of the Arhuacos may be awaiting a discoverer.

FIG. 13—Camp on the southern slope of the ridge shown in Figs. 9 and 12. Altitude 4,000 feet. The first and third Indians from the left are Tucucus; the second and fourth, Macoas. The cotton robe worn by the two standing Indians is the characteristic garment of the Macoas—a response to the mists and cold of the interior of the Sierra.

KILLING A MONKEY

The sixth day found us struggling up the slopes and saw us finally reach our next camp in the late afternoon, at an altitude of 5,400 feet. Here we found that a large part of the food that had been left behind had spoiled. We finished the remainder that night, the Indians even eating the skins of the plantains. An early start was made the next morning, and almost before the sun was visible we ran into a party of howling monkeys, one of which the writer succeeded in shooting. This was his first experience in killing a monkey, and he sincerely hopes it may be his last. The dying

agonies of the wounded animal, regarded with stoical indifference by the Indians, will long remain in the writer's memory. Hungry as I was, the meal that was prepared almost directly after the animal's death had no attraction for me. In fact I was obliged to leave the Indians for a while until their repast was finished. Even the thought that I had shot the monkey under circumstances of great stress failed to console me. I believe that this remorse is experienced by the majority of tropical explorers who have at times been obliged to kill monkeys in order to ward off the dangers of starvation. The Indians, on the other hand, appeared to have none of

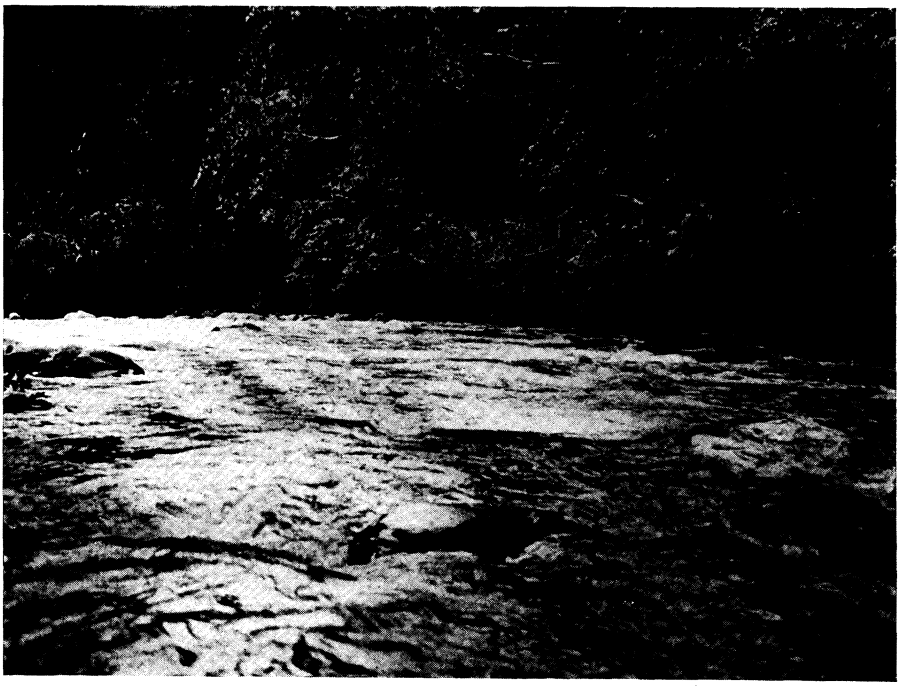

FIG. 14—The Apon River: looking downstream. The river here lies at an elevation of 2,200 feet

these feelings and made a hearty meal, with a consequent revival of their good humor. That night we reached our camp at an altitude of 5,100 feet, having traveled the entire afternoon in a steady downpour. In this camp we found the first cache of food we had made; this, together with the remainder of the monkey, was eaten by the Indians.

The seventh day found us once again cutting a way through the ferns, and early that afternoon, thanks to the quicker progress made over the path cleared five days previous, we reached our first camp at an altitude of 4,700 feet. As it was quite early, we decided to continue along the trail. The traveling was now all downhill and easy going, as the trail had frequently been used by the Macoa settlement. Incidentally we were again suffering from hunger, as no more game had been seen after we met the

monkeys, and no food had been left in the first camp. Our start the next morning was therefore made very early, and before eight o'clock in the forenoon of July 2 we reached the Macoa settlement, where plentiful food had been prepared by Peñaranda upon hearing the writer's warning shots from a nearby hilltop.

Return to the Lowlands

A few days after arriving, the writer decided to bid farewell to the Macoas and Tucucus and to return to the plains. The return journey down the mountains took less time than the ascent; and, when we finally emerged at the cattle farm of Señor García, I had covered in ten hours what previously had taken two days. I was, in many ways, regretful at leaving the Macoas, who had treated me so well; and I believe that several of my kindly hosts were sorry to see me go. Not all the Macoas had remained friendly, however, and in some ways I felt that there was a possibility of imminent trouble had we remained much longer. The novelty had worn off, and several of the Indians had become dissatisfied when the stock of trading goods was exhausted. Besides, it is simply natural for the Macoa to get into a fight every little while, a propensity of which I saw plentiful evidence during two *chicha* feasts that were held during my stay in the mountains. I was not desirous of being a party to one of these fights and losing the linguistic, ethnological, and geographical data I had been able to collect.

Fig. 15—Looking down upon the Apon River from an altitude of 2,700 feet on the ridge shown in Fig. 12. The woods occur only immediately along the stream; above, the slopes are grass-covered, as in the right background.

There are great possibilities in the Sierra de Perijá for future exploration. A prolonged sojourn among the Macoas, with a plentiful amount of trading goods and canned food, would allow for many journeys through the interior of the Sierra and for the mapping of the headwaters of many of the rivers that go to make up the western tributaries of Lake Maracaibo. That the American Geographical Society enabled the writer to lift, be it ever so slightly, the veil of mystery which now hangs over this chain, means to him a debt of gratitude which his mere words cannot sufficiently express.

The Western Maracaibo Lowland, Venezuela

Theodoor de Booy

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THE WESTERN MARACAIBO LOWLAND, VENEZUELA*

By THEODOOR DE BOOY

[With separate map, Pl. XVII, facing p. 496.]

LAKE MARACAIBO

Lake Maracaibo was discovered by Alonzo de Ojeda in 1499. At the time of its discovery the lake was called "Coquibacoa" by the aborigines and "Gulf of Venice" by Ojeda, the latter name being suggested to this *conquistador* from the resemblance of the Indian pile dwellings on its shores and in the lake itself to the type of houses erected in Venice on the lagoons. According to Sanchez, Lake Maracaibo was also named the "Lago de Nuestra Señora."[1] Subsequently, both the lake and the principal town on its shores were designated by the aboriginal name Maracaibo, whose origin is obscure. Sanchez states that the name is derived from the exclamation of an Indian warrior who called out "*Mara cayó*" ("Mara falls") on seeing his chief, named Mara, fall in a battle against the Spanish invaders.[2] This seems far-fetched, as it is hardly likely that the Indian would have been sufficiently familiar with the language of the hated invaders to have made such a remark in Spanish. Crevaux suggests that Maracaibo is possibly derived from the Indian word *maracaï*, which means tiger.[3] According to Ernst, the word is derived from the Indian word *maracayar-mbo,* which signifies "tiger's foot."[4]

Lake Maracaibo extends from about lat. 9° to lat. 11° N. and from long. 71° to long. 72° W. It is about 100 miles long, north and south, and from 40 to 60 miles wide and is connected with the Gulf of Venezuela by a strait of fresh to brackish water about 35 miles long and from 4 to 10 miles wide. "The depth of water in the south is as much as 250 meters; in the middle about 150 and in the north a great deal less."[5]

The western borders of the lake remained unexplored until 1529 when the German Ambrosio Alfinger crossed from Coro to the present site of the city of Maracaibo and founded a settlement in this place, previous to his transmontane journey to Colombia. There are one or two instances after this where some of the *conquistadores* attempted journeys due west

* This is the second of two articles dealing with the author's expedition to the Sierra de Perijá, Venezuela, in May-July, 1918, under the auspices of the American Geographical Society. The first article, in the November *Review*, discussed the range itself, while the present article takes up the lowland lying between Lake Maracaibo and the Sierra de Perijá. The map accompanying this number illustrates both articles.—EDIT. NOTE.

[1] Silvestre Sanchez: Geografía y breve historia de la Sección Zulia, Caracas, 1883, p. 42.

[2] Sanchez, *op. cit.*, p. 84.

[3] Jules Crevaux: Voyages dans l'Amérique du Sud, Paris, 1883, p. 446.

[4] Marcial Hernandez: Sinopsis de historia de Venezuela, Maracaibo, 1914, p. 7. This writer does not give the source whence he derived this information.

[5] Wilhelm Sievers: Venezuela und die deutschen Interessen, *Angewandte Geographie*, Ser. 1, Part III, Halle, 1903, pp. 17-18.

FIG. 1—The plain between La Villa and Arimpia. The trails from one settlement to another are hard to find as they run apparently aimlessly over the savana.

from the shores of Lake Maracaibo, but these attempts appear to have been generally defeated by the hostile Motilone Indians, who were well able to cope with the invaders. The city of Maracaibo appears from the first to have been a stronghold from which the eastern shores of the lake were dominated, while the colonization of the western shores, with their hostile aborigines, was deferred until the eighteenth century. Between the years 1779 and 1792 the Capuchins of Navarre established ten missions west of the lake, in which were about 1,000 baptized Indians and 300 unbaptized.[6] These missions were subsequently destroyed by Indian uprisings, but they undoubtedly were directly responsible for the colonization of the surrounding districts.

The District of Perijá

The state of Zulia, which almost completely encompasses Lake Maracaibo, is divided into various political divisions named districts. This paper deals mainly with the District of Perijá, which lies west of the central part of Lake Maracaibo. It is bounded to the north by the Palmar River, to the west by the crest of the Sierra de Perijá, and to the south by the Santa Ana River. The capital of the district is Machiques (Libertad). According to the census of 1909, this district has a population of 5,512.[7]

Its Rivers

The district is watered by the Palmar River, whose tributaries—Tosas, Laja, and Tapias—rise in the Sierra de Perijá; the San Juan and San Ignacio Rivers, which find their origin in the plains near La Villa; the Apón River, which also originates in the Sierra de Perijá, together with its tributaries the Aponcito, the Macoa, and the Cogollo; and the Santa Ana River, with its tributaries the Rio Negro, Rio Yasa, and Tucuco, which likewise comes from the Sierra de Perijá. Outside of these there are various smaller creeks, such as the Arguaco, the La Gé, the Motilone, and the Cuiva, which, in the rainy season, serve to irrigate the country.

It can be noted upon the map of the province of Maracaibo in Codazzi's Atlas[8] that the Palmar, Apón, Rio Negro, and Santa Ana Rivers are shown as being navigable for a considerable distance from their mouths in Lake Maracaibo. It would appear as if the celebrated geographer depended too much upon hearsay information in this matter. The Palmar River is

[6] Anuario estadístico de la Sección Zulia, Maracaibo, 1886, Vol. 1, pp. 57-58.

[7] L. V. Dalton: Venezuela, London, 1912, p. 273. Sanchez (*op. cit.*, pp. 65-66) states that by the census of 1881 the district was officially credited with 4,346 inhabitants but that in his opinion it had at least 8,000 inhabitants. The writer shares this opinion for the census of 1909, believing that the census must have been carelessly taken and have failed to enumerate hundreds of the scattered families that live upon the savanas. This estimate also probably does not take into account the Indians living west and south of Machiques, the number of which cannot be determined. Ernst (A. Ernst: Un craneo motilón, *Rev. Cientif. Univ. Centr. de Venezuela*, Vol. 1 (n. d.), pp. 119-124) states that "no one has up to the present time seen the plantations of the Motilones nor knows with certainty if they have any fixed abodes; in consequence the number of these aborigines cannot be approximated."

[8] Agustín Codazzi: Atlas físico y político de la República de Venezuela, Caracas, 1840.

navigable for some ten miles from its mouth, but only for canoes. The Apón is navigable for a distance of twelve miles from the lake, as far as the point called Palo Gordo, but only for canoes. A great deal of the commerce between Machiques and Maracaibo is transported by the lake and up this river to Palo Gordo, from where it is but a short distance overland to Machiques. The Santa Ana is said to be navigable for a considerable distance, but the writer is informed by settlers along the lake shore that the dangers of Indian raids make the navigation of the

FIG. 2—The La Gé River near La Quebrada.

FIG. 4—The Aponcito River at the crossing between Machiques and El Llano.

(Figs. 2, 3, 4, and 5 represent, in the order named, the typical aspect of the rivers of the western Maracaibo lowland in their course from the mountains to the lake.)

upper waters of this river impracticable. Virtually the entire region south of Machiques as far as the river Catatumbo in the District of Colón is impenetrable for this reason.

Some of the smaller rivers of the Perijá district carry water in their lower courses only during the rainy season. Owing to the porosity of the lake plain all the rivers, without a single exception, carry a larger volume of water where they break through the Sierra de Perijá than at their mouths in Lake Maracaibo. The upper beds of all of them consist of boulders and rocks of various sizes that have been brought down from the Sierra (Fig. 2). The rivers here have an impetuous current, due to the sudden drop in elevation. Soon, however, the number of boulders grows less, and the river bed consists of half boulders and half gravel (Fig. 3). At length, about one-third the way across the plain, the river beds

consist of nothing but sand (Fig. 4). Several of the rivers finally lose themselves entirely, and naught remains but a dry, sandy strip forming a sharp contrast to the surrounding savana-covered plains (Fig. 5). The

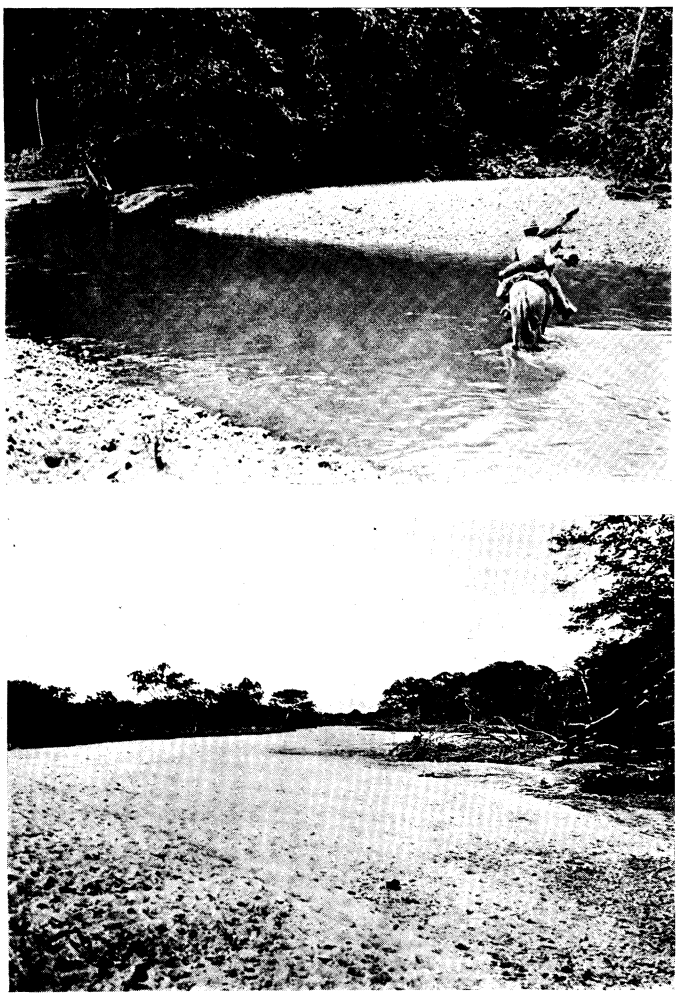


FIG. 3 (upper)—The Macoita River at the crossing between Machiques and El Llano.

FIG. 5 (lower) -A *cañada*, or dry river bed, near San Juan.

natives make use of these dry river beds, *cañadas,* as they are called, to dig shallow depressions from which fresh water can be obtained at any season of the year.

ITS CLIMATE

The climate of the western shore of Lake Maracaibo in general is quite healthful. Sievers states that Maracaibo is one of the warmest places in

South America and that it has an average yearly temperature of between 22° and 27° C. (72° to 80° F.) He also states that afternoon temperatures of 35° C. (95° F.) are reached. In these statements Sievers is justified, but his contention[9] that Maracaibo is to be especially feared climatically is far from being correct. While it is true that occasional outbursts of yellow fever have taken place in Maracaibo itself, this was due more to a lack of precautionary measures than to any other cause; in the healthier regions west and south of the city yellow fever is unknown. A more cheerful view of the climate is taken by Plümacher, who considers Maracaibo extremely healthful and as evidence cites that the death rate is but about one-half the birth rate.[10]

The rainy season in the regions west of Lake Maracaibo extends from about the first of May until the end of July. The month of August is fairly dry, while the middle of September again sees the commencement of heavy precipitation, which lasts through October and November until about the first part of December. June, October, and November are the wettest months. At other times of the year there is hardly any rainfall, and these are of course the months when travel west of the lake is at its best.

The City of Maracaibo

Maracaibo is a thriving city, in size the second in Venezuela. Its exports are larger than those of La Guaira, the port of Caracas. While the first settlement here was founded by Alfinger in 1529, it was destroyed by the Indians shortly afterwards; it was not until 1571 that Alonzo de Pacheco founded the present city and named it Nueva Zamora.[11] According to the census of 1909, the town has a population of 37,551 inhabitants,[12] but competent local authorities place the number greatly in excess of this figure. The city is laid out regularly and has some beautiful plazas and public buildings. It presents a bustling appearance, and the amount of export goods carried through its streets gives one a fair idea of the prosperity of the interior states. The commerce from the region to the west of the Cordillera de Mérida and that of the eastern part of the Colombian state of Santander passes through Maracaibo by way of the Zulia and Catatumbo Rivers and the lake. Possibly one-half of the so-called Maracaibo coffee comes from the Andean states of Venezuela and the other half from the state of Santander, as no coffee at all is produced within a hundred miles of the town.

The Three Types of Country between Lake Maracaibo and the Sierra de Perijá

After landing in Maracaibo, the writer decided to proceed overland to La Horqueta, a station of the Caribbean Petroleum Company at the foot

[9] Sievers, *op. cit.*, pp. 31-32.
[10] O. Plümacher: Maracaibo, *Das Ausland*, Vol. 61, 1888, p. 812.
[11] Dalton, *op. cit.*, p. 151.
[12] Dalton, *op. cit.*, p. 273.

of the Sierra de Perijá preparatory to his expedition into the interior of the range, described in a previous article.[13] The usual route to this camp is by water down the western shore of the lake to Iguana Point and then overland to La Horqueta. As this route would not afford an opportunity for studying the topography of the region, it was decided to take the longer overland route in a southwesterly direction from Maracaibo. On this route three distinct zones are met with before arriving at the foot of the Sierra de Perijá.[14]

FIG. 6—A plantation of divi-divi trees along the road between Maracaibo and La Pua. These trees are grown for their seeds, which contain tannic acid, used in tanning.

The Arid Coastal Zone

The first zone may be named the arid coastal zone. It consists of a broad, arid belt upon which is seen the typical vegetation found in these latitudes along portions of the seacoast where a scant rainfall is experienced or where the porous nature of the soil is such that the rainfall is speedily absorbed without giving rise to vegetation and its attendant humus. The appearance of the country directly west of the city of Maracaibo, to the eye of the writer, is identical with the landscapes of the island of Margarita off the Venezuelan coast to the eastward—a sandy waste upon which cacti, shrubs, and smaller trees alone succeed in obtaining a foothold. Following the road from Maracaibo to the southwest one sees here and there small *ranchos* where goats provide their owners with a precarious living. Outside

[13] An Exploration of the Sierra de Perijá, Venezuela, *Geogr. Rev.*, Nov., 1918, pp. 385-410.

[14] A valuable map of the vegetation of northern Venezuela, 1:3,000,000, forms one of a series of three maps on the same scale (the other two showing geological structure and relief) by W. Sievers, accompanied by explanatory text (Karten zur physikalischen Geographie Venezuelas, *Petermanns Mitt.*, Vol. 42, 1896, pp. 125-129, 149-155, 197-201, with Pls. 10, 11, 15; reference on pp. 197-200 and Pl. 15).

of doves, hawks, parrakeets, and owls, one sees but little wild animal life in this zone. The roads are heavy, deep in sand, and level. Here and there a small hummock of reddish shale, perhaps five meters high, raises itself above the general level. All in all, the scenery is depressing in the extreme. The glare of the sun is incredibly strong, and the traveler who comes unprovided with a canteen will suffer exceedingly from thirst, no wells or water holes with water fit to drink being found after one leaves Maracaibo. In one or two instances small plantations of umbrella-like divi-divi trees (*Caesalpinia coraria;* see Fig. 6) are seen. The seeds of these trees contain a large proportion of tannic and gallic acid; they are used extensively in the local tanneries and are also exported to northern markets. Just outside of Maracaibo one crosses the dry bed of a river whose course appears to have changed to the northward; it is the local custom to dig shallow wells in the sandy bottom of this former watercourse from which water may be obtained that is but slightly brackish.

The arid coastal zone continues inland for a distance of about 30 kilometers. The road from Maracaibo passes two important ranchos, that of El Palotal (about 12 km. from Maracaibo) and that of Rincon la Vera (about 14 km. from Maracaibo). At these two places large depressions in the soil serve to collect rain water. Thus the owner is enabled to raise fairly large herds of cattle, which feed upon the wiry grass and the leaves of low bushes that go to make up the scant vegetation of these parts. The products of these cattle in the shape of milk, cheese, and hides are sent to Maracaibo. After passing these two ranchos one begins to notice a change in the aspect of the country. The shrubs are not so abundant, and larger trees are seen here and there. The soil formation, however, is still practically the same, and the country retains its level aspect. About halfway between Maracaibo and Monte Verde lies the small settlement of La Pua, consisting of a *tienda* (small shop) and two or three small huts. Minor supplies can be purchased here.

The Dry-Forest Zone

The Way Station of Monte Verde

One enters the second zone, which may be called the dry-forest zone, at Monte Verde. This place is appropriately named "green woods," as here begins the wooded belt, with a width of about 45 kilometers. Monte Verde itself is naught but an open structure that serves as a resting place for the pack trains carrying supplies to the interior—merely a larger edition of the Indian huts of the mountains. A stockade encloses a space around the building, which consists of a thatched roof supported by poles. A caretaker lives nearby, to whose lot it falls to cut the fodder for the arriving pack animals. For this he makes a small fixed charge, but there is no charge for the use of the rest house. Half of the floor area of the rancho

bears a raised wooden platform upon which the travelers swing their hammocks; the other half has a mud pavement which is used to build fires for cooking food. A night scene in one of these ranchos is singularly weird. The flickering fires form a strong contrast to the gloom of the surrounding forest. In the gently swaying hammocks the chatter of travelers at times drowns even the noise of the howling monkeys far off

FIG. 7—Ferry across the Palmar River at Paso de la Candelaria.

in the forest. After a while the occupants of the hammocks grow silent, and the wild life of the woods has the night to itself, the crickets and howlers ably supported by the myriads of frogs in the nearby ponds.

THE CHARACTER OF THE WOODLAND

The wooded zone supports large trees, the giant *ceiba* being one of the predominant varieties. Large numbers of valuable cedar trees can also be observed. Very little underbrush is seen, and it would appear as if each giant tree required all the nourishment which the shallow soil covering the underlying sand could give and as if nothing were left to sustain smaller vegetation. The soil is still sandy and the road level. Here and there a palm tree raises its stately crest. During the rainy season the road is generally covered with water. Owing to the sandy soil no mud is formed, and in consequence travel is possible at any time of the year.

Monte Verde to the Palmar River

From Monte Verde to the crossing of the Palmar River the country is almost uninhabited. The reason for this is that with one or two exceptions no pasturage is found for cattle, nor is there soil that would make an agricultural enterprise successful. Four ponds, at Prevención, San Pedro, San Isidro, and San Pablo, border the road, so that the traveler need not take the same precautions against thirst as were necessary between Maracaibo and Monte Verde. Small cattle farms are found near the last three

Fig. 8—A street in La Villa.

of these ponds, but there is no possibility of obtaining supplies here, as the owners live in dire poverty. Beyond the invariable cup of coffee, which is duly prepared as an act of courtesy for any arriving traveler, it is impossible to obtain any provisions except some green plantains.

More Densely Wooded Riverine Belt

Before reaching the ford of the Palmar River, we find in the second zone a higher degree of fertility. The humus covering the sandy soil becomes deeper, and the forest has a denser appearance. The woods here are peopled with monkeys, jaguars, tapirs, peccaries, wild boars, and birds of all descriptions, such as curassows, wild turkeys, partridges, parrots, pigeons, and macaws. The traveler is astonished at the faunal riches of this district. It proves to be a sportsman's paradise. Large swarms of butterflies cluster around the water puddles in the road and on being disturbed fly up in such numbers as almost to obscure one's vision.

The Palmar River

At the ford of the Palmar River, named Paso de la Candelaria (Fig. 7), the stream is about 120 feet wide and can be crossed on horseback during the

dry season. During rainy weather the river frequently is so high that the traveler must cross by canoe while the animals swim. Occasionally even the current becomes so swift that the traveler is obliged to wait upon the banks until the waters subside. The river is not navigable, as reports state that it loses itself in swampy marshes some distance below the ford and does not recover its channel until within a short distance from its mouth in Lake Maracaibo. A toll is levied by the government upon all travelers and animals that cross the river, and ferrymen and toll gatherers

FIG. 9—Typical native houses near La Villa. The house on the right is made of intertwined boughs plastered with mud.

are stationed at the ford. At Paso de la Candelaria also is found a large cattle ranch with excellent pasturage. Here are produced large quantities of the typical white cheese that can be seen in the Maracaibo markets.

The forest zone continues for a considerable distance beyond the river. The country now becomes slightly rolling, and it may be noted that the original sandy lake bottom has been covered with the more fertile deposits that have washed down from the Sierra de Perijá.

The Savana Zone

THE TOWN OF LA VILLA

About three hours' ride from Paso de la Candelaria, a short distance before the ancient town of La Villa is reached, the forest opens and one enters the third zone. This is a belt about 15 kilometers wide. In reality it is a plateau with an elevation of about 300 feet where erosion in places has cut small valleys, leaving low hills that overlook the mountains and the intervening ravines. These low, rolling plains are crossed here and there by ridges of white sandstone that are in general parallel with the

mountains and die out as soon as they approach the Palmar River. The low portions consist in the main of gravel and boulder-covered terraces of uneven character. This third zone may be called the savana zone and extends to the foot of the Sierra de Perijá. Small clumps of trees dot the grass-covered savana. The grass is not high even in the rainy season and resembles dune or broom grass. A few huts and some horses, cattle, sheep, and goats indicate that this zone is slightly more populated than the two previously described regions. The town of La Villa, officially known as La Villa de Rosario de Perijá, and not as "Perijá," as it is marked on many maps, consists of about one hundred houses and is irregularly laid out (Fig. 8). La Villa was also known during the Guzman-Blanco administration as "Federación," and during the same epoch the district which is now the District of Perijá was known as the "Districto Guzman-Blanco." It may be mentioned that this renaming of towns, districts, and states in Venezuela has caused a great deal of confusion in the past and makes the reading of maps difficult. La Villa is the residence of the *alcalde* of the municipality of Perijá, the other municipality of the district being that of Machiques.

According to Sanchez, the town of La Villa was founded by families from the Canary Islands in 1800.[15] The writer is of the opinion that this information is incorrect, as he personally inspected the church records of La Villa, which go back to the year 1781. Judging by the architecture of its church the town is of far greater antiquity. It may be mentioned incidentally that Sanchez states that the savana surrounding La Villa is named the "Sabana de Sartanejo." According to the local authorities La Villa has about 250 inhabitants, many of the houses being unoccupied for the larger part of the year. It is a sort of recuperating resort for the landowners from regions to the north and west. They are in the habit of occasionally spending a week or two here, the climate of the place being famed for its salubrity. That La Villa was a more important settlement in former days can be judged from the numerous ruined house foundations that still exist. There is now but little traffic. A shop or two seem to suffice for the needs of the inhabitants and of the surrounding country. Many of the houses still retain traces of the favorite architectural vagaries of the early settlers. This is especially noticeable in the curious windows with their wooden grills.

Between La Villa and the Sierra

Beyond La Villa the country becomes more thickly settled. Many little huts are seen, made of intertwined boughs that have been plastered with mud (Fig. 9). One is struck by the patriarchal mode of living of the settlers, who appear to be almost entirely independent of the outside world and can produce almost all they need without having to go elsewhere.

[15] Sanchez, *op. cit.*, p. 63.

The Sierra de Perijá now comes into view (see Fig. 1 in first article, p. 388). It would be hard indeed to describe its beauties and its grandeur. When it is approached from the east in the afternoon, the sun seems to accentuate the cloud masses that drift along the ridges. The vegetation on the mountains is scarcely visible against the light of the sun, and the entire ridge appears covered with a bluish haze. From the Venezuelan side the Sierra de Perijá undoubtedly presents a different aspect from that seen from the Colombian valleys. While the range is reported to be partly devoid of vegetation on its western slopes, it is densely forested on

FIG. 10—The Ciénaga de Arimpia, a shallow lake, typical of the western Maracaibo lowland, which dries up in the dry season.

the eastern. Vegetation appears to extend to the crest of every ridge; no bare places are seen at all. One can clearly make out the waterfall of the Cogollo River, the white strip of this cascade being in sharp contrast to the deep green of the surrounding vegetation.

Numerous small hills now begin to put in an appearance. These cannot be called the foothills of the Sierra de Perijá as they are totally detached and appear like isolated islands on the savana. None of them have elevations of over 100 feet. It is not unusual to find swamps and small lakes between the ridges. Owing to the peculiar formation of the soil, quicksands frequently form in these swamps and offer a serious menace to the unwary traveler. Reports that travelers have been engulfed in these quicksands are not uncommon.

The savanas end near the ridges of the Sierra de Perijá. Before we reach these ridges several shallow lakes have to be passed, of which the largest is the Ciénaga de Arimpia (Fig. 10), which has a considerable area during the rainy season but dries up almost entirely at other times of the

FIG. 11—Outskirts of the town of Machiques. Sierra de Perijá in the background.

year. Near this lake is found the settlement of La Horqueta, where the station of the Caribbean Petroleum Company is located. This station consists of a large thatched bungalow for the use of officials and a mess room. Both houses are enclosed in mosquito netting—a great blessing to the traveler in a country where mosquitoes are found in incredible quantities. Besides these buildings a number of sheds for machinery, houses for the workmen, etc., are included in the settlement.

The Region Along the Foot of the Range

Between La Horqueta and Machiques

The country between La Horqueta and Machiques consists for the greater part of savana and is only wooded in the belts following the watercourses. There are two routes that are in general use for travel to Machiques: one, an inner route with reference to the mountains, leading from the settlement of Arimpia southwest via El Rodeo and El Llano; the other, an outer route, running southeast to San Juan and then southwest via Villa Vieja to San Rafael and thence to Machiques. The advantage of the outer route is that in the rainy season one is not held up at the crossings of various rivers. The outer route, however, besides being considerably longer, has the disadvantage that it leads almost entirely over open savana, which makes travel in the heat of the day a severe hardship.

The first settlement of size one reaches on following the outer route after leaving La Horqueta is that of Arimpia. This consists of at least fifty houses scattered over the savana. Each house has its grazing lands, so that the distance between any two houses may be as much as half a mile. The inhabitants of Arimpia, in fact the inhabitants of all the settlements between Arimpia and Machiques, depend for a living almost exclusively upon the raising of cattle, goats, and sheep. The trails from one settlement to another are hard to find as the animals have made so many paths on the savana that these are frequently mistaken for the road (Fig. 1). Bird life on the savana appears to differ greatly from the bird life that is found in the wooded zone. Undoubtedly the savanas would prove a rich field to ornithologists, as the casual observer is struck with the immense number of species seen, running all the way from the large storks and cranes that frequent the swamps to the smallest sized humming birds.

The next settlement of size met with on this road is that of San Juan, consisting of about thirty huts. The inhabitants of San Juan appear to have specialized in the raising of sheep, instead of the usual goats. The grass here appears to be a trifle more nutritious than it is in other parts. This is probably accounted for by the fact that a large depression exists south of San Juan from which the surrounding country derives a great deal of moisture. In consequence the aspect of the savana is greener, and, with its clumps of trees, resembles, when viewed from a distance, nothing

so much as a Kentish meadow studded with untidy orchards. On the hummocks north and south of San Juan can also be seen clumps of coconut trees; in fact similar groves are not unusual throughout the entire Perijá district, additional evidence that the soil here was at one time sea bottom and is still sufficiently impregnated with salt to permit proper cultivation of coconut trees. It is a curious and unusual sight to come across bearing coconut trees at such a distance from the sea.

After passing San Juan, the road leads to the east of a large swamp called El Pintado. Beyond this one passes two small settlements, San Ignacio and Villa Vieja. The road now takes an abrupt turn to the southwest, enters the densely wooded zone of the Apón River, and crosses this river at the ford of San Rafael. The wooded belt here has a width of about 12 kilometers and is not left until just before one reaches the settlement of Las Piedras, halfway from the ford to Machiques.

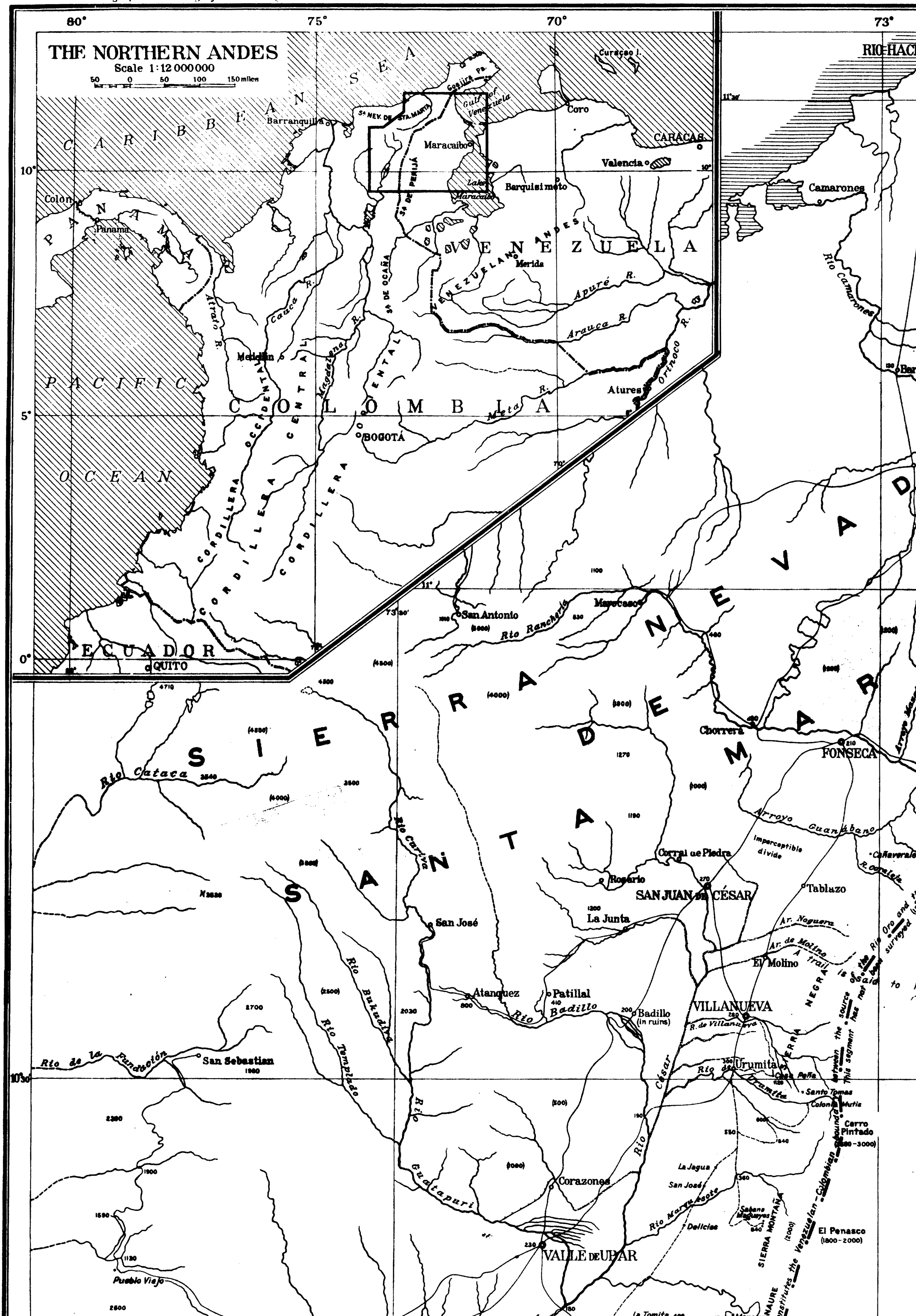
The Town of Machiques

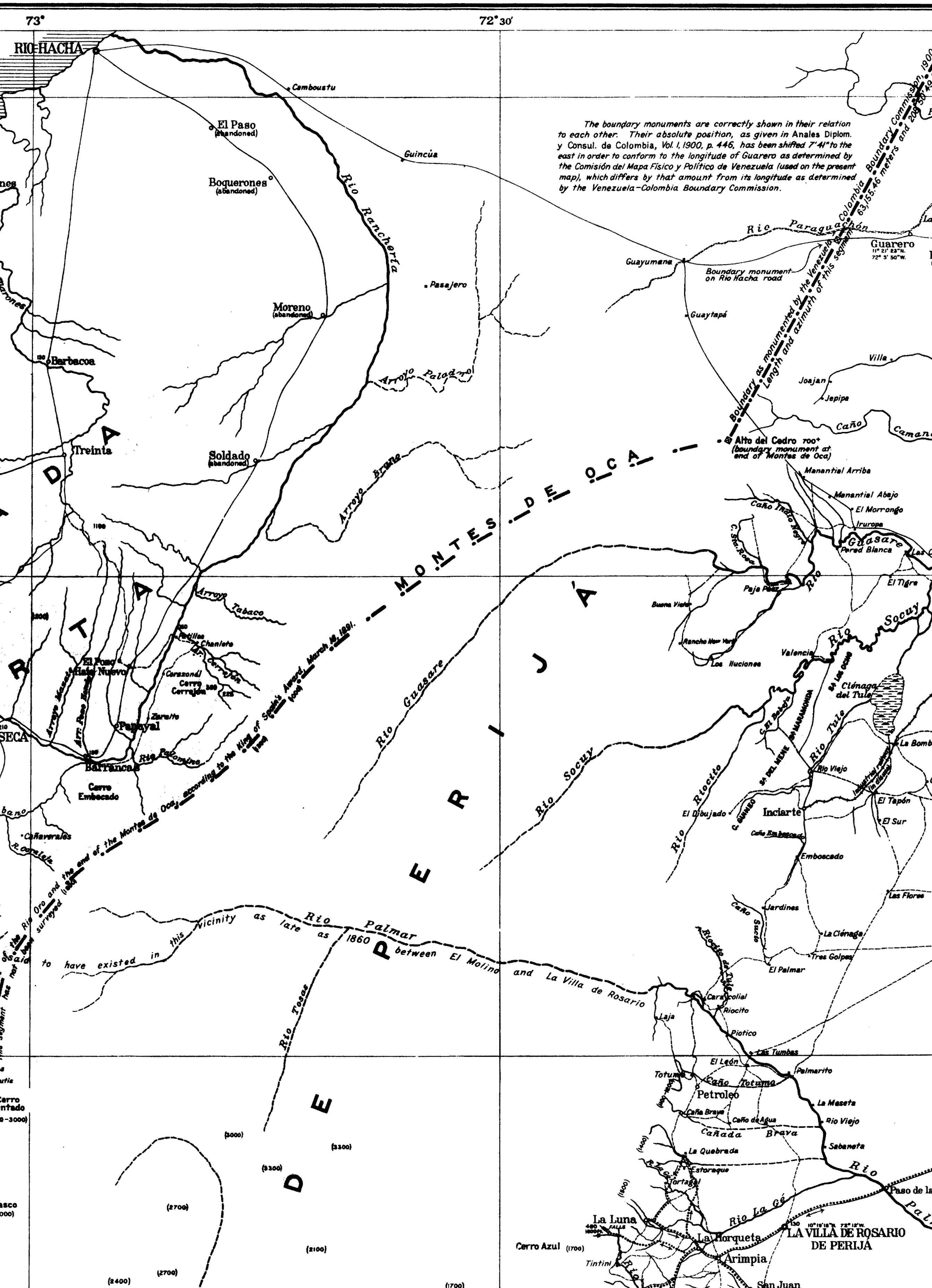
The town of Machiques (Fig. 11) is situated on the southern bank of the Apón River, which, according to Sanchez, is also named the Rio Figra.[16] It consists of about 300 houses and perhaps 2,000 inhabitants, although the natives claim that 4,000 people live in the town itself and 6,000 in the immediate neighborhood. The town is not located advantageously, as it is built upon a level plateau with an altitude of about 400 feet, which is sometimes partly inundated by the Apón. The town is built in two parts, separated by a swamp which does not tend to improve the health of the inhabitants.

Machiques is the residence of the Governor of Perijá. The town is also named Libertad, which is a survival of the Guzman-Blanco administration and appears to have been retained longer than the name of Federación for La Villa. The writer cannot explain the origin of either the word Machiques or Perijá. Machiques is a comparatively new settlement. Judging from its architecture and from local traditions, it cannot be more than fifty years old. The church and the government office are the only public structures of any distinction. None of the houses have two stories, and they are all of the same architectural simplicity, consisting generally of one room divided by a flimsy partition. Unlike the older residences of La Villa, but very few houses are seen in Machiques that have the tiled roofs so typical of the older Spanish-American settlements. Instead, they are provided with the thatched roof of palm leaves found on the huts of the savana.

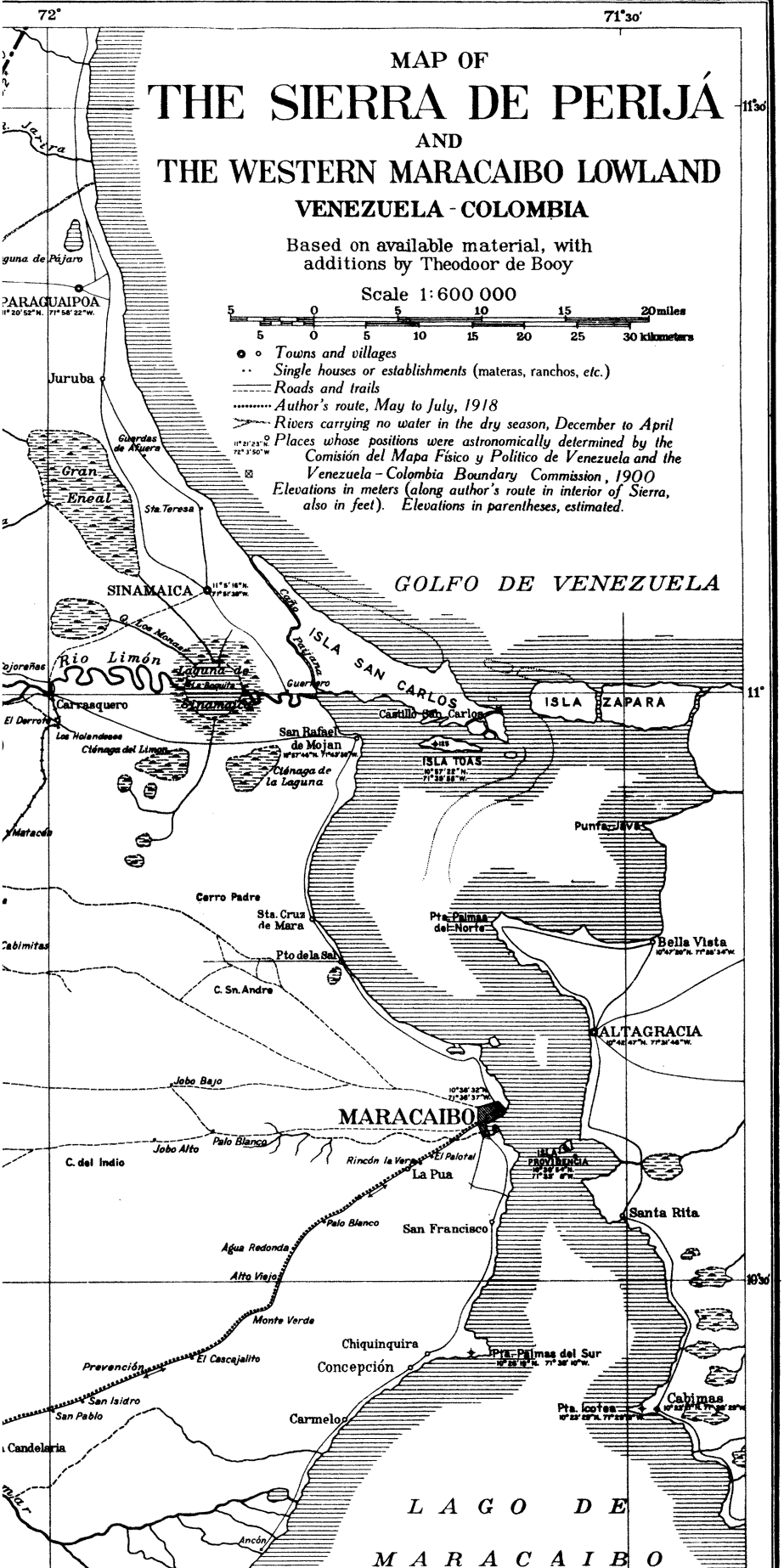
The inhabitants of Machiques depend largely upon the cattle farms that surround it for their livelihood. Various landed proprietors reside in the town when not living upon their estates. Furthermore, Machiques is the center of imports from Maracaibo for distribution through the coun-

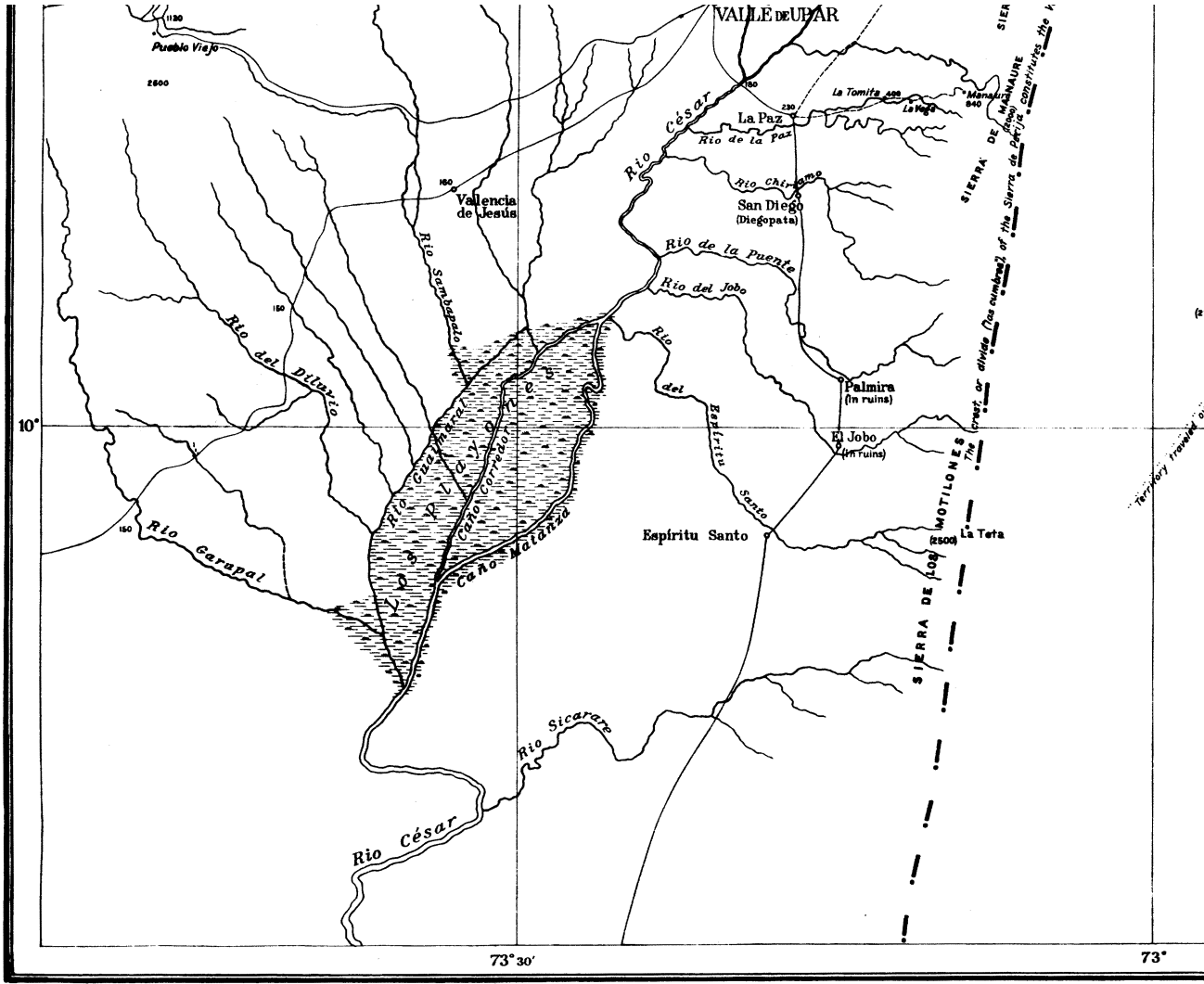
[16] Sanchez, *op. cit.*, p. 63.

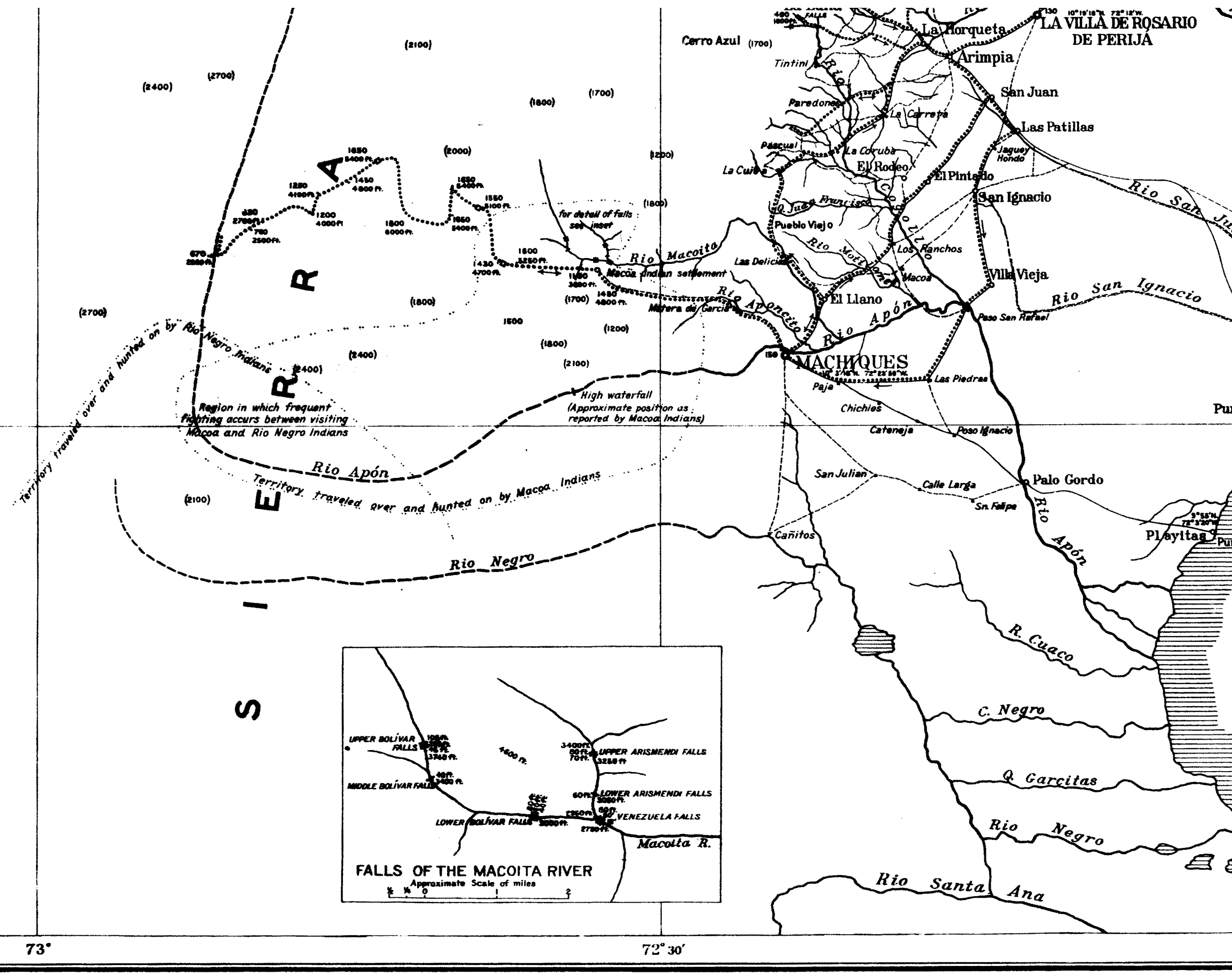

THE NORTHERN ANDES
Scale 1:12 000 000
50 0 50 100 150 miles
80° 75° 70° 73°
CARIBBEAN SEA
PACIFIC OCEAN
PANAMA
Colon
Panama
Barranquilla
Sa NEV. DE STA. MARTA
Goajira Pa.
Gulf of Venezuela
Curaçao I.
Coro
CARACAS
Valencia
Maracaibo
Lake Maracaibo
Barquisimeto
Sa DE PERIJÁ
Sa DE OCAÑA
VENEZUELA
VENEZUELAN ANDES
Merida
Apuré R.
Arauca R.
Orinoco R.
Meta R.
Atures
COLOMBIA
BOGOTÁ
Medellin
Atrato R.
Cauca R.
Magdalena R.
CORDILLERA OCCIDENTAL
CORDILLERA CENTRAL
CORDILLERA ORIENTAL
ECUADOR
QUITO
RIO HACHA
Camarones
Rio Camarones
SIERRA NEVADA DE SANTA MARTA
San Antonio
Rio Rancheria
Marocaso
Chorrera
FONSECA
Arroyo Guanábano
Imperceptible divide
Corral de Piedra
Rosario
SAN JUAN DE CÉSAR
Tablazo
La Junta
San José
Ar. Noguera
Ar. de Molino
El Molino
Rio Cataca
Rio Curiva
Rio Bukudiva
Rio Templado
Rio Guatapuri
Rio de la Fundación
San Sebastian
Atanquez
Patillal
Rio Badillo
Badillo (in ruins)
VILLANUEVA
R. de Villanueva
Urumita
Rio de Urumita
Santo Tomas
Colonia Mutis
Cerro Pintado (2880-3000)
Rio César
La Jagua
San José
Corazones
Rio Mariangola
Delicias
VALLE DE UPAR
Pueblo Viejo
SIERRA MONTAÑA
El Penasco (1800-2000)
A trail is said to
NEGRA
Rio Oro and the source of the
between the source
This segment has not been surveyed
Venezuelan-Colombian boundary
Cañaveral
R. Cañaleta
La Tomita



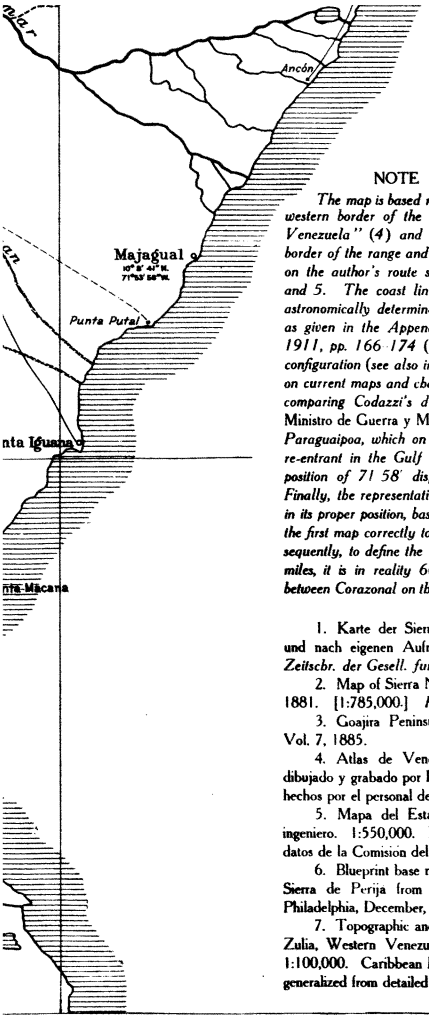
73°
72° 30'
RIO HACHA
Camboustu
El Paso (abandoned)
Guincúa
Boquerones (abandoned)
Rio Rancheria
The boundary monuments are correctly shown in their relation to each other. Their absolute position, as given in Anales Diplom. y Consul. de Colombia, Vol. I, 1900, p. 446, has been shifted 7' 41" to the east in order to conform to the longitude of Guarero as determined by the Comisión del Mapa Físico y Político de Venezuela (used on the present map), which differs by that amount from its longitude as determined by the Venezuela-Colombia Boundary Commission.
Rio Paraguachón
Guarero
Guayumana
Boundary monument on Rio Hacha road
Guaytapá
Pasajero
Moreno (abandoned)
Barbacoa
Arroyo Paladino
Boundary as monumented by the Venezuela-Colombia Boundary Commission, 1900
Length and azimuth of this segment 63,155.46 meters and 208° 50' 49"
Villa
Joajan
Jepipa
Caño
Treinta
Soldado (abandoned)
Arroyo Bruno
Alto del Cedro 700+ (boundary monument at end of Montes de Oca)
MONTES DE OCA
Manantial Arriba
Manantial Abajo
El Morrongo
Irurapa
Caño Indio Negro
C. Sta. Rosa
Rio Guasare
Pared Blanca
El Tigre
Paja Paja
Buena Vista
Arroyo Tabaco
Rancho New York
Los Ilusiones
Valencia
Rio Socuy
Patillas
Chanleto
Corazonal
Cerro Cerrajón
El Poso
Hato Nuevo
Zaratte
Papayal
Barrancas
Rio Palomino
Cerro Embocado
Cañaverales
Arroyo Manuel
Arr. Paso Hondo
Rio Guasare
PERIJÁ
Ciénaga del Tule
Rio Tule
La Bomba
Rio Viejo
El Tapón
El Sur
El Dibujado
Inciarte
Rio Riecito
Emboscado
Las Flores
Jardines
Caño Sucio
La Ciénaga
Tres Golpes
El Palmar
Rio Palmar
said to have existed in this vicinity as late as 1860 between El Molino and La Villa de Rosario
Rio Tosas
Carracolial
Riocito
Laja
Piotico
Las Tumbas
El León
Palmarito
Totuma
Caño Totuma
Petroleo
La Maseta
Caña Brava
Caño de Agua
Rio Viejo
Cañada Brava
Sabaneta
La Quebrada
Estoraque
Portaga
Rio
Paso de la
La Luna
Rio La Gé
La Horqueta
LA VILLA DE ROSARIO DE PERIJÁ
Cerro Azul (1700)
Tintini
Arimpia
San Juan
(3000)
(3300)
(3300)
(2700)
(2100)
(2400)
(2700)
(1700)


72°
71°30'
11°30'
11°
10°30'
MAP OF
THE SIERRA DE PERIJÁ
AND
THE WESTERN MARACAIBO LOWLAND
VENEZUELA - COLOMBIA
Based on available material, with additions by Theodoor de Booy
Scale 1:600 000
5 0 5 10 15 20 miles
5 0 5 10 15 20 25 30 kilometers
Towns and villages
Single houses or establishments (materas, ranchos, etc.)
Roads and trails
Author's route, May to July, 1918
Rivers carrying no water in the dry season, December to April
Places whose positions were astronomically determined by the Comisión del Mapa Físico y Político de Venezuela and the Venezuela - Colombia Boundary Commission, 1900
Elevations in meters (along author's route in interior of Sierra, also in feet). Elevations in parentheses, estimated.
GOLFO DE VENEZUELA
ISLA SAN CARLOS
ISLA ZAPARA
ISLA TOAS
MARACAIBO
LAGO DE MARACAIBO
Juruba
Gran Eneal
Sta. Teresa
SINAMAICA
Rio Limón
Laguna de Sinamaica
Carrasquero
El Desprendido
Los Holandeses
Ciénaga del Limón
San Rafael de Mojan
Ciénaga de la Laguna
Castillo San Carlos
Punta Icotea
Cerro Padre
Sta. Cruz de Mara
Pto de la Sal
C. San Andres
Pta. Palmas del Norte
Bella Vista
ALTAGRACIA
Jobo Bajo
Jobo Alto
Palo Blanco
C. del Indio
Rincón la Vereda
El Palotal
La Pua
ISLA DE PROVIDENCIA
Santa Rita
San Francisco
Agua Redonda
Alto Viejo
Monte Verde
Chiquinquira
Concepción
Pta. Palmas del Sur
Prevención
El Cascajalito
San Isidro
San Pablo
Carmelo
Pta. Icotea
Cabimas
Candelaria
Ancón





LA VILLA DE ROSARIO
DE PERIJÁ
La Horqueta
Arimpia
San Juan
Las Patillas
Cerro Azul (1700)
Tintini
Paredones
La Carreta
Pascual
La Coruba
El Rodeo
La Cuiba
El Pintado
San Ignacio
Rio San Ignacio
Pueblo Viejo
Q. Juan Francisco
Rio Motilones
Los Ranchos
Las Delicias
Macoa
Villa Vieja
El Llano
Rio Apón
Paso San Rafael
Rio Macoita
Macoa Indian settlement
for detail of falls see inset
Matera de Garcia
Rio Aponcito
MACHIQUES
Las Piedras
Paja
Chichies
Cateneja
Poso Ignacio
San Julian
Calle Larga
Sn. Felipe
Palo Gordo
Playitas
Cañitos
High waterfall
(Approximate position as reported by Macoa Indians)
Territory traveled over and hunted on by Rio Negro Indians
Region in which frequent fighting occurs between visiting Macoa and Rio Negro Indians
Territory traveled over and hunted on by Macoa Indians
Rio Negro
R. Cuaco
C. Negro
Q. Garcitas
Rio Negro
Rio Santa Ana
S I E R R A
FALLS OF THE MACOITA RIVER
Approximate Scale of miles
UPPER BOLIVAR FALLS
MIDDLE BOLIVAR FALLS
LOWER BOLIVAR FALLS
UPPER ARISMENDI FALLS
LOWER ARISMENDI FALLS
VENEZUELA FALLS
Macoita R.
73°
72° 30′



LAGO DE MARACAIBO

NOTE ON THE CONSTRUCTION OF THE MAP

The map is based mainly on Sievers and Simons (references 1 and 2 in list below) for the western border of the Sierra de Perija and the area west of it, and on the "Atlas de Venezuela" (4) and maps by the Caribbean Petroleum Co. (6 and 7) for the eastern border of the range and the western Maracaibo lowland. The interior of the range is based on the author's route sketches and, for the rest, outlined conjecturally according to maps 4 and 5. The coast line of the Gulf of Venezuela and Lake Maracaibo is based on the astronomically determined positions of the Comision del Mapa Fisico y Politico de Venezuela as given in the Appendix to the Memoria del Ministerio de Relaciones Interiores, *Caracas, 1911, pp. 166 174 (also incorporated in the "Atlas de Venezuela"). The resulting configuration (see also inset in upper left corner) differs widely from the usual representation on current maps and charts, which goes back to Codazzi, 1840 (see the map, 1:1,300,000, comparing Codazzi's delineation with that of the new map, in Vol. 2 of* Memoria del Ministro de Guerra y Marina, *Caracas, 1907). This holds true especially of the coast at Paraguaipoa, which on the older maps is shown in longitude 72°5'W., creating quite a deep re-entrant in the Gulf of Venezuela, termed the Ensenada de Calabozo. The corrected position of 71°58' displaces the town 7½ miles to the east and flattens out the bay. Finally, the representation on the present map of the eastern border of the Sierra de Perijá in its proper position, based on the surveys of the Caribbean Petroleum Co., makes this perhaps the first map correctly to show its relation to the previously located western border and, consequently, to define the extent of the range. While most maps give it a width of 25 30 miles, it is in reality 60 miles wide between Villanueva and La Luna and 45 miles wide between Corazonal on the Rio Ranchería and the eastern foot of the range abreast of Jardines.*

List of Sources

1. Karte der Sierra Nevada de Santa Marta . . . . auf Grund der Karte von Simons und nach eigenen Aufnahmen gezeichnet von Dr. W. Sievers, 1888. 1:500,000. Pl. I, *Zeitschr. der Gesell. fur Erdkunde zu Berlin*, Vol. 23, 1888.

2. Map of Sierra Nevada de Santa Marta . . . . from a Survey by Mr. F. A. A. Simons, 1881. [1:785,000.] *Proc. Royal Geogr. Soc.*, Vol. 3, 1881.

3. Goajira Peninsula, by F. A. A. Simons. 1:925,000. *Proc. Royal Geogr. Soc.*, Vol. 7, 1885.

4. Atlas de Venezuela: Estado Zulia. 1 500,000. Editado por Vicente Lecuna, dibujado y grabado por Luis Muñoz Tebar con los mejores datos y segun los ultimos trabajos hechos por el personal del Mapa Fisico y Politico. [Caracas,] 1916.

5. Mapa del Estado Zulia, [por] Luis R. Chacin, estudiante, [y] F. Chacín Navas, ingeniero. 1:550,000. Basado en los trabajos cientificos del coronel Agustin Codazzi i algunos datos de la Comision del Mapa Fisico i Politico de Venezuela. Maracaibo, November, 1915.

6. Blueprint base map of the western Maracaibo lowland and the eastern border of the Sierra de Perija from Sinamaica to Machiques. 1:100,000. Caribbean Petroleum Co., Philadelphia, December, 1913. [No relief.]

7. Topographic and Geologic Sketch Map of the Perijá Rio Limón-Maracaibo Region Zulia, Western Venezuela. Compiled to accompany report of Ralph Arnold, July, 1915 1:100,000. Caribbean Petroleum Co., Philadelphia. [Relief in contours (interval, 30 meters) generalized from detailed contour maps in 1:25,000.]

72°

71°30'

10°

Drawn by W. Briesemeister

tryside. The district due west from Machiques as far as the Sierra de Perijá is quite fertile, being covered with the deposits of the Apón River, so that large *potreros* afford abundant pasturage for cattle.

The Country South of Machiques

The country directly to the south of Machiques is uninhabited as far as the Catatumbo River, as raids by the Indian tribes have put a stop to all enterprises in this region. Formerly there existed a road from Machiques to El Pilar on the Catatumbo, but this road has not been used for at least one hundred years and all traces of it have disappeared. No inhabitant of Machiques ventures farther than Los Cañitos, the cattle ranch due south from the town on the northern bank of the Yasa River. Some few years ago the Caribbean Petroleum Company of Philadelphia sent a large armed expedition into this region in order to explore the country between the Yasa and the Santa Ana; but, after months of incredible hardships and after having succeeded in penetrating the unknown area but a short distance, this expedition had to return. Despite constant care one of the laborers that went with the party was killed from ambush by the Indians, and, had the party been less heavily guarded, it is probable that none would have returned. South of the Yasa live the dreaded Motilones and more particularly the Pariri, Tucucu, and Rio Negro subtribes. Reports also speak of a semi-arboreal tribe of Indians named Porotos, whose alleged ferocity is dreaded even by the Motilones. This country undoubtedly offers great possibilities for canoe exploration from the mouth of the Santa Ana River in Lake Maracaibo to its source and to the headwaters of its tributaries. This is probably one of the most interesting ethnological fields in South America still unexplored.

A fact that may be of interest to paleontologists looking for new fields of exploration is that the inhabitants of Machiques report finding, in close proximity to the town, immense bones of prehistoric animals that resemble mastodons.

From Machiques North to La Horqueta

Returning from Machiques to La Horqueta by the route lying nearest to the Sierra de Perijá, one has to cross the Apón River at a ford about half a mile from the town. The Apón here still retains a great deal of the impetuosity that characterizes its course in the mountains and during the rainy season is frequently so turbulent that crossing becomes impossible. The stream here has a rocky bed and is not over three feet deep in the middle during normal times.

Before reaching the important settlement of El Llano one has to cross the Aponcito and the Macoita (Fig. 3)—a matter which, during the dry season, presents no difficulty. El Llano is a collection of about thirty scattered ranchos. Due west from the crossing of the Macoita River, at the very

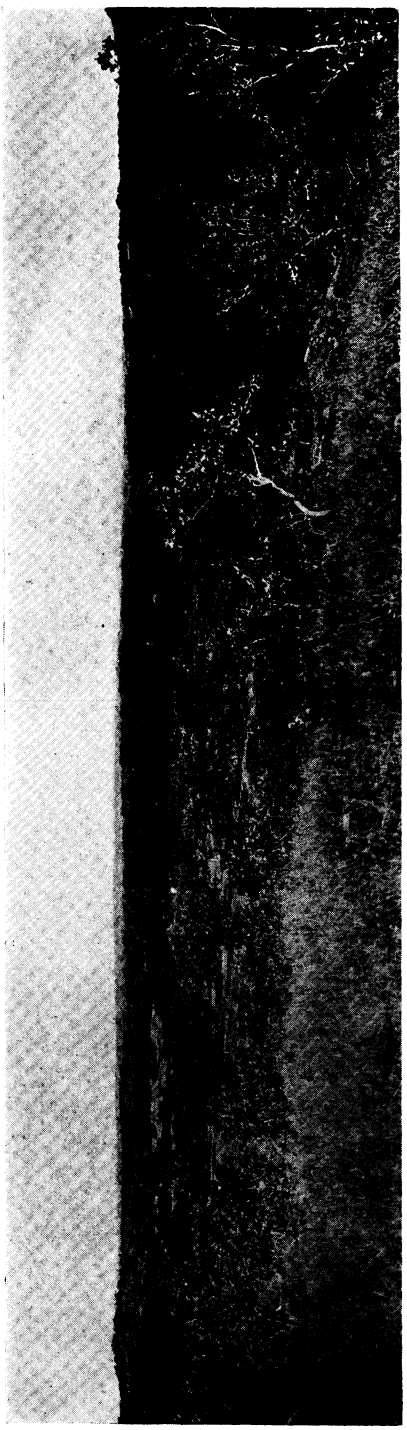


FIG. 12—View looking east and southeast over the plain from a low hill known as Pueblo Viejo. Note the savana vegetation, becoming more densely wooded on the right, toward the Apón River.

foot of the Sierra de Perijá, are found the remains of one of the ten missions of the Capuchins of Navarre, on a low hilltop which is today known as "Pueblo Viejo" (Old Town). In this region the writer conducted archeological investigations after returning from his sojourn among the Macoa Indians in the interior of the mountain range. Here were found the remains of an ancient civilization resembling in culture that of the Arhuaco Indians of Colombia. While this archeological work was more in the nature of a reconnaissance, enough antiquities were found to convince the writer of great possibilities in future investigation.

After passing El Llano, one comes to the fords of the Motilone and Cogollo Rivers, the latter being the deeper and, in the rainy season, the more dangerous to cross. It is because of these five crossings (the Apón, Aponcito, Macoita, Motilone, and Cogollo Rivers) that this inner road is not taken during the rainy season, travelers preferring to take the longer, but easier route which entails only the crossing of the Apón. After fording the Cogollo one reaches the small settlement of El Rodeo, crosses a wide strip of savana, and arrives at Arimpia.

There is still another road from Machiques and La Horqueta that one can take, providing the services of a good guide can be procured. This road runs directly along the foot of the mountains and over a broken country. It

FIG. 13—Pasture land at the foot of the Sierra de Perijá near La Quebrada. The decreasing elevation of the range toward the north (right) is shown.

leads from Machiques to a very small settlement called Las Delicias, thence to a cattle farm on the Cuiba River—a tributary of the Cogollo—and from here via another cattle farm named Pascual to the Coruba station of the Caribbean Petroleum Company on the Cogollo. From Coruba to La Horqueta this company has built a wide tractor road. This route leads for the greater part through the virgin woods along the mountain slopes and repays in beauty what it lacks in comfort.

THE REGION NORTH OF LA HORQUETA

In general, the country north of La Horqueta presents no aspect different from that of the region to the south. The La Gé River, a tributary of the Palmar, resembles in every way the tributaries of the Apón (Fig. 2). Strips of woodland are found along the streams, but otherwise the country can again be classified as belonging to the savana zone previously mentioned. The writer did not go farther north than the cattle farm of La Quebrada, where is found some of the best *potrero* land in the Perijá district (Fig. 13).

ONE DRAWBACK TO TRAVEL IN THE PERIJÁ DISTRICT

In general, travel in the Perijá district is pleasant. The inhabitants, while not living on a pretentious scale, are unusually hospitable and invariably kind to the stranger in their midst. The danger from snakes, although very real, is a small drawback to anyone provided with boots and leggings. The climate is good and not oppressively hot. It is only during the rainy season that travel is at times difficult.

There is, however, one great drawback to a sojourn in this region. While seemingly small, this drawback assumes proportions that may lead to grave consequences, and the writer suffered severely from it. As he does not possess the pen of a Whitney, he can do no better than quote this author's description *verbatim*.[17]

[17] Caspar Whitney: The Flowing Road, Philadelphia, 1912, pp. 237-238.

Known to Central America and Mexico as the red-bug, the *garrapata* is the tick of Venezuela, and breeds in four sizes of malignance; the largest as large as a full grown bedbug, the smallest little bigger than a pen point. These in all their sizes infest the brush and the grass. The low branches that sweep your hat as you ride, the bush that drags across your legs in the saddle, the grass through which you walk, the log upon which you rest, each and sundry, as the idiom goes, supplies its quota of swarming, biting *garrapatas.* And the smallest is the arch fiend of the lot, for not only is it so tiny as to be all but invisible, but it burrows into your skin immediately upon contact.

. . . On returning to the camp, every man went at once to the fire, where, divesting himself of all clothing, he held the different articles over the flames to loosen the grip of the insect so it might be shaken off . . . Then standing nude, search for those on his body would be instituted by a fellow sufferer, whose back in turn he explored later.

It was found by the writer that bathing in water containing a very strong infusion of crude native tobacco had the effect of ridding the body of the smaller variety of ticks. Furthermore, the writer found, to his sorrow, that scratching the tick bites resulted in bad and painful infections which were slow to heal and caused him a great deal of suffering and annoyance.