

in navigating, even at the lowest stage of water. He considered it to be perfectly navigable for steamers up to the parallel of 11° s. At some future time it may become a valuable means of communication with the province of Carabaya in Southern Peru—the more so as thus far it comes straight as if from the Madre de Dios; still it was not of a size to give him much hope of its being that unapproachable river. After the parallel of 11° the Aquiry bends from the west and becomes wider and shallower, so that the party had to drag the canoes perpetually over the obstacles. At last canoe-travelling was completely stopped by a network of stranded timber, and Mr. Chandless had to leave behind most of his party with the larger canoe, and continue the journey in a small boat (*montaria*). He was here a little too early, for the dry season had not yet broken up and given depth to the upper course of the river. At length he found it useless longer to continue the laborious task, and turned to descend.

From a point a little above where the Aquiry bends from its easterly to a northerly course, lat. 11° s., Mr. Chandless started inland on foot, striking due south and hoping to reach some other river belonging to the Madre de Dios basin. For the first three or four miles inland the wood was tolerably clear, but beyond that distance almost impenetrable, except where the party cut a path. At the end of a week he was compelled to return for want of provisions. At four or five miles from the bank of the Aquiry he crossed a low ridge, and beyond this came to a succession of small streams, all with a general direction of east. Mr. Chandless concluded by expressing his opinion that the Madre de Dios falls into the Beni, perhaps between 11° and $11^{\circ} 30'$ s. lat.

The paper will be published entire, with the Author's map of the Aquiry, in the Journal, vol. xxxvi.

2. *Journal of an Expedition to Explore the Courses of the Rivers San Gavan and Ayapata, in the Peruvian province of Carabaya.* By DON ANTONIO RAIMONDY, Honorary Corresponding Member of the Royal Geographical Society.

DON ANTONIO RAIMONDY, our Peruvian Honorary Corresponding Member, who is already well known to South American geographers as the author of a valuable work on the Amazonian province of Loreto, has now communicated to the Society a most interesting paper, containing the results of his exploration of the rivers San Gavan and Ayapata, in the Peruvian province of

Caravaya. The maps of this region are so incorrect as to be quite useless, and it was the desire to fix the positions of these two rivers, from their sources in the Cordillera to their junction with the Ynambari, which led Señor Raimondy to undertake this adventurous journey in August, 1864.

The province of Caravaya is traversed from w.n.w. to e.s.e. by the great cordillera of the Eastern Andes, and a narrow strip of territory along its eastern frontier is occupied by the snowy peaks and ridges, and by a very lofty table-land to the southward. The rest of the province is to the eastward of the Andes, and consists of a series of mountain-ridges, with rivers between them, which branch off from the main chain, and gradually sink down into the vast Amazonian plain. They are covered with forests, the home of the inestimable chinchona-trees, and present some of the most magnificent scenery in the world. It had always been believed in Peru that the rivers of Caravaya, and those further to the north-west which drain the Cuzco Andes, formed the sources of the Purus. The great discovery of Mr. Chandless, who found the sources of the Purus and of the Aquiry in the forests, at a distance from the mountains, has proved that this was an error, although a glance at the map will show that it was a very natural one. Señor Raimondy now tells us that it has been discovered that these Cuzceñan and Caravayan rivers are actually tributaries of the Beni, one of the three main affluents of the Mamoré. Don Faustino Maldonado, a native of Tarapoto, whose exploration of the Ucayali was brought to the notice of the Geographical Section of the British Association at Leeds in 1858, lost his life in making this discovery. On the 5th of February, 1861, he constructed a canoe, and, with seven companions, embarked on the river Tono, near its confluence with the Piña-piña. These rivers flow through the forests of Paucar-tambo, to the eastward of Cuzco, and form the Madre de Dios or Amarumayu River, which, after uniting with the Ynambari from Caravaya, has hitherto been supposed to form the main source of the Purus. Maldonado continued to descend this great river, passing many mouths of affluents, generally entering on the right bank, until he reached a rapid which obliged him to land, and repair his canoe. Soon afterwards he entered the river Mamoré, and found himself among the savage Caripuna Indians. On the 18th the canoe was capsized in a rapid called *Calderao do inferno*, and Maldonado was drowned, with three of his companions. The other four continued the descent of the Mamoré and Madeira, passing the town of Borba, and entering the river Amazons. They obtained a certificate from the Brazilian authorities at Barra, and returned to Tarapoto, their native place

on the Huallaga. In the beginning of 1862 these four companions of the unfortunate Maldonado ascended the river Ucajali to Cuzco, and showed the authorities there the certificates of their perilous voyage. Maldonado was unacquainted with the names of the rivers which he navigated in his frail canoe, but as the Beni is the only large river which flows into the Madeira in that part of its course where the Caripuna Indians are met with, as we are informed by Lieut. Gibbon, U.S.N., Señor Raimondy is of opinion that the united Ynambari and Madre de Dios flow into the Beni, and that Maldonado entered the Madeira by descending its tributary the Beni. He is confirmed in this opinion by the circumstance that the account given of the mouth of the Beni by Maldonado's companions, agrees with the report of Señor Palacios, who explored a portion of the Beni many years ago, by order of the Bolivian Government. These interesting particulars are supplementary to the discoveries of Mr. Chandless, and finally settle the long doubtful geographical question respecting the numerous rivers which drain the Andes of Cuzco and Caravaya. They are sources, not of the Purus, but of the Beni.

Señor Raimondy's own valuable labours were confined, on this occasion, to a careful examination of the courses of the two most western Caravayan rivers, the San Gavan and Ayapata, from the Andes to their mouths in the Ynambari, and also of that portion of the Ynambari itself between the mouths of these two tributaries.

The villages of Caravaya are situated near the commencement of the forest region, in the deep ravines formed by the rivers, at an elevation from 6000 to 8000 feet above the sea. Those visited by Señor Raimondy, on this occasion, were Ituata, Ayapata, and Ollachea. He describes the climate as agreeable, but as occasionally foggy. In the mornings the loftier regions are free from mists, while the warm forests below are covered with a dense cloak of fog, which, when looked at from above, appears like a sea of fleecy vapour. The upper regions then receive the first rays of the sun, and, becoming warm, a current of air rushes up from the forests below, bringing with it dense masses of vapour. After visiting the sources of all the streams which form the rivers Ayapata and San Gavan, he commenced an adventurous journey down the valleys of Ollachea and San Gavan, in order to examine the whole course of the river, as far as its confluence with the Ynambari. The river San Gavan flows through a ravine so narrow that, in many places, there is no room for a path between the cliffs and the water. At last the gorge became impassable, and it was necessary to return to Ayapata, and reach the San Gavan River, by another route,

across the forest-covered mountains. Señor Raimondy describes the scenery at the point where the forests commence, as grand and majestic in the extreme. The eye extends over a vast panorama of verdure, bounded only by the horizon, with the silvery sheen of reaches of the rivers showing here and there through the foliage. Unfortunately the dense masses of cloud only occasionally open, so as to disclose this sublime prospect. Generally the view consists of a rolling mass of fleecy clouds, with a few forest-covered hills, rising up, like islands, in the midst.

Descending into these cloud-covered forests, Señor Raimondy reached the estate of San José de Bellavista, on the banks of the San Gavan, the extreme limit of civilization. Here a most enterprising Peruvian, named Aragon, cultivates sugar-cane for making rum, cocoa, coffee, pine-apples, and maize for the support of his labourers. This estate is 2400 feet above the level of the sea. It is well within the haunts of the savage Indian tribe of Chunchos, and has frequently been attacked by them, especially in 1851 and 1862.

Raimondy left San José on the 7th of September, and entered the unexplored forests with a few Indians and 15 days' provisions. They had to force their way through the tangled vegetation, and, in some places, where perpendicular precipices rose sheer up from the river, it was necessary to make a sort of Jacob's ladder of *lianas*, and so ascend the wall of living rock, descending again where it receded so as to leave walking space between the cliffs and the river. It took a whole day to advance a league in such a country.

At length they reached the banks of the great river Ynambari, at a point where it is more than 200 yards in width. At the confluence of the San Gavan and Ynambari the elevation above the sea is 1570 feet. Señor Raimondy is of opinion that, at a very short distance below this point, the Ynambari would be found to be navigable, because the hills here become very low, and soon afterwards sink altogether into the vast Amazonian plain. Between this point and the confluence of the Madre de Dios the slope is less than 8 feet per league.

Señor Raimondy then followed the course of the Ynambari up-stream, until he reached the point of its confluence with the Ayapata, a distance of about 12 geographical miles. He returned by following the course of the Ayapata up-stream, encountering great difficulties, hacking his way step by step through dense forests, wading across rapid streams, crossing the river on trees cut down and thrown over it for the purpose, and scaling most formidable precipices. The provisions ran short, and hunger added to the fatigue of this return journey.

The results of his expedition were—the exact delineation of the courses of two important affluents of the Ynambari, and of a portion of the course of that river itself; the more correct fixing of the positions of the villages of Ollachea, Ayapata, Ituata, Corani, and Macusani; and the discovery that the San Gavan and Ayapata flow directly into the Ynambari, without uniting either with each other or with the river Marcapata, as they are erroneously made to do on most modern maps. Señor Raimondy made careful meteorological observations at each encampment, and his paper is enriched with numerous valuable notes on the trees he met with during the course of his expedition; which give some new information respecting the geographical distribution of plants, as regards elevation above the sea, in a very important botanical region.

There is reason to hope that, before long, we shall receive further communication from Señor Raimondy, as it is his intention to continue his explorations in the valleys of Caravaya.

Señor Raimondy's Paper will be printed entire in Journal, vol. xxxvii.

The PRESIDENT, in returning thanks to Mr. Chandless, reminded the meeting that this was the first appearance before the Society of this successful traveller, since receiving the Royal Medal last session for one of the most remarkable geographical explorations ever undertaken by one individual. Mr. Chandless had qualified himself for his recent researches by long explorations in various parts of America. He began by traversing North America, publishing an interesting book on the journey, entitled 'A Visit to the Salt Lake;' and he afterwards travelled through South America, from the Paraguay to the Amazons, down the Tapajos River. Mr. Chandless then devoted about two years to the exploration which gained for him the highest distinction of this Society, namely, that of the river Purus, a tributary of the Amazons, which he ascended for more than 1800 miles. He at the same time laid down the various windings of the river by accurate observations. Mr. Chandless had performed this labour entirely at his own expense. He (the President) believed that it was no exaggeration to say that the Society had never previously had before it any one who, at his own instance, had accomplished so much as Mr. Chandless.

Mr. MARKHAM said that it must have struck all those who had read works on the subject of the valley of the Amazons, how very fortunate that region had been in its scientific explorers. In the last century there was the great name of La Condamine, and we had had in this century many men of scientific reputation who had visited and written about different portions of the Amazons Valley—Humboldt, Spix, and Martius, Poeppig, Castelnau, and Smyth, and, in later years, Bates, Spruce, and Wallace. That region had been most fortunate in its latest explorer, Mr. Chandless. The Society had seldom received a more admirable piece of geographical work than the minute and complete maps of the Purus and Aquiry rivers which Mr. Chandless has presented. Judging from the descriptions of the mouth of the Purus given by La Condamine and Smyth, that river appeared to be one of the most important secondary rivers in South America, but it had been scientifically unknown until 1864. Now, however, thanks to Mr. Chandless, it has been accurately mapped very nearly to its source, although Mr. Chandless modestly

omitted to state that he had reached the source. At all events, he reached a spot where his canoe grounded. His work is of great geographical value from the numerous astronomical observations made throughout the course of the river. The belief of the Peruvians, resting not on fact, but on opinion—a belief which he (Mr. Markham) had fully shared—was, that the drainage of the glorious eastern slopes of the Cordilleras of Caravaya and of Cuzco formed the sources of the Purus. That belief was now dispelled. It was at length known that neither the Purus nor any of its tributaries came near the Andes, and that their sources were in the virgin forests of the vast Amazonian plain. For this knowledge, and also for the great advantage of having the Purus thoroughly mapped, the acknowledgments of the Society were due to their gold medallist Mr. Chandless. The second Paper, which had been read, communicated the fact that the ill-fated Peruvian explorer, Faustino Maldonado, had ascertained that the rivers flowing from the Caravayan Cordilleras were tributaries of the Madeira, one of the secondary rivers of the great Amazons system. The people of Cuzco had a universal belief that the river which flowed through the forest eastward of Cuzco, called the Tono, was the headwater of the Purus; and when he (Mr. Markham) was at that ancient Inca city, 13 years ago, a noble old Italian missionary, Father Bovo de Revello, had recently published a pamphlet, entitled 'El brillante porvenir del Cuzco' (the brilliant future of Cuzco), in which he prophesied that hereafter, by the navigation of the Purus, the grand old city would be brought several thousand miles nearer Europe than its modern rival Lima. It was even now possible that the dream might be realised; but the road must be sought by the Madeira and the Beni, or possibly by the Aquiry, and not by the Purus. The discovery of Maldonado with respect to the rivers flowing from the forests eastward of Cuzco being affluents of the Beni, were very curiously corroborated, to a certain extent, by the historical narratives of the old Spanish conqueror Cieza de Leon, and of the Inca Garcilasso de la Vega. One of the great sovereigns of the great empire of Peru, Inca Rocca, invaded the forests to the eastward of Cuzco, and discovered that all the rivers united and formed one stream, which was called the Amaramayu (the Serpentine), now better known as the Madre de Dios. Afterwards another Inca, named Yupanqui, made a road from the Andes to the banks of the Madre de Dios, and having spent three years in building canoes, in which to embark his army upon it, he descended it, and eventually reached the country of the Moxos, whom he conquered. If the Madre de Dios flowed into the Beni, the Inca would have reached the country of Moxos, which is in Bolivia. If it flowed in any other direction he certainly would not have reached that district. He (Mr. Markham) understood that Don Antonio Raimondy intended to continue his researches in this most interesting and important region; and he did not think that the Society could do better service than by giving every encouragement to such men, and by giving all publicity to their work. He trusted that Mr. Chandless would also continue his researches, and explore the Beni in the same admirable way in which he had done the Purus.

Mr. BOLLAERT said that his friend Professor Raimondy had written him lately that he intended to return to the region of these rivers. His explorations had been most interesting. The difficulties he had to encounter must have been very great, but his results were most accurate and could be relied on. His Paper and map were valuable contributions to the geography of the country.

Mr. BATES, who was called forward by the audience, said that he addressed the Society on the occasion of the reading of Mr. Chandless's paper last year on his first journey up the Purus, and he was afraid what he might say now would be little but repetition. He had himself spent nearly five years in the

great plain of the Upper Amazons, through which the Purus ran, but he was not on the Purus itself. His head-quarters were at a little town called Ega, some 200 miles west of the mouth of the Purus, and situated on the banks of a lake, or expansion of the bed of a tributary, 5 miles broad and of unknown length. He thence made excursions in various directions; on one occasion for several months, a distance of 400 miles westward of his head-quarters. The whole region formed a nearly level plain, the only inequalities being rounded elevations of a clayey formation not more than 60 or 70 feet above the level of the river. It had been ascertained that this vast plain of the Upper Amazons extended at least 500 or 600 miles from north to south, and about 800 miles from east to west. It was entirely covered with forest, the trees matted and locked together by woody lianas, or climbing plants of infinite variety, and rising to an average height of from 120 to 150 feet. There was scarcely an acre of open or grass-land. The soil was most fertile. It was composed of alluvium—the deposits and washings of the river sediment accumulated during countless ages. In some parts, where the banks of the river were washed by currents, he had seen a depth of more than 20 feet of vegetable humus. This level country was traversed east and west by the main Amazons, a stream without a rock to interfere with its free navigation, up which steamers of considerable draught might proceed at all seasons of the year for 600 miles beyond the farthest point he had reached—a distance therefore of 2400 miles from the Atlantic. The river was already navigated monthly, by a line of steamers, to this distance. This great and fertile country, with all these advantages of easy communication, was, however, almost unpeopled. The population of the whole plain within Brazilian territory, the last time a rough census was taken by the Brazilian Government, amounted only to 40,000. On an average, the villages are about 100 miles apart, and each village contained not more than 600 or 700 inhabitants, the greater part of whom were pure-blood Indians, the rest being half-breeds and a few white families from the southern provinces of Brazil sent out to administer justice or attend to similar duties. This region would doubtless be a grand country in the distant future, and the banks of the main river Amazons would be the first to become peopled and flourishing, as the main stream alone offered an uninterrupted communication between the Atlantic and the fertile provinces of East Peru. The inhabitants of Southern Peru, beyond the reach of the main Amazons, had always looked to the Purus, one of its principal southern tributaries, as their future great highway to the Atlantic. The great interest attached to its exploration can therefore be readily understood. These hopes were damped by the results of Mr. Chandless' investigation, at least for the present, for the river was found to terminate in the midst of almost uninhabited forests. As, however, the great navigable streams of Southern Peru have been discovered to find their way into the Madeira instead of into the Purus, some might ask why the Madeira should not become this great channel of navigation? The reason was simply that this fine stream before joining the Amazons passed through a range of hills, the western frontier of the highlands of Brazil, and the navigation was interrupted by a succession of waterfalls. Small canoes could ascend only at high water and by much labour. All the other southern tributaries of the Amazons to the westward were far too short to reach Peru, and the Ucayáli, the largest of the westerly affluents, did not reach so far south as the rich province of Caravaya.

Mr. WALLACE, in answer to an invitation by the President, said he had not himself visited the interesting district described in Mr. Chandless' paper. There appeared, however, to be a very singular geographical fact brought out by the discoveries of Mr. Chandless, namely, a very great similarity or parallelism between the tributary rivers on the south of the Amazons and those on the north—particularly between the Purus and the river Uaupés, an

affluent of the Rio Negro, which he (Mr. Wallace) ascended. It was a very curious circumstance that an immense district of country immediately at the foot of the Andes, both north and south, should, apparently, not receive a single drop of water from those mountains. On the south of the Amazons there was an enormous triangular district, as large as France, between the Madeira and the Ucayali, and immediately below the great range of the Andes, and yet its rivers were not derived from that range. Exactly in the same manner, on the north of the Amazons, the Japura and the rivers east of it appeared to terminate in the great forest-plains before they reached the Andes. He had ascended the Uaupés far enough to ascertain the same fact with regard to this stream. Though prevented from reaching its source, he ascended to a point near a cataract, where the river, though very wide, was a slow, sluggish, black-water stream, and he heard that for 10 days' journey farther up it continued so all the year round. This was a sufficient proof that not a drop of water came from the slopes of the Andes. Hence, there were enormous plains north and south of the Amazons which were, by some means, cut off from the drainage of the Andes. It would be very interesting to ascertain what was the cause of this separation. It would appear probable that it must depend in some manner upon the peculiar contour of the country. There might be a local elevation or ridge near the foot of the range, but separated from it, which caused the water to flow north and south and find an outlet in one of the great rivers. He observed in the map figures indicating the altitude of the river Purus at different points. He wished to ask Mr. Chandless whether those figures could be relied on?

Mr. CHANDLESS, in reply, said that he believed, quoting from memory from Mr. Wallace's book, it was found that the barometer stood higher at the town of Barra than at Pará, and he had found that at 600 miles up the Purus it stood higher than at Barra. That, of course, gave a false result as to elevation, but he believed that the observations were quite correct instrumentally. His barometer had been tested at Kew. Some allowance must be made for receding from the equator and the diminution of the equatorial depression of the barometer. He could not believe that at a point 1500 miles from the sea the elevation would be only 107 feet.

In answer to a question from Mr. MARKHAM, Mr. Chandless said that the greatest height he had observed on the Amazons was 1010 feet; and on the Purus about 1088 feet. This would accord with the general level of the country as ascertained by Señor Raimondy's observations; one-tenth of an inch variation of pressure on the barometer would be equal to 100 feet.

The PRESIDENT inquired the altitude of the ridges above the stream towards the headwaters of the Aquiry.

Mr. CHANDLESS replied that the highest ridge was about 250 feet above the river. He did not see any land high enough to be called a chain of hills.

Mr. MARKHAM asked whether Mr. Chandless saw any high land on the horizon in the direction of the Andes.

Mr. CHANDLESS said that one of his men whom he sent up a tree reported that he could see blue hills about s.s.w. That would agree with the position of the hills on Mr. Markham's map.

Mr. WALLACE asked whether Mr. Chandless had any simultaneous observations made at Barra while he was on the Purus.

Mr. CHANDLESS replied that he had not. He had given, besides the means of his barometrical observations, the assumed means at the sea-level, but could not say whether these were correct.

Dr. MANN said that the natural range of the barometer and the difference of pressure throughout the district of the Amazons could not be less than one inch, which was equivalent to a thousand feet. Although Mr. Chandless's

barometric observations were valuable in themselves, still they could not be relied on as indicative of height unless simultaneous observations were made elsewhere by a standard instrument, by which errors due to the variation of atmospheric pressure could be eliminated.

Mr. CRAWFURD said that it struck him that the tribes of Indians in the valley of the Amazons were much like herds of the lower animals. He believed that the reason of the paucity of population in that immense plain was the enormous quantity of timber which grew there. A country covered with forests was always deficient in useful plants capable of cultivation and in animals amenable to domestication. The fertile valley which had been spoken of might be very valuable some day, but the Spaniards and Portuguese had been in occupation of it for upwards of 300 years and made nothing of it. He wished to be informed by Mr. Chandless whether the different tribes of natives whom he met spoke the same language, or whether their languages were different and founded on the American principle of agglutination. He wished also to know what animals were met with on the Purus.

Mr. CHANDLESS replied that he had met eight tribes, speaking, he believed, as many different languages. As to the animals, he had seen the curassow-bird, the tapir, and the capivaras (or water-hog), the last of these being very common. Monkeys were to be found in the trees by the river-side, but he had met with scarcely any animals on his land journey through the forest, the noise of cutting the path through the timber having probably frightened them away.

To an inquiry from Dr. WEBSTER as to whether india-rubber-trees were numerous in the forest, Mr. Chandless replied that they were numerous far up the Purus. Those who were accustomed to prepare india-rubber said that it was of good quality.

Eighth Meeting, 11th March, 1867.

MAJOR-GENERAL SIR HENRY C. RAWLINSON, K.C.B., M.P., VICE-PRESIDENT, in the Chair.

PRESENTATIONS.—*Pearson Morrison, Esq.; Richard Baxter, Esq.; Edward Thornton, Esq., C.B.; Frederick Berridge, Esq.*

ELECTIONS.—*H. L. Anderson, Esq.* (late Chief Secretary to the Bombay Government); *C. F. Collier, Esq.; Colonel Richard Crewe; William Leighton Jordan, Esq.; William Martin, Esq.; Pearson Morrison, Esq.; James O'Brien, Esq.; Francis Beaufort William Quin, Esq.; William Rossiter, Esq.; Colonel J. C. Salkeld* (H.M.'s Indian Forces); *Charles William Shepherd, Esq., M.A., F.Z.S.; Edwin Story, Esq., M.A., St. John's College, Cambridge.*

ACCESSIONS TO THE LIBRARY SINCE THE LAST MEETING.—'Elementary Treatise on Quartz and Opal,' by George Trail, F.R.G.S. Presented by the Author. 'Polynesia: a Popular Description of the Physical Features, Inhabitants, Natural History, and Productions of the Islands of the Pacific; with an Account of their Discovery and