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to pass a very cordial vote of thanks to Major Maunsell for having given us such an excellent idea of the magnificent mountains of this part of Kurdistan. I am sure you will pass this vote of thanks unanimously. And I think we ought also to thank Earl Percy for his friendly criticism of this paper, through which a great deal of additional information, especially respecting the geology and archæology of the country, was brought out in Major Maunsell's reply.

NORTHERN BOLIVIA AND PRESIDENT PANDO'S NEW MAP.*

By Colonel GEORGE EARL CHURCH.

THE Royal Geographical Society is indebted to his Excellency Colonel José M. Pando, President of Bolivia, for a new and interesting map of the north-eastern part of that country, transmitted to us through his Excellency Señor F. Avelino Aramayo, the Bolivian minister to the court of St. James.† It includes the extensive explorations made personally by Colonel Pando between the years 1892 and 1898, and throws much-needed light upon an attractive section of South America, which, from the days of the Incas, has seemed to challenge exploration. It lies to the east of the cradle of the Inca empire, from which no man can look across Lake Titicaca at the magnificent range of white-bonneted peaks which marks the line of the inland Andes without an almost irresistible inclination to break through one of its gaps and plunge down the slope into the Amazon valley, to solve the mysteries which lie hidden there. The Inca Rocca, the successor of Manco Capac, entrusted to his son, Yaguarguaque, an expedition of 15,000 men to conquer this region, then called Antisuyu. He easily penetrated from Cuzco to Paucartambo, and thence, with great difficulties, to Tono—the first coca plantations of the Indians, but went no farther. Even the great Inca Yupanqui could not resist the temptation; and, according to Garcilaso de la Vega, sent a numerous, well-equipped army which reached the Tono river, spent two years in building rafts, descended the river Mayu-tata, or Amaru-mayu, and conquered the countries to the east of Cuzco as far as the plains of Musu, now known as Mojos.‡ It is probable that this expedition did not reach the falls of the Madeira, but on arriving at the level country, at about 12° S. lat., struck to the south-east and crossed the Beni river into the Mojos territory, keeping a short distance from the base of the foothills of the Andes in the more or less open lands.

* Map, p. 248.

† The geographical world will learn with pleasure that, continuing his services to science, President Pando concluded a contract, on February 15, 1901, for the survey of that part of the Andean plateau belonging to the Department of Oruro and La Paz, between Lake Titicaca, the Desaguadero, Pampa Aullagas, and towards the east to the summits of the inland range of the Andes.

‡ In the *Proceedings of the Royal Geographical Society* for June, 1883, will be found a most interesting paper on "The Basins of the Amaru-mayu and the Beni," by Sir Clements R. Markham.

Soon after the conquest of Peru by the Spaniards, the Inca domination of the region subdued by Yupanqui ceased, and the savage tribes at the eastern base of the Andes resumed their independence, which they have tenaciously guarded up to the last twenty years. The rule of the Incas was forgotten among them, except on the Tono river, where traces of Inca settlements can still be found.

Only a short period of time elapsed from the date of the Spanish conquest before an expedition of note attempted to reach the Mayutata. The conclusion of the civil war between the Pizarros and Almagros in Southern Peru (in 1538) left Hernando Pizarro surrounded by many dangerous and turbulent followers of whom he desired to rid himself. He therefore gave permission to Pedro de Candia to lead a body of three hundred men, across the Eastern Andes, from Cuzco into the Amazon valley. Herrera says that Candia entered by the slope which is limited on the north by the river Opotari and south by the valley of Cochabamba, which is called the Mojos road; and that, finally, he took the route across the Tono Andes, and, in Opotari, 3 leagues from Tono, found a large town, 30 leagues from Cuzco. Although terrorized at the difficulties which they encountered at every step, the men forced their way further onward, through a rough country covered with dense forests of ever-increasing thickness; but, after four days, they were opposed by savage hordes, who told them that they "had nothing but small houses covered with branches of trees, that their arms were bows and arrows, that they ate roots and yuca, which they cultivated, and with that they lived contented; and that in those forests there were monkeys and pumas and some tapirs, which they killed with arrows, and advised them not to go further on, because they were getting lost." After penetrating a little more to the east under almost incredible hardships, the expedition returned to the mountains.

Hernando Pizarro then deprived Candia of his command, and allowed one of his most esteemed companions, Pedro Anzures de Camporeddo, to organize a force to conquer the province of Mojos by the way of Caravaya, the Inca name of which was Collahuaya. He gathered a large and enthusiastic body of adventurers, supported by several thousand Quichua Indians, and started, in 1539, from the town of Ayabire. He descended the mountains to Sandia and San Juan del Oro, centres for the working of the rich gold-washings of Caravaya, which had been exploited in Inca times, but by which pass is unknown—probably by one about 100 miles south of the river Tono. He then entered the present Bolivian province of Caupolicán, called Zama, which is the Ixiamas or Ysiamas of to-day, in the north of the same province. Ixiamas, Tumapasa, Aten, and Cavinás form a large district, west of the middle Beni river, occupied by the Tacana Indians. The expedition seems to have crossed this great river, which they

called the Amapalcas, and to have penetrated far to the south-east into the territory of Mojos. It probably reached the vicinity of the Mamoré river a little south of the present town of Trinidad. Then, sending out a small scouting party, a great river was discovered running from east to west, doubtless the Grande branch of the Mamoré. After five months of terrible hardships, the expedition returned to the town of Ayabire, having lost 4000 Indians and negroes and 143 Spaniards. The former suffered from hunger to such an extent that as fast as their companions died the survivors ate them.

In 1576, the rival Spanish expeditions of Tordoya and Maldonado, numbering several hundred adventurers, penetrated to the headwaters of the Mayu-tata. Here they so fiercely fought against each other, for three days, in the dark, dense forests, that nearly all were killed. The few survivors were beset by the savages, who killed Tordoya and captured Maldonado. Other expeditions of minor importance followed during the Spanish colonial period, but accomplished nothing. In 1835, General Miller descended from Cuzco to the forests of Paucartambo; but, during the first half of the past century, the War of Independence and the general exhaustion which followed left the tribes on the eastern slope of the Andes to bury in oblivion the memories of Spanish inroads upon their forest strongholds.

In 1851, Lieut. Gibbon, of the U.S. Navy, reached the Tono and Mayu-tata from the Andean tableland, and as he gazed upon the riotous wealth of nature which surrounded him, and reflected upon the direction taken by the great river at his feet, he wrote, "All the silver and gold of Peru are not to be compared with the undeveloped commercial resources of this beautiful garden." There he found the brave and good Padre Bovo de Revello, an Italian Carmelite monk, with his little flock of neophytes. He had changed the name of the river "Amarumayu" of the Incas to "Madre de Dios," for the reason that the savages, after having killed a number of his people and destroyed their church, had thrown the image they worshipped into the water, which had floated down-stream, and was afterwards found on a rock in the middle of the Mayu-tata. It seems destined to retain the name conferred upon it by the pious father, although it is known to the Tacana Indians along its banks as the Mayu-tata, or Great Father river.

Markham followed Gibbon, and in 1853 descended from Cuzco, and obtained a view of the Mayu-tata, believing, like Gibbon, that it was the upper Purus.

On December 26, 1860, the gallant Peruvian, Colonel Faustino Maldonado, with a most scantily equipped expedition, and only twelve men, essayed the task of descending the Mayu-tata throughout its course. He reached the Tono, at its confluence with the Piñi-piñi, where he embarked on a rudely constructed raft, passed the mouth of the Inambari on January 8, and, fighting his way through savage

tribes, entered the Beni, and, soon after, the Madeira, at the falls. Here he met a friendly tribe of Caripunas, who advised him, as they also advised me in 1872, to always keep to the right bank in descending that formidable line of cataracts. On March 18, six of the party, in a bark canoe, had the unfortunate idea to take the west side of the river at the Caldeirão do Inferno (Cauldron of Hell). Four of them were lost, including Maldonado. This cataract has a length of about $1\frac{1}{2}$ mile. For the first quarter of a mile it falls over 7 feet, and for the remainder of the distance 13 feet. The volume of water it carries is immense, the river being about a mile wide. In descending, it is the custom to hug the right bank at the commencement, but I got caught in a violent current in mid-river and could not gain the shore. My canoe, with her twelve Indian paddlers, was not 5 inches out of water. The great stream seemed to hollow in the middle, as if the bottom were dropping down. A reef, extending from an island, crossed it diagonally, showing a high and angry wall of foam. Towards this barrier, the current drove us with frightful velocity. My Indians were dismayed, and were on the point of jumping overboard, as is their custom in such dangers, when I seized a Colt's army revolver and swore I would shoot the first one who disobeyed an order. The little craft danced almost upon the edge of the reef, when it was suddenly caught by an eddy, thrown to the right, and whirled round the flank of the reef into open water, between it and the shore. All this was tame in comparison to what now met my eye. To quote from my journal, "We shot currents, rapids, whirlpools, waves, and foam as lightning zigzags through a cloud. We went down the main cataract at the rate of 20 miles an hour. I stood in front of our little rush cabin, waving my revolver to the right or left as I desired to indicate the direction the captain should steer. In mid-river, along the lower reach of the rapids, was a ridge of water perhaps 40 feet wide in its widest place. On its rounded edge, sharp, spiteful waves of foam were playing. On each side there was a return of the river forming a gigantic whirlpool, and, as we shot along the crest, the return waters sped up-stream with dizzy velocity. Twice the side of the canoe nearly touched them—twice grazed death; but my muscular Indians and their cool, splendid captain, Pedro Ycho, took us safely through." This is the fall where Maldonado lost his life, after solving the problem of centuries as to the course of the Mayu-tata. A few years later, the exploration of the Purus, by Chandless, demonstrated, mathematically, that this river had no connection with the streams so many travellers had seen at the foot of the Andes, east of Cuzco.

In 1865, Antonio Raimondi descended the Paucartambo river a short distance below the town of that name, and then crossed the inland range, eastwards, towards the sources of the Mayu-tata by the Cusilluyoc pass. By a steep descent, he reached the plains on the following day, "populated towards the close of the past century by numerous flourishing

estates of cacao and coca, a region which, later, was the theatre of sanguinary struggles with the savage Huachipairis and Tuyeneris, who destroyed, in a few days, the work of many years." He then examined the upper rivers which unite to form the Mayu-tata, and returned to Paucartambo.

Colonel La Torre, Prefect of Cuzco, pronounced "the Madre de Dios the broad, open tomb for explorers." It received him also, in his expedition of 1873. He reached a point near the main river, and died pierced by thirty-four Indian arrows.

Besides the numerous efforts made to explore and occupy the region of the Mayu-tata by descending the Andes to the east of Cuzco, numerous expeditions, during and after the Spanish colonial period, attempted to reach the lower Beni and Mayu-tata districts by way of the Beni river from La Paz, and from Sandia, on the Carabaya slope of the Andes. The Franciscan convent at La Paz was especially zealous in its efforts to establish missions in the district in question, and clung tenaciously, but not always successfully, to any foothold it gained. Cavinás, on the middle Beni, appears to have been its main outpost.

In 1560, Diego Aleman, a resident, and one of the founders, of La Paz, organized a company to discover the territory watered by the Mayu-tata. He descended the mountains to the north of Cochabamba, but, on the border of Mojos, was routed and made prisoner by the Indians. Then followed the Licenciados Balboa and Garcés, who reached the Mayu-tata, but returned on account of insufficient resources. The information gained caused Padre Miguel de Urrea to penetrate the region. After remaining for a considerable period of time, he was killed by the Sabainas. Then followed the Curate Calacoto, who was forced to return without results.

Padre Rafael Sains, in his "Memoria historica del Colegio de San José de la Paz" (unpublished),* says that Pedro de Aleguá Urquiza obtained from the king a privilege to conquer Caupolicán. With a strong expedition, he founded his first town, San Juan de Sahagun de Mojos. He then founded Apolobamba, and pressed on to Aquachile, an Indian town, where he died of fever. His disheartened followers then abandoned the two last-named places and retired to Mojos. Urquiza was governor of the famous gold district of Tipuani, and discovered the ancient military road which the Incas opened by Suri and Camata. "It passes near Atén by the height of Altuncama, near Apolobamba, and runs northward; then goes through the gorge of Siliamas and continues to San José de Chupiamonos. At the high points of the *pampa*, it has small fortifications. Its width is very regular, and the road is paved according to its locality. It presents well-founded proof

* See 'Límites de la provincia de Caupolicán ó Apolobamba,' por Carlos Bravo La Paz, 1890.

that, before the Inca Yupanqui entered Mojos, the inhabitants of Laricasa, Humasuyu, and Pacasa had communication with the peoples or tribes situated on the other side (the north) of the Amaru-mayu."

Padre Gregorio Bolivar, in 1620, and afterwards in 1631, pushed northward from La Paz into the lower Beni and Mayu-tata, but was never heard of afterwards. In 1629, the Jesuit father Bernado Rheus, from the Andes of La Paz, penetrated to the north of Apolobamba and perished by the hands of the savages. The Dominican monk Tomás de Chaves wandered for fourteen years to the north of Cochabamba in Mojos and the Beni. He returned to the convent of La Paz, and died about 1656. Friar Domingo Alvarez de Toledo took up the work, and, by the way of Caravaya, went 40 leagues northward into the territory of the Toromona savages in the Mayu-tata basin.

Padre Rafael Sains states that Gabriel Gonzales undertook the conquest of Paititi in 1670. He descended the river Beni, but his expedition was fruitless, and he returned. Several missionaries from Caravaya, whose names he gives, reached the lands of the Araonas in 1680, where they remained two years, and retired disconsolate at the ill success of their mission. Seven more then went from Sandia, and under most disheartening difficulties, founded ten *reductions*, or Indian settlements, in two years, some of which were afterwards abandoned. From this time forward, the persistent missionary fathers, especially those of the convent of La Paz, generally held to the ground they had gained, but never found it possible to effect a permanent lodgment in the basin of the Mayu-tata. It is probable that, in the eighteenth and nineteenth centuries, they possessed much more information than the geographical world in general regarding northern and north-western Bolivia, and that the convents of Cuzco, Moquegua, Juli on Lake Titicaca, and La Paz still contain much unpublished data describing the country, the course of the rivers, and manners and customs of the Indian tribes.

In 1879, my friend Antonio Raimondi published, for the first time, a letter which P. José Figueira, who in 1803 was curate at Cavinás, wrote to the superior of his college at Moquegua, describing a voyage which he made down the Beni from Cavinás. It seems that he reached a point near the confluence of the Beni with the Mamoré and "very close to the mouth of the rio Magno," or Mayu-tata, "which receives all the water of the mountains of Cuzco." The information given to him by an Indian chief, Yusayri, left no doubt that the Mayu-tata was the main affluent of the Beni.

The intrepid Padre Mancini, who resided from 1850 to 1864 in Mocetenes and northern Caupolican, directed his steps westward from his mission station, and, alone, with cross in hand, travelled over an immense area of unknown country, visiting many Indian tribes, such as the Guacanaguas, Machuis, and Toromonas. He then turned northward,

remained for a time with the Araonas, crossed the Mayu-tata, and entered the country of the Pacahuaras, lying between that river and the Purús. He made a rude map of his peregrinations, which I afterwards saw at the Recoleta Convent at La Paz, to which he belonged.

In 1866, two Franciscan friars, from the same convent, reached the Mayu-tata, five days' journey north-west from their mission at Cavinás. In 1869, in La Paz, I often met one of these good men, Padre Fidel Codinach, a native of Spain, of half Spanish, half French blood, who gave me much information regarding the valley of the Mayu-tata and many notes from his journal. "Between the Madidi branch of the Beni and the Mayu-tata, besides a considerable district north of the latter river, all of the tribes speak the Tacana language. It is almost totally different from either Quichua or Aymará. The Tacanas cannot count beyond six. South of the mouth of the Madidi, and between the Unduma and Tegéque branches of the Beni, is found the mission of Ysiana. Near it passes an Inca road, running from the direction of Cuzco towards the bank of the Beni. The road is about 25 feet wide, and long lengths of it, well paved, are still visible. With reference to the lands occupied by the Tacana tribes, they are unsurpassed in beauty, as much for their topography as for their fertility and richness. They cover a broad space, about four degrees of latitude and about eight of longitude. The position is exceedingly agreeable—now extensive groves, which are suddenly replaced by delightful pasture lands, now by brooks, rivers, and lakes filled by numerous classes of fish. The most perfect salubrity of climate exists, despite the warm temperature. The groves are delightful and filled with all that gives pleasure—the leafy and productive almond-tree" (probably the Brazil nut), "the aromatic gum and the palm, ranging from the highest to the lowest, from the royal to the smallest. Hidden riches exist in these lands, grateful and filled with perfume, gum and wax abundant and varied. Here are found cabinet-woods, medicinal plants, and many other valuable productions, without mentioning the great mineral wealth of the district."

But the vast and beautiful region lying north-west of the Madidi and Beni rivers as far as the Aquiry branch of the Purús, and bisected by the Mayu-tata, was practically valueless to the commercial world, and cut off almost entirely from it, so long as the dreaded lower reach of the river Beni remained unexplored. When I descended the falls of the Madeira, the imagination of my boatmen, as I made them paddle a few miles into the mouth of the Beni, peopled this region with the most ferocious tribes of savages, and filled the river itself with obstacles to which those of the Madeira were only child's play. Augustin Palacios, Bolivian "Administrator of Rents" in the Beni province, had, in 1846, ascended the Beni to the rapid of Esperanza, near its mouth, and made a sketch of it. Above this was the *unknown*, with its terrors. At length, in 1880–81, Dr. Edwin R. Heath, an American who had been

professionally employed in my effort to open Bolivia to the commerce of the world, explored and mapped the Beni from Reyes to its mouth. The most of it was done in an old boat, 15 feet long and 4 feet wide, which Dr. Heath found submerged. He says,* "Bow and stern I could thrust my hand through. Pulling it on land, we caulked it with Indian corn husks, and plastered mud over them." With two Indian paddlers he accomplished his daring exploration successfully, but, all the way, found it difficult to keep his wretched craft from sinking. He solved a great geographical problem with the most primitive means that could be devised. The commercial effect upon the region which he opened was immediate and marvellous.

Previous to Heath's exploration, rubber trees had been discovered at Cavinás in 1869 or 1870, and, the quality of the rubber proving excellent, about 185 Bolivians were employed in the business of exploiting the neighbouring district. The product in 1880 was 104,000 lbs. Within two years from the exploration, the number of men engaged had increased to about 1500. Now they number several thousand, and have made prosperous settlements along the banks of the Beni, the Mayu-tata, the Orton, Abuna, the Aquire branch of the Purus, and numerous other streams which drain the vast region, now generally known as the Acre and Madre de Dios district, which comprises all of the great triangular area of Bolivia lying north-west of the Madidi and Beni rivers, and which is bounded on the north-east by Brazil and south-west by Peru. The precious gum, the best in the Amazon basin, is found here in such abundance that it has given large fortunes to the collectors. These, objecting to the export duties levied by Bolivia, recently made a revolution declaring their independence, relying upon their almost inaccessible position and the arms and ammunition which their wealth had enabled them to accumulate to defend themselves against any force which the government might be able to send against them. The energy of President Pando was equal to the occasion, and, a few months ago, the revolution was suffocated by prompt and efficacious military measures, carried out under enormous difficulties by my old friend Colonel Juan L. Muñoz.

Naturally, the disturbances in the Acre territory have, for 1899 and 1900, diminished the rubber exportation of Bolivia, which is estimated for the past year at about 2,000,000 kilos, worth about \$2 gold per kilo.

M. Vicente Ballivian gives the Bolivian export as follows:—

For 1896	...	...	...	...	1,140,712 kilos.
„ 1897	...	...	...	...	1,674,216 „
„ 1898	...	...	...	...	3,155,955 „

Of this quantity for 1898, however, 2,000,000 kilos was the *estimated* product of the Acre region.

* See *Proceedings of the Royal Geographical Society*, June, 1883.

Some rubber from the Beni district is sent across the Andes and exported from the Peruvian port of Mollendo. The last report of the Bolivian Minister of Finance fixes the quantity for the first half of 1900 at 157,200 kilos, say 314,400 kilos for the year.

The export from Puerto Suarez *viá* the river Purus for the last half of 1899 was 45,918 kilos, or say for the year 91,836 kilos. The export duties for the first quarter of 1900, collected at Villa Bella, at the confluence of the Beni and Mamoré rivers, which represent the quantity of rubber sent down the falls of the Madeira, amounted to \$66,658 Bolivian silver, a sum which corresponds to about 416,612 kilos.

A Bolivian and Brazilian commission of demarcation is now engaged tracing the north-east boundary-line between Brazil and Bolivia, which, according to the treaty of March, 1867, between those powers, runs from the junction of the Beni and Mamoré directly to the extreme headwaters of the Javary river, which stream, throughout its course, is the boundary between Brazil and Peru.

There is no treaty of limits between Bolivia and Peru. The boundary, thus far more or less recognized, is the one which existed between the viceroalties of Peru and Buenos Aires at the time of the independence from Spain. Peru claims territory to the east of the Inambari affluent of the Mayu-tata, while Bolivia could claim Sandia and Caravaya up to the Vilcanota inland range of the Andes, which were not incorporated in the bishopric of Cuzco.* The line will probably be defined ultimately on the principle of *uti possidetis*, and it seems probable that the one generally fixed by geographers as the proper boundary is more or less just. It is the same as is found on President Pando's map, extending along the course of the Inambari to its mouth, and thence directly to the headwaters of the Javary.

Colonel Pando's map bears evidence of having been made with scientific care. It gives us the names of the numerous affluents of the main rivers and their branches, while the eastern drainage system of the Caravaya range of the Andes, from Cuzco south-east, is shown in great detail—sources from which the Pando, Inambari, Marcapata, and other great south-western tributaries of the Mayu-tata draw their immense volumes of water. But the most remarkable feature of the map is the course given to the Paucartambo river, which is shown to be the main affluent of the Manu-tata or Madre de Dios. The Paucartambo, which rises in the Vilcanota mountains and runs north-west, leaving Cuzco only 30 miles to the left, in a straight line, has heretofore been considered as a branch of the Urubamba affluent of the

* Alto Peru, which formed part of the viceroyalty of Peru, was separated from this and incorporated with that of Buenos Aires by royal *cedula* of August 8, 1776. A royal *ordenanza*, of January 28, 1782, determined that the district of La Paz "should include all of the bishopric of that name and also the provinces of Lampa, Caravaya and Azangaro."

Ucayali. It seems, however, that the Paucartambo gives a great bend to the east, at about lat. $11^{\circ} 20'$, breaks through the mountains, and thence, under the name of the Manu, flows south-east to join the Mayu-tata. The course of the Manu was perhaps roughly mapped by Fiscarrald, when, in 1894, from his rubber estate, at the confluence of the Tambo and Urubamba, he ascended the latter stream to its Camisea branch, which enters it from the east, and in an hour's time crossed a narrow divide to a small affluent of the Manu, which he descended to the Mayu-tata. I have no knowledge of the Paucartambo ever having been explored between Cuzco and its heretofore supposed junction with the Urubamba. Its valley is occupied by savage tribes, and the river, as far as the point where Fiscarrald struck it, courses through the mountain gorges of one of the wildest and most broken sections of Peru. Like the Apurimac, it must be a succession of violent rapids and cataracts. It would be very interesting to have the *data* upon which the course of the Paucartambo, as now shown, is based. There are general reasons for the belief that Colonel Pando's map gives approximately its real course, and that he has made a correction of the first importance in the geography of South America.

The vigorous and brave defence which numerous savage tribes have made of the territory they occupy in the valleys of the Mayu-tata and Beni for hundreds of years, is perhaps the best proof of its value as an abode for man; and indeed it would be difficult, in any part of the world, to find a more beautiful and seductive region, where climate, fertility of soil, hill, dale, mountain slope, forest, rich savana, lake and river are more delightfully mingled, the whole teeming with varied animal life and abounding in such gifts as nature lavishly confers only when in her most prodigal and generous mood. It is this region, with its sturdy aboriginal people, which is now rapidly being brought under the lash of *civilization*. The map of President Pando shows all the principal rivers of this savage Arcadia, lays bare the mysteries which Inca, Spaniard, and his descendant warred for many a century to fathom, and the world owes to President Pando and his able coadjutors its recognition for an extremely valuable contribution to geographical knowledge.

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NORTHERN BOLIVIA.

as corrected by
COLONEL JOSÉ M. PANDO.
from his Explorations
1892 - 1898.

Scale of Miles .
0 10 20 30 40 50 100
Scale, 1 : 2000,000 or 31.6 miles = 1 inch.