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family, and personally conducted them to the houses set apart for them.

On July 12th the padre visited the hot springs of Umbiriri, which rise at the foot of steep hills, on the bank of the Rebvubwe; on July 13th he baptised seventeen children, and on July 14th he visited an old chapel four leagues to the north-west, which Canhenze had built as a mausoleum for the Pereira family. The chapel is kept in repair, but the village near it has been abandoned owing to its exposed position. On July 17th the governor and his padre were back at Tete.

Notes of a Visit made to the Delta of the River Tocantins, Brazil.

By JAMES W. WELLS, M. INST. C.E., F.R.G.S.

DURING May and June 1884, I had occasion to make a journey to Pará, to examine the Igarapé-Mirim and Abaete districts in the delta of the river Tocantins. Steamers from Europe to Pará make for Salinas, a low white cliff on the shore, a few miles to the east of the mouth of the Pará river. Here native pilots have to be engaged, in accordance with the port regulations.

It is several hours steaming up the river to the city of Pará, the distance being seventy miles from the mouth. It is difficult for any one to realise that this really is a river, for there is a nearly continuous horizon of sky and water, broken only by low-lying, dense forest-covered islands. The first near view of this forest is really wonderful for its wealth of vegetation. I have travelled through Brazil, and have resided on various parts of the coast between Rio de Janeiro and Pará, but nowhere is the forest so dense, so varied, and so essentially tropical as here. All other parts of Brazil have much in common, but here a boundless extent of lowlands intersected by channels wide or narrow, and always deep, without any break to the continual forest, stamps the Pará river with quite distinctive features.

Pará of late years has made immense strides in its trade, chiefly if not entirely owing to indiarubber. Labourers from adjoining provinces have migrated to the Amazons by thousands yearly. Numerous steamship companies have been organised, some of the steamers taking nine months on a single voyage up and down the Amazons and its numerous tributaries. Of course to meet this development other trades or businesses have likewise expanded. Streets have become paved, well lighted, drained and watered; tramways are laid down, a railway is building, warehouses and jetties border the busy wharves of the city, in fact there is a certain air of prosperity in Pará, a bustle in its streets, and generally signs of "go," which one would not expect to find in a town amid such surroundings. It numbers now about 60,000 inhabitants.

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On landing I found there was a small steamer leaving at 6 P.M. for my destination, and at that hour I found myself aboard a steam launch moored alongside a species of decked barge (*batelhão*), roofed over, under which, amongst a most heterogeneous mass of cargo, the many black, brown, and whitey-brown passengers of all ages and sexes were lying in their hammocks awaiting the departure. It was, however, 9 o'clock before the steamer got away.

About 4 A.M. the launch stopped at the little river-side hamlet of Guajara, to discharge passengers and cargo. This little place consisted of the usual row of dilapidated, broken-down adobe-built houses, with an unkempt square of rank grass, the usual rickety church, tumble-down fences, and rank vegetation, trying its best to hide the squalor and ugliness of a Brazilian hamlet. The river on which we were, the Moju, constitutes the division of the delta lands of the Tocantins from terra firma. The distinction is very marked, for the lands on the right bank of the Moju are occasionally slightly elevated, and form a really dry land, whereas on the left bank the lands are level with the highest tides and become slightly inundated; the soil is also deeper.

Soon after 6 A.M. we left Guajara. The river Moju does not average more than 600 feet wide, the banks are clothed with forest, amongst which are numerous little clearings and huts, and small farms. Some of the huts were fairly comfortable, but the greater number were in a most horrible state of squalor and neglect. There is no occasion for this, as generous nature here provides all that a peasant can require to make himself exceedingly comfortable.

About 8.30 A.M. we left the Rio Moju, and entered a canal 1200 yards long and 15 yards wide, constructed about fifty years ago. This canal connects the Igarapé-Mirim waters with the river Moju. An *igarapé* is a natural navigable channel connecting one stream with another, or a side branch of a main stream; the existence of *igarapés* is the best evidence of the flatness of a district. The district into which we had now entered is that of Igarapé-Mirim, which in combination with the adjoining district of Abaete constitutes the delta of the Tocantins; it consists of several wide channels, such as the Muritipucu, Meruhu, Caigi, Anapu, Igarapé-Mirim, &c., all of which are connected with each other by innumerable small canals or furos.

The route we were then following is the usual course taken by all the small river craft going from Pará to the Tocantins, as by this direction the heavy seas that sometimes prevail in the broad main river are thereby avoided; it will thus be seen that this canal saves a considerable detour by the old "Igarapé-velho" route, which joins the Moju higher up. At 10.30 A.M. we arrived at the town of Igarapé-Mirim, consisting of about fifty houses, with the inevitable square and church, and one or two streets of white-washed adobe houses, but nevertheless a considerable improvement on Guajara. There was more life in the place

(if really existence in such a place can be called life at all), the houses are larger and cleaner, and less in a state of utter decay. The town is situated on high ground—that is what is considered high ground here, I think it must be quite 12 inches above the surrounding districts—and is very rarely flooded. Here we left the principal part of our cargo and passengers.

At 2 o'clock P.M. we proceeded to our destination at the sugar estate of Senhor Manoel Teixeira on the river Meruhu-Mirim, where we arrived at 5.30 P.M., where I was most hospitably received and entertained by the proprietor. Senhor Manoel Teixeira, a Portuguese by birth and parentage, now a naturalised Brazilian, is a type of the hard-working, old-fashioned Portuguese stock. About ten years ago he came to this place, purchased several square miles of land for a mere trifle, and erected a sugar-mill, and laid out his plantations. At first he owned forty to fifty slaves; but his prosperity enabled him to give them their freedom; he now employs entirely free labour, mostly imported from adjoining provinces. His exertions have apparently been well rewarded.

With regard to the Amazons delta generally, I do not know of any place on the globe that is so exceptionally favoured by nature for the cultivation of tropical produce, and yet which is so little utilised. There is a ready market near at hand, at such prices as cannot be obtained probably in any other country. There is a magnificent network of navigable streams, to carry produce from any plantation to the market in Pará, or to steamers going to Pará. The soil is exceedingly rich, and from 10 to 20 feet deep. The climate is so equable, that it is only necessary to plant anything in plots of plantations in rotation, to have a continual crop of any produce all the year round; and once planted, sugar-canes grow up crop after crop for many years; in fact, the sugar-mills work the whole year.

The tides in this district do not sensibly differ from those observed at the Marine Arsenal at Pará; the highest tides rise 12 feet, and the smallest 2 feet 3 inches. In consequence of the scouring that daily takes place in the numerous channels and canals of this district, stagnant water has no opportunity of collecting, consequently mosquitoes and malaria are rare; I consider the district for its equatorial position and exceedingly low-lying lands to be exceptionally healthy. The temperature varies from 73° on the coolest night to 90° on the hottest day; the average mean daily temperature being 83° in the shade. The lands in all directions are without exception covered with a dense forest containing some of the finest timber trees of the tropics.

I remained a few days at Senhor Teixeira's house, and accompanied him on various excursions to the different rivers, channels, farms, and plantations of the district. There are 27 sugar-mills at work, most of which have steam power; they grind cane all the year round, and boil the juice in open pans, which necessitates at

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least 8° Beaumé of saccharine matter to make decent sugar, and is a proof of the exceptional fact that the canes mature at any period of the year in this favoured district. I saw a cane-field 20 years old, from which yearly crops had been taken without re-planting; this is usually the case with most of the plantations, until the fields become so neglected and dirty, that it is cheaper to plant a fresh patch. Cultivation of sugar-cane is the principal occupation of the inhabitants; a little indiarubber is also collected, but the trees are nearly exhausted; rice commands a high price in Pará, and there are exceptional facilities for its growth in the delta, but nothing is done with it.

A few words about indiarubber. This valuable indigenous production is annually exported to the amount of 6000 to 7000 tons, value about 1,000,000*l.*, all of which is extracted from the wilds of the Amazons. This product has been both a curse to the country, and yet the source of its prosperity. Pará through this one article quadrupled its revenue in four years, but the profits to the collectors have been so immense that all other sources of industry have been neglected, and consequently labour and provisions are very dear. Last year, however, there was a considerable drop in the price of rubber, and it is to be hoped that the thousands of labourers who have been attracted from adjoining provinces will now settle themselves to more useful and stable branches of industry. The rubber fever in Pará is very similar in its results to the gold fever of California and Australia, namely, numbers of immigrants are attracted to these regions who will eventually remain and develop the many natural sources of wealth that the country offers, but who otherwise would not have come. There is now direct steam communication by very fine steamers between Manaos, one thousand miles up the Amazons, and Rio de Janeiro.

To return to the subject of this paper. It will be seen that the Tocantins empties into the broad river known as the Pará. My opinion is that this latter river was in former times one of the main outlets of the Amazons, and that its western extremity is now silted up and is only connected with the Amazons by a number of very narrow but deep channels, through which steamers pass with difficulty. The quantity of Amazons water that now enters the Pará is insignificant in volume, and now it must not and cannot be considered one of the outlets of the Amazons, although by many geographers it is still considered to be so.

The Rio Muritupucu is the direct route for large river steamers to and from Pará and the Tocantins; its bed, like many of the other rivers of the district, often consists of rock, which forms also the nucleus of most of the islands, upon which has been deposited the rich alluvial mud of the river Tocantins, now covered by dense tropical forests to the water's edge. All these streams are navigable, and singularly free from snags.

My visit terminated, I descended the Rio Muritipucu to the Pará river, where I found a fresh breeze, and a boisterous sea that severely tried the sea-going qualities of our small steam launch. Eventually I passed through the winding channel known as the Arroyal, and thence crossed to Pará.

The German Xingu Expedition of 1884.

THE Xingu river, one of the great tributaries of the Amazons, of which we have heard little since the visit to its lower reaches in 1842-3 by Prince Adalbert of Prussia, was explored in 1884 by a party consisting of Dr. Karl von den Steinen, Herr W. v. d. Steinen, and Dr. Otto Claus, who, starting from Cuyaba in the interior, journeyed down the river to the point where it discharges into the estuary of the Amazons. Prince Adalbert had taken the opposite direction and travelled up the river from Pará. Among other important results, this expedition confirms the conclusion with regard to the geology of the interior arrived at by the late Professor Hartt, who at the time of his death was conducting the survey of the country ordered by the Brazilian Government, and Mr. J. W. Wells, who recently read a paper on Brazil before our Society, viz. that the whole interior of Brazil south of the Amazon valley has been at one time an immense plateau, and that the changes which it has undergone are due to water denudation. The party explored also the plateau of Mato Grosso, on which are the sources of so many important rivers. We take the following account of the expedition and its results from two papers by Dr. Otto Claus, published in Nos. 5 and 6 of Petermann's 'Mitteilungen,' 1886. Fuller details regarding the journey will be found in Dr. Karl v. d. Steinen's work entitled 'Durch Zentralbrasilien' (F. A. Brockhaus).

Cuyaba, the starting-point of the expedition, is the chief town of the province of Mato Grosso, and possesses a population of 15,000. Here the party was furnished with a military escort of twenty-five men for a protection against native attacks. On May 25th, 1884, the travellers left Cuyaba with a three months' supply of provisions consisting of beans, rice, mandioc, and bacon, carried by oxen and mules. A fortnight later they reached the great plateau of Mato Grosso, and on July 6th found themselves on new territory, having crossed the river Paranatinga in 14½° S. lat. Keeping an easterly course, they arrived on July 15th at the Tamitatoala-Batovy, a river about 130 feet broad, and one of the three streams which unite to form the Xingu proper. Here canoes were made from the bark of the jatoba tree, and the oxen were slaughtered and their flesh salted. The river journey was forthwith commenced, the party then numbering twenty, and on August 25th the Xingu proper was reached at 12° S. lat. The travellers navigated the numerous